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The location of innovation education in
Icelandic compulsory schools

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ABSTRACT

Innovation and entrepreneurial education (IEE) is a curricular area that is about applying creativity and knowledge to meet needs or solve problems that learners identify and are important to them. It involves inventing objects and processes to improve social life and aims to develop critical and creative thinking in design, technology, marketing and enterprise. The main emphasis in IEE is about enhancing creativity and actualizing ideas, about innovation and entrepreneurship. Learners should become competent at developing ideas and actualising them. Innovation and creativity are qualities and skills that present and future learners and citizens need and are emphasised in official discourses and educational policies. A curriculum for innovation education was introduced into the Icelandic national curriculum for compulsory school in 1999 but its implementation in Icelandic compulsory school practice has been sporadic (Jónsdóttir, 2005). My own experience of working with IEE in a compulsory school showed me that it could be a framework and a tool to make learning more meaningful through the creative use of knowledge.

The formal aim of this study is to examine examples of innovation and entrepreneurial education (IEE) in compulsory schools in Iceland and locate them within the pedagogic discourse, thereby extracting an understanding of the nature of IEE and the conditions in which it thrives. The research focuses on the work of teachers within the schools and what supports them and their schools in offering and developing IEE. Some legal, curricular and political frameworks are explored and intrinsic tendencies and social structures identified and analysed for the influences they have on the relocation of the innovation discourse in schools as innovation education. The key research question is: *Where and how is innovation education located in Icelandic compulsory schools?*

The research builds primarily on qualitative case studies of IEE in three compulsory schools in Iceland. Observations of lessons were undertaken, interviews with teachers, principals and learners were conducted and school curricula and other texts analysed. In addition interviews were taken with seven teachers from other schools. Official documents and papers were consulted. Data gathering started in autumn 2006 and finished in spring 2009.

The research is developed within a socio-cultural framework with an ecological emphasis on interacting, interpretative and critical perspectives. The purpose is to map the location and nature of the phenomenon of IEE. This is done using three different theories, on which a socio-cultural understanding of three case studies is based. Bernstein's theories of the sociology of education were used to describe and analyse the pedagogic device, and interpret regulative and instructional discourses in different settings (Bernstein, 2000). To

locate the intricate collection of settings affecting IEE and to map their interaction the theory of human ecology developed by Bronfenbrenner (1979) was used. His ecological theory of human development acknowledges that human abilities and their realization depend to a significant degree on social and institutional context. Environments in Bronfenbrenner's theory are analyzed as organic interacting systems, micro-, meso-, exo- and macrosystems, with the individual at the heart of the systems. The theory of curriculum implementation proposed by Rogan and Grayson (2003) and Rogan (2007) prompted an adaptation of Bronfenbrenner's systems ecology and was used to identify feasible routes towards successful implementation of IEE and to display the complexity and interplay of elements and settings. By amalgamating these theories an analytical tool was developed in the research process to identify the location of teachers, schools and their surrounding systems in the *preferred ecology of IEE*, where systems gradually develop alongside neighbouring systems interacting and invigorating each other.

Criteria based on Bernstein's concepts of classification and framing were developed for analysing interaction in IEE. In applying Bernstein's theories on classification of knowledge and framing of teacher and learner roles four kinds of integrated curricular forms could be identified: *discipline based*, *separate disciplines*, *interdisciplinary* and *integrated*. The research showed that IEE is found in several forms and is not located within any one school subject but was sometimes offered as a special subject. Arts and crafts teachers often work with IEE.

Teachers are bound by subject organization of school knowledge and need support to master the balance of freedom and structure that IEE requires when integrating knowledge and crossing boundaries of different kinds, such as between school and society, among school subjects, and between school knowledge and everyday knowledge. Other challenges are relationships among teachers and between teachers and learners. An application of the criteria developed from Bernstein's concepts of classification and framing revealed three modes of pedagogy with teachers working with IEE: *controlled*, *progressive* and *emancipatory*. Teachers display different strengths of framing in IEE lessons with an inherent tendency towards strong framing.

Settings in schools created different conditions for IEE and were identified through using Bronfenbrenner's systems as: *dormant*, *enclosed*, *developing* and *feasible*. The setting in which one teacher worked gave a hint of a fifth setting, an *organic setting*.

The *preferred ecology* analysis showed that implementation of IEE is influenced by personal and professional attitudes of the teachers, conditions within the schools and attitudes and interest in society. Further, all of these are influenced by the macro conditions and culture of Iceland. The exosystem of two of the case schools could be strengthened

with regard to an ideal IEE culture and has the potential to be influenced by schools themselves. The microsystem could develop further by a combination of capacity development and outside support.

The knowledge presented in the thesis can be used to infuse discussions about purpose of education in general and about IEE. I also hope that the findings will be used to promote discussion in the public sphere, for instance, among parents, policy makers and teachers and last but not least will make an impact on the experience and development of learners. If innovation, creativity, holistic thinking and sustainability are key to education in the 21st century, then changes are needed in education that build on perspectives of all stakeholders.

Keywords: Innovation and entrepreneurial education, creativity, Bernstein's theories of education, curriculum change, school development

ÁGRIP

Íslenskt heiti ritgerðarinnar er *Nýsköpunarmennt í íslenskum grunnskólum*.

Nýsköpunar- og frumkvöðlamennt (NFM) er námskráarvið sem felur í sér að nota sköpun og þekkingu við að svara þörfum eða leysa vandamál sem nemendur koma auga á og eru þeim mikilvæg. Í því felst að finna upp hluti og ferli sem auðvelda á einhvern hátt lífið í samfélaginu og jafnframt er markmiðið að þróa gagnrýna og skapandi hugsun í hönnun, tækni, viðskiptum og framkvæmdum af margvíslegu tagi. Aðaláherslan í NFM er á að efla færni til sköpunar og að gera hugmyndir að veruleika. Nemendur eiga að verða færir um að þróa hugmyndir og koma þeim í framkvæmd. Samkvæmt opinberri orðræðu og ríkjandi menntastefnu er nýsköpun og færni til sköpunar þeir eiginleikar og færni sem nemendur í nútíð og framtíð þurfa að hafa á valdi sínu. Námskrá í NFM var kynnt í íslenskri aðalnámskrá fyrir grunnskóla 1999 en framkvæmd hennar í skólasterfi hefur verið slitrótt (Svanborg R. Jónsdóttir, 2005). Reynsla mín af kennslu NFM í grunnskóla sýndi mér að hún getur verið umgjörð og verkfæri til að gera nám merkingarbærara þar sem nemendur fá tækifæri til að hagnýta þekkingu á skapandi hátt.

Markmið doktorsrannsóknarinnar var að skoða og greina birtingarform nýsköpunarmenttar í íslenskum grunnskólum. Í rannsókninni er athyglinni einkum beint að störfum kennara í skólunum og leitast við að finna út hvað styður þá og skólana í að innleiða og þróa NFM. Lykilspurning rannsóknarinnar er: *Hvar og hvernig er nýsköpunarmennt staðsett í íslenskum grunnskólum?*

Fylgst var með nýsköpunarmennt í þremur skólum og gögnum safnað með þátttökuathugunum. Tekin voru viðtöl við kennara, stjórnendur og nemendur í þessum skólum, en þar að auki voru tekin viðtöl við sjö kennara úr öðrum skólum. Einnig voru námskrár, stefnuskjöl og skýrslur greindar. Gagnaöflun hófst haustið 2006 og lauk vorið 2009.

Rannsóknin byggir á grunni félags- og menningarkenninga þar sem vistfræðilegri sýn er beitt til að skýra og túlka samverkandi þætti, og þjóna um leið sem gagnrýnið sjónarhorn. Markmiðið er að skrásetja og draga upp stöðu og eðli fyrirbærisins NFM. Það er gert með því að greina gögnin sem safnað var, með þremur mismunandi kenningum, sem byggja undir félags- og menningarlegan skilning á þremur tilvikum sem rannsökuð voru. Kenningar Bernsteins um félagsfræði menntunar voru notaðar til að lýsa og greina hið uppeldislega „tæki“ og til að túlka stýrandi orðræðu og kennsluorðræðu í mismunandi aðstæðum (Bernstein, 2000). Kenning Bronfenbrenners (1979) um félagsleg vistkerfi (*human ecology*) var notuð í greiningunni til að safna saman og staðsetja hina margvíslegu

þætti sem hafa áhrif á NFM og skrá samspil þeirra. Kenningar Rogan og Grayson (2003) voru aðlagðar að vistfræði Bronfenbrenners til að koma auga á og greina fýsilegar leiðir í átt að farsælli innleiðingu NFM og til að sýna hina margvíslegu áhrifþætti og samspil þeirra við umhverfi sitt. Innleiðing NFM ræðst af persónulegum og faglegum viðhorfum kennara, skilyrðum innan skólanna sem mótast af viðhorfum sem og áhuga og viðhorfum í samfélaginu. Ennfremur hafa menning og almenn skilyrði í landinu áhrif á fyrrgreinda þætti.

Einn afrakstur rannsóknarinnar var matstæki sem þróað var með því að tvíanna saman kenningum Bronfenbrenners og Rogan og Grayson og var það notað til að greina stöðu og framvindu nýsköpunarmentar í skólunum. Einig voru matsviðmið búin til sem byggðust á hugtökum Bernsteins um flokkun og umgerð og voru þau notuð til að greina samskipti og tengsl ýmissa þátta í nýsköpunarment.

Með því að nota kenningar Bernsteins til að greina gögnin mátti greina fernskonar námskrárför sem birtust í fjórum mismunandi tegundum samþættingar í nýsköpunarment. Fyrsta nálgunin er *nálgun út frá námsgrein (discipline based)*, önnur *þemanálgun sjálfstæðra námsgreina (separate disciplines)*, þriðja *þverfagleg nálgun (interdisciplinary)* og fjórða *heildræn nálgun (integrated)*. Rannsóknin sýndi að nýsköpunarment er ekki skilgreind í skólunum innan ákveðinnar námsgreinar en var oft í boði sem sérstök námsgrein eða viðfangsefni og það voru gjarnan list- og verkgreinakennarar sem unnu með nýsköpunarment.

Kennarar eru vanir námsgreinafyrirkomulagi í skipulagningu þekkingar og þurfa stuðning til að ná hæfilegu jafnvægi milli frelsis og skipulags sem er nauðsynlegt í vinnu með nýsköpunarment og við að samþætta þekkingu og yfirstíga afmörkun af ýmsu tagi svo sem milli skóla og samfélags, milli námsgreina og milli skólaþekkingar og þekkingar úr daglegu lífi. Aðrar áskoranir felast í samvinnu kennara og samskiptum milli nemenda og kennara. Kennararnir unnu með nýsköpunarment með misjafnlega stífa eða lausa umgerð og virðist vera tilhneiging hjá þeim í átt að stífri umgerð. Með því að nota greiningartæki sem þróað var út frá kenningum Bernsteins með flokkun og umgerð mátti greina þrenns konar mismunandi viðmót hjá kennurum: *stjórnandi (controlled)*, *framsækið (progressive)* og *eflandi (emancipatory)*.

Aðstæður í skólunum sköpuðu mismunandi skilyrði fyrir NFM og voru þau greind með aðstoð kenninga Bronfenbrenners um félagsleg lífkerfi og sýndi greiningin fernskonar aðstæður: *óvirkar (dormant)*, *aflokaðar (enclosed)*, *í þróun (developing)* og *æskilegar (feasible)*. Vísir að fimmtu aðstæðunum kom í ljós í kringumstæðum eins kennarans sem lífrænar aðstæður (*organic setting*).

Hið æskilega félagslega vistkerfi fyrir NFM má líta á sem fjölkerfa þróun þar sem hvert kerfi þróast samsíða nágranna kerfi og þau þurfa að hafa samskipti sem ýta undir þróun hvers annars. Ytra kerfi sem birtist sem viðhorf í samfélaginu, hjá tveimur skólunum virðast styst á veg komin í að þróast í átt til þeirrar menningar sem best styður við NFM og hefur jafnframt mikla möguleika til framfara. Hægt er að hafa áhrif á innsta kerfið, í skólastofunni, með samspili aukinnar getu og stuðningi utanfrá.

Þá þekkingu sem er kynnt í þessari rannsókn mætti nota sem innlegg í umræður um menntun almennt og um nýsköpunar- og frumkvöðlamennt. Vonast er til að niðurstöðurnar kalli á almennar umræður, meðal annars hjá foreldrum, stjórnvöldum og kennurum og að þær verði til þess að hafa jákvæð áhrif á reynslu og þroska nemenda, sem er það sem mestu máli skiptir. Ef við metum mikils sköpun, heildræna hugsun og sjálfbærni með ábyrgri nýsköpun bæði nú og í framtíðinni þá er ljóst að við þurfum breytingar í menntun sem byggja á sýn og virkri samræðu allra hagsmunaaðila.

Lykilorð: Nýsköpunar- og frumkvöðlamennt, sköpun, kenningar Bernsteins um uppeldis- og kennslufræði, námskrárbreytingar, skólaþróun.

This thesis is dedicated to the memory of my parents.

My mother Anna Halldórsdóttir (died 1978) loved learning and inculcated in me the love of studying and my father Jón Einarsson (died 2010) supported me and was proud of me.

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CHAPTER 1: Introduction

1.1 Starting out

I smiled as I walked from the crafts classroom into the main building of my school in Iceland where I had taught for twenty-three years. It had just stopped raining, the air was fresh and cold and the sun had started shining. I was happy. I had just finished teaching a class in innovation education and I remember feeling good, as everything was as it should be. The learners had been active and interested and two boys, that usually loved to play football whenever they could, chose to work on their project in the free periods. They had co-invented a solution for feeding free-range hens that they were building to sell at a market that the class was planning the following week. At that time I had been teaching innovation education for five years and it had been a good experience as it gave me a chance to be the teacher I wanted to be. The learners could be creative using all kinds of knowledge from school subjects and from life itself.

I had always loved school and being a learner but when I started teaching I soon found that some learners did not like school and some even hated it, and I really wanted find ways to help them enjoy learning and going to school. I saw that different subjects appealed to different learners, some would like gymnastics, others liked crafts, some liked arts and some liked everything. Sometimes some girls liked arts and the majority of boys liked crafts, but there was not a clear-cut difference across gender. Through the years I attended several courses and tried new things, varying my approaches in teaching and projects of many sorts. These experiments were often successful and I was able to offer learners opportunities for learning that engaged the majority. When I learned about innovation education I first tried it as a short diversion in my teaching but as it turned out to engage the children well and in a different way than in anything else we were doing in the school, I expanded it into a special subject with the support of the principal. I taught innovation education for the last ten years that I taught in compulsory school (1995-2006) and my adoration grew with more experience and every course I took. In the form we offered it in my school it covered many fundamental elements of human life, from enhancing the capacity to be creative, solve problems and work together, to understanding and making technology, to comprehending and making business and finally to scrutinizing the environment and how things connect and depend on each other. I was very happy as innovation education engaged the learners through their own experience and as it connected their own lives and work life somehow so naturally that often they did not realise that they were doing school work or being creative.

Definition of innovation education

Innovation education is a curriculum area where learners can influence their own learning and provide the basis for their own projects themselves. It has been defined by Burke (2002) as follows:

Innovation education involves inventing new objects, redesigning things that already exist and building for change to enhance and improve the conditions of social life. It encourages children and young people to look carefully and critically at the material world that surrounds them. It teaches, through active engagement, that the material world has been made by people and can be altered, changed and improved. It develops critical thinking and practical skills in design and technology and in marketing and enterprise.

In innovation education learners identify needs that are important to them and work on solving them. They use their personal social histories, their own lives and experiences as a foundation for their understanding of the world (Gunnarsdóttir, 2001a). They use knowledge and skills, both their own and by harnessing their environment to produce new knowledge, either as new to them or even to the world as well (Gunnarsdóttir, 2001a).

In Iceland ‘innovation and the practical use of knowledge’ is part of the national curriculum for compulsory schools (learners aged 6 -15 years) and is an option in upper secondary schools (learners aged 16 -19). The term ‘innovation education’ (í nýsköpunarmennt) is more commonly used in compulsory schools and ‘entrepreneurship education’ or ‘entrepreneurial education’ (í frumkvöðlamennt) is used at upper secondary level. Even so, the latter terminology is more business oriented than is always the case in school practice, thus the Scottish approach called ‘enterprise education’ is also appealing (Deuchar, 2008; Paterson, 2009). As my understanding of the phenomenon progressed I have come to realise the close interconnection of ‘innovation’ and ‘entrepreneurship’ (enterprise) in innovation and entrepreneurship education. They are two sides of the same coin (Jónsdóttir, 2008b). The early foundation lies in creative work and honing creative skills (Figure 1.1), and with time the emphasis moves towards actualising the ideas, being enterprising and developing entrepreneurship skills and knowledge. Creativity and enterprise are integral parts of ‘innovation and entrepreneurial education’ and the balance between them may alter with the age of the learner but both are always present. As learners get older and have more experience of innovation their learning may be more characterized by entrepreneurship but creativity and innovation are always core elements. Innovation and entrepreneurial education is therefore seen as encompassing both. Here I will use the term ‘innovation education’ or the abbreviation IEE when talking about ‘innovation and entrepreneurial education’ regardless of school level.

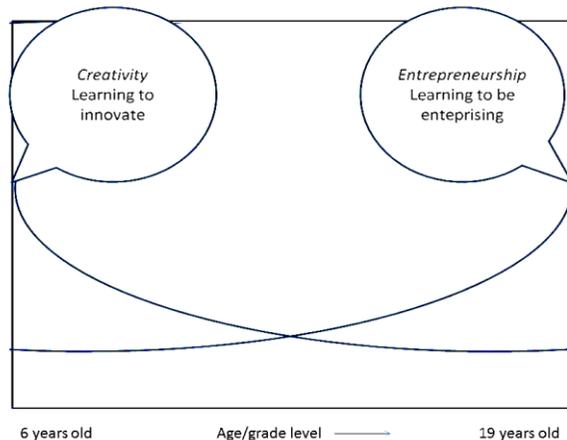


Figure 1.1 Two foundations of innovation and entrepreneurial education (created by Macdonald & Jónsdóttir in 2007)

Prior to this study very little research has been carried out in innovation education or technology education in Icelandic schools. Two research projects have been carried out on innovation education in Iceland, Gunnarsdóttir's Ph.D. research *Innovation Education. Defining the Phenomenon* completed in 2001 and my own master's research completed in 2005. One other Ph.D. project is underway, the research of Thorsteinsson at Loughborough University in England, carried out in Icelandic compulsory schools focusing on the design process and use of electronic tools.

As indicated above I found innovation education to be powerful and the learners were more active and interested in general than in any area I had taught before. I noticed that not many other schools in Iceland were doing innovation education which surprised me since it was introduced in the official curriculum in 1999. When I had a chance to do my master's research I decided to find out whether IEE was spreading into Icelandic schools and what factors influenced its dissemination. The findings showed that innovation education was not common in compulsory schools and that there were many factors affecting its implementation (Jónsdóttir, 2005).

Innovation education in Iceland emerged around 1990, mainly in Foldaskóli in Reykjavík where the pedagogy and teaching materials were developed. IEE was introduced in the curriculum for compulsory schools and secondary schools in Iceland in 1999. For compulsory schools it was placed in the Information and Technology Education (ITE) curriculum (Ministry of Education, 1999b) but without an explicit allocation of time. Since IEE is a part of the Icelandic formal curriculum and the dissemination in school practice is

weak (Jónsdóttir, 2005) it raises the question of where the administrators, learners and teachers locate innovation education. Is it a special 'subject' in their understanding, or a 'method' or what sort of phenomenon is it to those who have experience of it?

The introduction of innovation education in schools in Iceland seems to follow similar tendencies as other reforms in education that had been regularly tried for the last century and die out or become isolated (Tyack & Cuban, 2001). The tendency to maintain an academic focus and traditional ways of teaching and learning by "feeding" knowledge to learners (Säljö, 2003) has persisted, whereas innovation education builds on the approach that learners are active and creative and the teacher's role is to support the learners construction of knowledge rather than to be the ultimate expert that "feeds" knowledge (Gunnarsdóttir, 2001b). This thesis will address the location of innovation education in the Icelandic school system.

1.2 Curriculum change and innovation education

Improvements and changes in education tend to be slow and often seem to evaporate without sustained change. Many forces influence change and there is a tendency in schools towards traditional practices and relatively inflexible organisation is typically subject based.

1.2.1 Understanding and enhancing curriculum change

Change in school practice and innovations in education have a tendency to come and go without leaving sustainable alterations (Tyack & Cuban, 2001). Reforms in education are regularly introduced in western societies, changes that are intended to make education for all better. Reforms or innovations are often implemented from above as policy. For example large scale reforms in the US in the late 1950s and throughout the 60s, such as open plan schools, flexible scheduling and team teaching, were not deemed successful (Fullan, 2001). Sometimes innovations were adopted on the surface with some of the language and structures becoming altered but not the practice of teaching. Putting ideas into practice was far more complex than people realized (Fullan, 2001).

Much research has been conducted to find out what went wrong and to identify what was successful and why in the implementation of educational change. Different methodologies were used. Psychological research focuses on learning and the brain's ability to learn gives clues on how to develop appropriate learning environments (Abbott & Ryan, 1999). The necessity to focus on real conditions generated research that educational psychologists

conducted to find out how to help students and teachers change their traditional roles in the classroom by identifying the interaction between learners personal factors and teaching methods (Boekaerts, 2002). Attention on learners' in the change process has been growing in educational research through considering learning, learners and systems with a focus on a specific issue or emphasis, for example, on learner aspirations and agency (Craft, Chappell, & Twining, 2008). Large scale research with the help of questionnaires to relevant stakeholders, intended to evaluate change reforms, have managed to extract a variety of information that has added to the knowledge about what matters in such reform efforts and why some are a success and some fail or are not sustained (Fullan, 1982). Such research have revealed several factors influencing the implementation and development of innovations such as: the quality and feasibility of the innovation; access to information; support of government; support or pressure of teachers; the advocators and advisors of change; pressure, support, lack of interest or opposition of the society; access to finance; central or local legislation; solution oriented initiatives to adopt innovations; administrative incentives for adoption; and the importance of quality learning materials (Fullan, 1982). The situatedness of the complex and intricate interaction of factors has called for an appropriate research method such as case study. Case studies can identify both surrounding factors influencing teachers' work, and their personal interpretative framework (sense-making) as well as in-school factors such as the character of a collective norm of willingness to innovate (Ballet & Kelchtermans, 2008).

Fullan and Stiegelbauer (1991) conclude that the reasons that reforms have failed is because the university scholars that were driving change were using theories that were too removed from practice and that the academics did not learn from school practice and did not understand it particularly well, nor did they consider the connection between the nature of the reform demands and the purpose of the schools. For changes to be successful teachers must understand what meaning and influence they have on their practice and what they mean in relation to their feelings, experiences and religion (Hargreaves, Earl, Moore, & Manning, 2001; Mansour, 2011).

Action research has been developing as a research methodology as a response to the gap between educational change research and the intended influence changes were expected to have on school practice. Action research advocates a research process that is open and democratic and rejects the clear separation between the researcher and the researched (Esterberg, 2002). The process is meant to be liberating for the participants as they gain knowledge about their own situations thus giving them power to influence and change them (Esterberg, 2002).

The understanding that education and change must be seen as a complex whole has been developing in educational research and the use of grand theories such as Cultural-Historical Activity Theory that help to connect large structures with the local and personal have been growing (Sannino & Nocon, 2008). Seeing the school setting as a web of ecology is not entirely new such as Goodlad (1975) pointed out in 1975. Goodlad advocated seeing and understanding the school as an ecological system rather than a mechanical one, with connecting parts that make a whole but each changing in unforeseen ways. Thompson (2010) in her review of school change identifies four different metaphors of understanding how schools work; the school as a rational machine; an ecological web; a system; and as a sense-making collective intelligence. None of these models are entirely separate from the others but they all include multiple factors and the last three all imply some sort of ecological or systems views (Thomson, 2010).

Middleton (2006) in writing about research in technology education suggests that research methodologies must be made more suitable for researching the things that need to be researched. Middleton also claims that research has been highly descriptive or quantitative or both and that we need more critical analyses of how teachers implement curriculum and need to draw on tacit knowledge, the idea that knowledge may reside in representations that we cannot describe using symbols (Middleton, 2006). Design Based Research (DBR) is a response in research methodology to implement innovations that are needed in practice, designed for the group that implements the change and evaluated with the researchers for its usefulness, strengths and weaknesses (Juuti & Lavonen, 2006).

In order to conduct research focusing not just on the obvious, surface features of innovations that are implemented, but also on the more complex features that complete the innovation implementation (Walker, 1990) requires well chosen methodologies that can dig deep into micro factors and make connections inside and out.

Rogan and Grayson (2003) have introduced a theory of curriculum change that is helpful for making sustainable choices. They pointed out that changes in education may require a change of culture and such changes do not happen in one gigantic step but rather in smaller manageable steps that also makes the changes more likely to be sustained.

1.2.2 Innovation education in the formal curriculum

A current focus in education is that learners are empowered to become active participants in learning activities (Kumar & Kogut, 2006). The need for this kind of approach in teaching and learning is growing in a changing world (Craft, 2011). Wells and Claxton (2002) argue that as we enter the 21st century we need to reconsider the goals of education in times of rapid social, economic and political change. Craft (2006) argues that as people

now experience constant changes in social relations, the economy and technology; it follows that individuals need to be increasingly self-directed. She describes the quality of self-direction as ‘little c creativity’, which involves the quality of personal agency. Little c creativity seems to be the same kind of creativity that is enhanced in innovation education as it is seen as a part of everyone’s potential.

A current focus in many countries is on ‘the knowledge-driven economy’ where education is expected to provide the drive and foundation for building up human capital, building knowledge bases and securing maintenance, dissemination and use of knowledge (OECD, 2008). The underlying purpose of education in each country can be extracted by identifying the discourses or messages of what people are expected to become, as a result of education, and what kind of philosophies or ideologies these discourses build on. For some time human capital and the knowledge society has been celebrated as the source and making of quality of the desirable society. Human Capital Theory appeared in the early 1960’s with ‘human capital’ as a key determinant of economic performance where individuals with knowledge and training are seen as human capital (Fitzsimons, 1999). Reformulations of Human Capital Theory have emphasized the role of education and training as key to participation in the new global economy (Fitzsimmons, 1999). Knowledge is seen as the driver of social development and is expected to be converted into value by application (Meek, Teichter, & Kearney, 2009). In a similar vein the “creative economy discourse” (Peters, Marginson, & Murphy, 2009) is taking over as the economic rationale for enhancing creative skills through education.

The question of what is education for, is thus at any given time a question of a philosophy of education. And who is it for? Is it for the society to make individuals effective in taking part in social and economical structures? Is it to sort out the academically intelligent from the differently intelligent to make work skills sorting efficient? Or is it to develop the person to be more human, to be the best she can be, to know how to be happy, to know how to live with others and to know and be able to transform oneself and society. In the case of IEE I can see the economic rationale as the one that may convince some of its importance but the rationale that is perhaps more important is the rationale of the empowerment of learners to become creative, active and responsible participants in their own lives and the society. This is in line with the belief that the creative individual is fulfilled and whose life is characterized by ‘agency’ – the capacity to take control and make something of it (Craft, 2003). Thus IEE can be seen as embracing the *learner centred ideologies*, *social efficiency* and *social reconstruction* ideologies (Schiro, 2008; Jónsdóttir, 2005) that have in the past influenced educational policies and curricula to different degrees and with varying purity.

Innovation is a popular term in political and economic discourse. The European Union wants to enhance innovation in Europe (Commission of the European communities, 2006, 2008) and in Iceland ‘innovation’ is seen as a necessary foundation for progress and prosperity (Sigurðsson, 2007). One might conclude that to enhance innovation, focused education should start right from the beginning of compulsory schooling but Icelandic schools have generally not offered this area of study (Jónsdóttir, 2005, 2007a). Recently a research project *Intentions and Reality* (IR) with a major focus on science and technology education was conducted in Icelandic schools. The discourse in the science curriculum for compulsory schools (Ministry of Education, 1999c) can be seen as welcoming to innovation education even if it never uses the word *innovation*. Words such as *initiative*, *critical thought*, *independence* and *responsibility*, can be found in the categories of the nature and role and methods and skills of the science curriculum in 1999 to express some of the aims. There is also clear emphasis in the science curriculum on practical knowledge and skills, integration of subjects, student choice and importance of transferability of knowledge to everyday life. The IR research revealed that innovation education and technology education are not well developed yet and are not found in the school curriculum of most Icelandic schools (Jónsdóttir & Macdonald, 2008).

Innovation education has many similarities to what in other countries is called ‘technology education’ or ‘design and technology education’. Technology education and innovation education both aim at building an understanding of technologies in the widest sense and problem solving and the design process is prominent in both (Haché, 2006; Jónsdóttir, 2006a). Technology education and innovation education lead to the kind of new knowledge and skills that are considered important in contemporary societies and have been introduced within the official curricula of many countries. These newly classified areas in education have been emerging for the last twenty years or so struggle for existence within structured and stratified school systems. Even though they incorporate many properties of what official discourses indicate are needed in society they have not yet found a permanent place (Jónsdóttir, 2006a; De Vries, 2006).

Gunnarsdóttir’s (2001b) research on innovation education in an Icelandic compulsory school identified two main processes when learners took part in innovation education episodes, the first *acquiring creative relevant skills* and the second the *ideation process*. The creative relevant skills are defined as necessary knowledge and skills for the development of ideas and inventions (Thorsteinsson & Gunnarsdóttir, [1996]b). Relevant knowledge might be about how things work i.e. their technology, and relevant skills being able to draw ideas, construct and build and talk about or describe ideas. Skills and knowledge become relevant to the children when they begin to use them in a creative way.

Some of these skills and knowledge can be taught and drilled without the impetus for the child to use them for creative purposes. The other process, Ideation, is what the learner goes through when working on an idea, his or her personal experience and development of the idea. Gunnarsdóttir's research shows that these two processes need to be balanced during IEE lessons. If the teacher takes on too directive a role in IEE then the learners tend to stop using their experience and little creative work will happen. The ownership of the learning process must be in the hands of the learner.

Gunnarsdóttir's research on IEE was undertaken in one school and it would be helpful to attain an understanding how teachers in other schools experience teaching innovation education and where they locate it in their school practice. What characterizes the pedagogy of those teachers who work with innovation education in different schools and under different conditions? And why do some of them stop working with IEE? Is it something in the context that supports them or obstructs them in carrying on with innovation education or is it mainly something personal?

1.3 A view of the world and of acquiring knowledge

Ontological and epistemological worldviews influence the way people see and understand the world. Ontology refers to the nature of reality and being, it addresses the form and nature of reality and what can be known about that reality (Olafson, Schraw, & Vander Veldt, 2010). An ontological worldview refers to an individual's combined beliefs that comprise a personal ontology and these beliefs can be tacit or explicit in part or in whole (Olafson et al., 2010). Epistemology refers to the implicit and explicit beliefs about the origin and acquisition of knowledge and epistemological worldviews refer to an individual's combined beliefs about the nature and acquisition of knowledge (Olafson et al., 2010).

In order to clarify the ontological and epistemological grounds on which I build the design and findings of this research I will now present those and how they affect my choices of question, methods and theoretical framework.

1.3.1 My research question

My key research question is:

Where and how is innovation education located in three Icelandic compulsory schools?

There are four more detailed questions:

- What is the rationale for innovation education?
- What affects the location of innovation education in three Icelandic schools?
- What characterizes the pedagogy of teachers that embrace innovation education?
- What characterizes the social ecology of IEE?

These are discussed in Chapter 3.

I have chosen a qualitative case study approach to address the questions, the technical details of which will be covered in Chapter 4.

I want my research to critically evaluate the social reality investigated and contribute to the transformation of it by making visible the affordances of IEE and conditions in schools and society that are either supportive or restrictive (Orlikowski & Baroudi, 1991).

My intention is to construct a social map that will locate and reveal a picture of IEE in three schools in Iceland. This map could be used to understand what IEE needs for successful implementation, its potentials and limitations, tensions and dilemmas in practice, and to make better policy decisions locally and on macro level. This kind of undertaking requires an overview of the social situation close and remote, thus at the same time as a close observation of chosen situations is made, a holistic ecological view is developed.

1.3.2 A socio-cultural framework

My research is framed within a socio-cultural (ecological) framework with an emphasis on interpretative and critical perspectives. The way I see the world and how people come to understand it, reflects the view that there are differences between people in how they perceive things and interpret them. The social reality that people experience is built on their interaction with each other and their own interpretation of those interactions. What I think and experience in a social episode can be different from what someone else might experience. The way humans attribute meanings to their experiences and behaviour is through a socially mediated process. Everything people learn is through interactions with other people whether face to face or through books or other media. I assume that humans do not primarily act as a direct response to physical stimuli but react to understandings and meanings that they acquired in the course of their socialization (Wettstein & Thommen, 2009).

Education takes place in diverse social contexts and an ecological perspective takes into account the different contexts (Wettstein & Thommen, 2010). In the same way as

Bronfenbrenner's (1979) theories depict, I acknowledge the interactions and reciprocal influences of the psychological and the social systems, forming social cultures that can be seen as ecologies for human development. I view humans as developing through their participation in socio-cultural activities in their communities that are open and transforming systems and education as the exchange between individual and social systems (Wettstein & Thommen, 2010, p. 360). Therefore my epistemological stance is that human beings come to know or understand phenomena they encounter through a complex social construction (Genishi & Glupczynski, 2006). My view is grounded in a socio-cultural constructivist and ecological ontology that acknowledges individual construction of knowledge and that it is influenced by culture and social interactions rooted historically in traceable systems, local and remote, those that are linked and influence each other.

1.3.3 *An interpretative view*

I am seeking to find out how people construct their knowledge about and in IEE and at the same time I am constructing knowledge from those encounters and my reflections and analysis on that same knowledge. Thus I am taking on the interpretative view of data: "What we call our data are really our own constructions of other people's constructions of what they and their compatriots are up to" (Geertz, 1973). Walsham (1993) describes this understanding in a similar way, stating that our knowledge of reality is a social construction by human actors and that this applies equally to researchers and thus there is no infallible objective reality that can be discovered by researchers and duplicated by others.

Eisner (2002) points out that objectivity in educational research refers both to *ontological objectivity*, the state in which one's perception of the world and the world itself is the same and *procedural objectivity*, where the method through which the world is described allows little or no personal judgment or interpretation. My own study is contrastingly positioned to this since the ontological objectivity is untenable in the constructivist approach and my method presupposes judgment and interpretation. Eisner (2002, p. 237) claims that 'objectivity is a function of inter-subjective agreement among a community of believers' which reaffirms the beliefs of those working within the system. Von Glasersfeld (2008) argues that we never know what the "world out there" is really like, as all we have is our experience of it and we can only compare experiences to more experiences. We thus put our experience together in a way that makes sense to us and helps us survive in the conditions we experience (Glasersfeld, 2008). Eisner advises that we cannot productively ask whether a set of ideas are really true but rather ask whether they are useful, whether they help us to do our work more effectively, perceive the phenomenon in more complex

and subtle ways or expand our intelligence in dealing with important problems (2002, p. 237).

My study draws knowledge of practice from the first-person experience view along with relevant conditions of experience (Smith, 2009). In other words I talk to people in schools and I visit their location of practice and try to capture an image of their daily life and their experiences concerning IEE. The study could be described as phenomenological as it is a study of how people experience the phenomenon IEE and what meaning it has for them and in the process I extract the significance of various factors that influence their views and practices. That phenomenon is studied within a local setting of three different schools as three cases of three different social contexts leading to an ecological picture of different settings. I talk to additional teachers outside those three cases to add to and check the views of IEE in the case schools.

1.3.4 The road ahead

My key research question indicates that a simple answer is not expected and that the way I see the world entails multiple views and voices. My study can be seen as a hermeneutical process: of gathering knowledge and extracting understanding through interpretation. The design entails an iterative process of understanding through gathering data and interpretation, viewing the data with ideas from other research, going back and forth, one informing the other and at the same time looking at the specifics of local information in light of the larger context. Gradually I build a set of criteria relevant and applicable to the contexts under study. Looking at data as it is gathered along the way and comparing to research questions gives answers and raises new questions that can be followed up in the next gathering of data. Such a dynamic process is necessary to explore multifaceted influences, get a sense of local culture and conditions and change the position to and fro, from immersion to distance in order to get the understanding of the micro actions and the influences of macro settings and connect those in a comprehensible ecological map.

The complexity of such an intricate collection of data calls for the support of an overarching theory that encompasses persons, and dynamic interaction and processes, cultures and systems. I adapt Bronfenbrenner's theory of human ecology to allow the construction of a holistic map of events that is both complex and comprehensible (Bronfenbrenner, 1979/1994).

Looking for the hidden or tacit factors needs tools that extend the vision of the researcher and for that I turn to Bernstein's theories that make available concepts with which to identify and interpret regulative and instructional discourses in different settings (Bernstein, 1996/2000). Furthermore the theories of Rogan and Grayson (2003) offer

views to identify possible routes that can be taken within the map of potential and preferable development of IEE and help me to display the complexity and interplay of systems. Rogan and Grayson's theories recognize that changes take time and usually happen gradually. These three theories do not demand findings of a specific kind, rather they offer maps to be drawn that allow and draw on diversity and different points of view, situations and conditions (Bronfenbrenner and Rogan & Grayson) and to uncover what is already there (Bernstein, 1996/2000). In this way I aim to construct a "structural corroboration" for validation where different data and information link to create a whole that support each other by the "bits of evidence that constitute it" (Eisner, 2002, p. 237). The aim is to show that "[E]vidence is structurally corroborative when pieces of evidence validate each other, the story holds up, the pieces fit, it makes sense, the facts are consistent" (Eisner, 2002, p. 237). It is though not considered a flaw if evidence seems contradictory from the point of view of informants, rather that it is richer.

The bulk of data is gathered on three locations from different informants and with a variety of methods, from analysis of papers and official documents and from interviews with seven additional teachers. This information is processed and presented with the help of the three different theories. The research aims to construct an authentic picture, a map, shows the location and nature of a phenomenon. The structure of this enterprise and the tools used coalesce to offer a valid, coherent and persuasive whole in answering a question expecting a complex answer. Using these three theories with the inductive analysis of data can be seen as an 'abductive' enterprise that is neither inductive nor deductive but synthetic (Valsiner, Molenaar, Lyra, & Chaudhary, 2009).

I locate myself as a social scientist who is not just an observer but also a participant in the field of this research (Hopkins & Pea, 1987). I view the entire research process as interactive, where as a researcher I bring past interactions and current interest into my research and I interact with the empirical materials and emerging ideas (Charmaz, 2005). Neither data nor ideas are mere objects that we passively observe and compile. How we conduct our research process does not occur in a social vacuum (Charmaz). My research data is processed through my critical reflections and reflecting on my subjectivity and inter-subjective relationships. I also acknowledge that I am a part of a society marked by various conflicts visible or hidden, and that no producers of knowledge are innocent or politically neutral (Foley & Valenzuela, 2005).

1.4 Purpose and impact of the research

I intend to use the knowledge I create to develop an interpretive community that discusses what is valid and reliable knowledge (Inayatullah, 1993) in the area of IEE, and even in education in general. My intention is also to use the knowledge to influence and engage the public (for instance parents), policy makers, teachers and learners. I want to influence the experience and development of learners.

1.4.1 Purpose of the research

To examine and understand issues in implementing innovation education

The underlying purpose of the research is to enhance innovation education in Icelandic school practice. I examine innovation education in Icelandic schools to find out what kind of support is necessary and useful to enhance the subject in school practice. Many proposed changes are not sustainable although they seem to be appropriate and timely for the current and future needs of learners and societies. Further understanding of the nature and needs of successful IEE and influencing factors can produce tools to make the ground more fertile and offer conditions for sustained growth in this area.

To provide information for discussion and development in schools

The knowledge that this research will produce, can contribute to and enhance discussion about innovation education in the development of teacher education and laying the foundation for focused innovation education throughout the school system. The findings can be used to develop courses for learner teachers, in-service teachers and others interested in innovation education and to be of guidance in school development in general. The research could enhance the development of innovation education through informed discussion and curriculum decisions.

To continue the critical discourse that I want to create with my research I intend to facilitate further discussions with scholars and share my findings, epistemological underpinnings and research methods, and thus subject my work to critical review in multiple conversations for continual re-examination of that knowledge through dialogue (Kelly, 2006, p. 52).

To support the work of the teacher

The research project aims at identifying examples of innovation education and locating these within the pedagogic discourse in order to understand the nature and ecology of innovation education. I study teachers' work and their experiences but other perspectives

will also be necessary, such as those of learners and administrators. Legal, curricular and political frameworks for the work of teachers need to be explored as well. Inherent tendencies and social structures will be identified and analysed for the influence they have on innovation education.

1.4.2 Impact of this research

A valuable contribution of this research will be extracting a meaningful understanding of what helps teachers to work with innovation education so that we can make more creative use of various kinds of knowledge and skills for the good of individuals and society. The official discourses about wanting innovation in society need to be realised in innovation education.

Nationally and internationally this research could be a base for developing learning paths for teachers and learner teachers and others interested in innovation education. Administrators have an opportunity to explore how innovations in education that require deep change can be supported and enhanced. Policy makers can make use of the findings to make the policies they develop more likely to succeed. Science and arts, business and personal life also directly and indirectly benefit from enhanced innovativeness and creativity.

To make innovation education an integral part of the Icelandic school system we need a good understanding of the demands IEE makes of learners, teachers, schools and society and gather knowledge of the conditions that encourage such activities.

All of the above could be used to influence the direction of policy in IEE. For example in teacher education in Iceland there is currently no policy in this area. Society in general and especially parents, as important stakeholders in formal education need a thorough introduction and understanding of IEE that the results of this research can help to make possible. The Association of Icelandic IEE teachers (FÍKNF) has supported and offered IEE courses for in-service teachers and promoted the curriculum area and is a likely platform for making use of the results. Business and potential funders of programs and research can be made aware of the potentials of IEE for young people and the conditions that support such education. The findings could provoke a productive discussion between various stakeholders and researchers about innovation education.

I believe that education is not and should not be value free. It can be used to reproduce set rules and locations of power or it can give people the tools to discover their own power of influence to the world and the skills to work with each other. Nordic education believes in the influence of the school system to equalise opportunities, provide learners with skills

benefiting them in the economy and skills for interacting with other people (Frímansson, 2006). My conviction is that innovation education could inculcate a belief in a learner's own ability to influence the environment and that individuals matter in society. IEE could help develop the skills to analyse conditions and take responsible actions.

I am critical of the current situation in education in Iceland and want to influence the discourses, cultures and persons (work life, teachers, administrators, learners, parents, officials and policy makers) that generate the conditions for IEE and similar curricular approaches.

My aspirations in doing this research are directed towards the implementation of innovation education as a tool to make individuals stronger and more competent in taking action personally and as citizens, to be more creative and ethical in dealing with the modern world. I would like to help schools and teachers to engage in a debate and to do that I want to find out how those who offer innovation education go about doing it and try to identify what helps them. I want to take part in educating young learners, adults, in-service teachers and learner teachers towards learning through creating. I also hope to take part in research in and development of education that will help move society forward, towards a more enjoyable and just world.

1.5 Overview of the foundation of the study

The way in which this research has been created and constructed can be seen as a lens to scrutinize and understand social reality (Figure 1.2).

Each layer of the lens influences what can be seen, gradually narrowing to a methodology that helps to identify matters of importance to the research question and is aligned with the ontology and epistemology on which the research rests. However this does not mean that each layer works separately one at a time or that they are as separated as the figure displays but rather that one builds a foundation for another and influences the potentials and choices that can be made. The social-cultural constructivist ontology forms a foundation for an epistemology that understands knowledge as a social construction that is individually understood. This kind of ontology and epistemology offers certain perspectives for research and together embrace certain methodologies that are relevant for this stance.

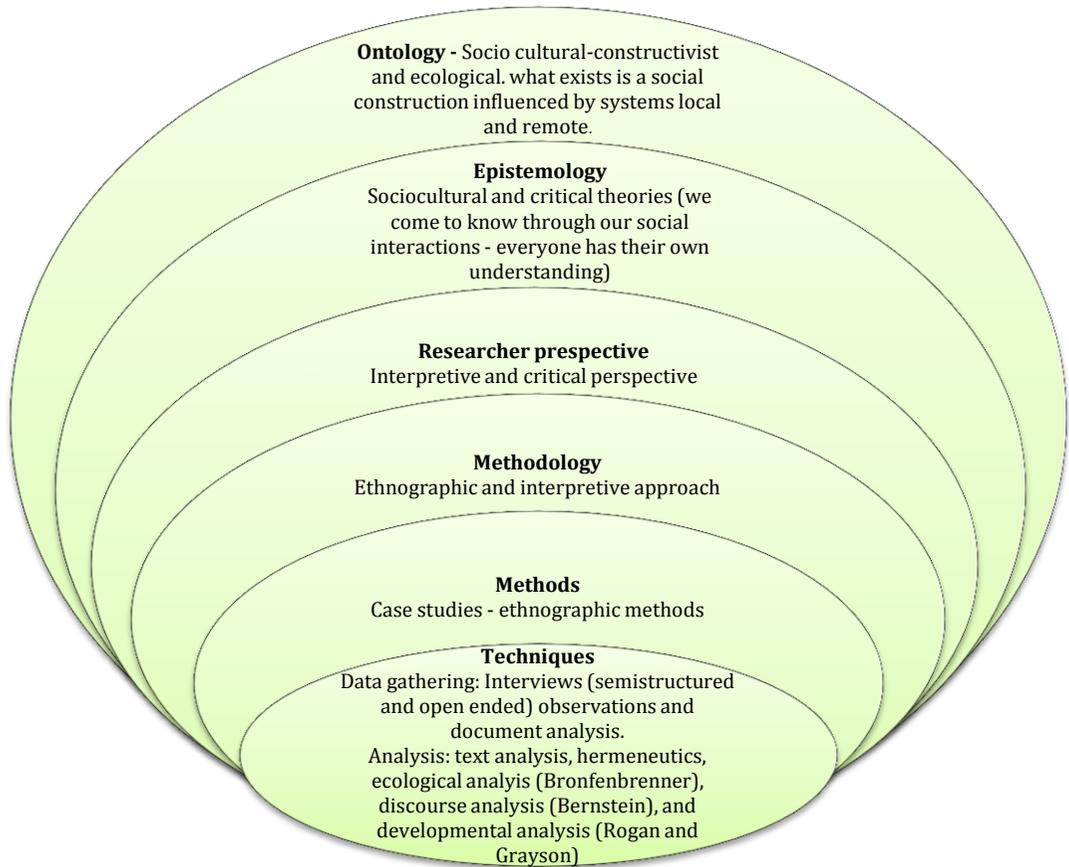


Figure 1.2 A visual presentation of the interrelationship between the epistemological and theoretical foundation of the study and the methodology.

Interpretive and critical perspectives and ethnographic and interpretive methodologies build on the understanding of knowing the world as a complex social construction. The methods and the techniques are rational consequences of choosing according to the ontological and epistemological stance, researcher's perspective and chosen methodology. They are meant to display as richly as possible the multiple voices, various understandings, social interactions and conditions that can enhance understanding of the IEE practice.

1.6 Structure of the thesis

In this first chapter I have introduced the research topic, the ontological and epistemological grounds I build my understanding on, and provided an overview of the purpose and potential impacts of the study. This has been done to lead the reader into the research task and hopefully ignite an interest in it as well. In Chapter 2, I introduce relevant literature for this research. The review covers appropriate research and writings about creativity, innovation and new areas of knowledge in education. Chapter 2 also presents the theories of Bronfenbrenner and Rogan and Grayson and the main concepts of Bernstein's theories. In Chapter 3 I introduce the research questions and discuss issues of research methodology and design, including the researcher's stance and ethical issues. The credibility of the findings is also discussed. In Chapter 4 I describe the methods of data collection and analysis, time schedule and an overview of data. Here I also describe my analytical journey. An analysis of the discursive background of innovation education in Iceland is presented in Chapter 5 where the official discourse of innovation is traced into pedagogy as a curricular subject. In Chapters 6 and 7 I introduce the findings from the three main cases and Chapter 8 analyses the settings, curriculum and pedagogy of teachers working with IEE. In Chapter 9 the model which I have called the *ecology of feasible IEE* is applied to the findings. In the final chapter the findings from the research are summarised, their implications for practice discussed and limitations and areas for further research suggested. Appendices include additional information with schedules for interviews (Appendix I), consent (Appendix II), detailed list of data (Appendix III), example of emerging themes (Appendix IV), example of initial coding (Appendix V), evaluation form (Appendix VI), translation of the IEE curriculum (Appendix VII) and a list of presentations and papers (Appendix VIII).

CHAPTER 2: Creativity and change

What makes this study significant? Why is it worth the effort to find out about the implementation and progress of innovation education? To answer these questions I want to introduce a rationale for why creativity and innovation are important in the kind of education that is needed in the modern world.

Creativity and innovative competences are a part of a range of skills that modern society needs. New curricula suggest that formal education and teachers are the key players in giving learners opportunities for developing such skills. Research on creativity in education and innovative skills has shown it is not always easy for teachers to work with the kind of approach that supports learner creativity.

2.1 Creativity

To advocates of innovation education, creativity is seen as a generic personal trait in all individuals, which can be developed as a skill. Creativity is a difficult concept. It is elusive in that it is commonly used but very complex. Everyone seems to understand it but it is not easy to define. Views on creativity have developed from being seen as something divine that belongs to a few geniuses to seeing it as belonging to everyone.

2.1.1 History of creativity research

Ideas of creativity as being of a sacred source such as ‘having an inspiration’ or ‘getting an idea’ can be found in Greek, Judaic, Christian and Muslim traditions and is founded on the belief that a higher power is the source (Ryhammar & Brodin, 1999; Craft, 2001). The earliest Western conception of creativity was the biblical story of the Creation which generated the idea of the artisan doing God’s work on Earth (Albert & Runco, 2002). During the Romantic era in Europe, originality, insight, the creative genius and feeling were highly valued and the source of inspiration and artistic expression was seen as part of the human being.

It was not until the end of the nineteenth century that the first systematic study of creativity was undertaken by Galton (Craft, 2001; Albert & Runco, 2002). Galton’s focus was on genius and so were hundreds of other studies until the 1920s, when the focus in psychology shifted to the investigation of intelligence. The majority of studies on creativity in psychology were in the 1950s and they were located within four major traditions, the psychoanalytic, cognitive, behaviourist and humanistic, some overlapping (Craft, 2001;

Ryhammar & Brolin, 1999). From these, three main lines of creativity research developed: work on personality, cognition and how to stimulate creativity (Craft, 2001; Sternberg & Lubart, 1999). Although these personality researches have generated interesting and enlightening knowledge they have been criticized for various reasons. Personality research, usually conducted on exceptionally creative persons, has been criticized for being too narrow, focused on famous people and findings of the qualities of creative people that are contradictory and superficial (Craft, 2001). Research based on measuring creativity in tests has been harshly criticized for measuring intelligence rather than creativity and 'creativity on request' as opposed to creativity in daily life (Craft).

During the latter part of the 20th century a strong concern for prioritising creativity in education emerged and various attempts to stimulate creativity was tried (Craft, 2001; Amabile, 1989). Results of programs to stimulate creativity have not been conclusive and transfer of enhanced creativity limited or none (Ryhammar & Brolin, 1999). A lack of systematic, controlled evaluation of such programmes and different theories underpinning their structure make it difficult to judge their efficacy and suitability (Ryhammer & Brolin). In the 1980s and 1990s, research in creativity became rooted in a social psychological framework that takes into account the significant role of social structures in fostering creativity in individuals (Ryhammar & Brolin, 1999, Jeffrey & Craft, 2006). Views that differentiate between H-creativity or historical creativity (important to the world) and P-creativity i.e. psychological creativity (important to the person) (Boden, 2005) opened a broader view of creativity that is relevant to education. The National Advisory Committee on Creative and Cultural Education (NACCCE) (1999) in England offered in their report *All our futures: Creativity, culture and education* a democratic definition of creativity. There it is argued that all people are capable of creative achievement in some area given the right conditions and if they have acquired relevant knowledge and skills. The board advocated a democratic conception of creativity that recognises the potential for creative achievement in all fields of human activity. *Ordinary creativity* (Ripple, 1989), *little c creativity* (Craft, 2006) or *democratic creativity* (NACCCE, 1999) is seen as the creativity of the ordinary person, recognising that everyone can be creative (Craft, 2001). Beghetto & Kaufman (2007; Kaufman & Beghetto, 2009) have defined mini-c creativity to describe every day creativity. They explain mini-c creativity as the novel and personally meaningful interpretation of experiences, actions and events that are not necessarily novel or appropriate to the outside world. They see mini-c creativity as intrapersonal and little c creativity as interpersonal.

2.1.2 *Defining creativity*

Although creativity is often difficult to define it has been described in relatively simple terms that many accept. Sternberg & Lubart (1999) and Sternberg, Pretz & Kaufman (2003) say creativity is the ability to flexibly produce work that is novel, high in quality and useful. In the book *Managing creativity and innovation* (Harvard Business Essentials, 2003, p. 82) creativity is defined as "... a process of developing and expressing novel ideas for solving problems or satisfying needs." Craft (2000) suggests that the core of creativity is *possibility thinking* and creating needs insight. She also claims that little c creativity is a capacity we all have that guides the choices we make every day. It allows us to identify and choose options for our own lives and in that way become our own creators (Craft). To be creative includes being able to imagine, to see further than the obvious, and to be original in one way or another (Craft, 2001).

Being creative relates to agency, the control individuals have of their actions and lives. Creativity involves people having 'agency' over their environment and it is about individuals being able to 'actualise' their choices in their lives (Craft, 2000, p. 21). Creativity thus can be seen as being about 'agency', the ability and capacity to act and work in order to produce ideas or products that are original and innovative in their context (Jeffrey, 2005, p. 6).

Some go as far as to state that there is no difference between innovation and creativity (Georgsdottir, Lubart, & Getz, 2003; Weisberg, 2003). Gunnarsdóttir (2001a) argues in her thesis *Innovation Education. Defining the Phenomenon* that if the child does not use its inherent ability to create this ability will diminish. She claims that there are two major factors, that influence this feature: the activity of the child and social, and environmental factors. The individual has to be active in the process of learning when working on his/her ideas with learning taking place through interaction with the social and physical environment, which in turn facilitates creativity and increases creative efficacy (Gunnarsdóttir, 2001b). Learners in IEE experience more freedom and that they have more control of tasks than in other subjects they know (Jónsdóttir, 2006b). This relates to work by Woods and Jeffrey (1997, 2003) showing that creativity demands innovation, relevance, ownership and control. Teachers and learners in IEE agree that the roles of teachers and learner are somewhat different than in most other lessons. Learners in IEE are required to be active and creative and the teacher supports them in developing their ideas instead of giving them the correct solutions (Jónsdóttir, 2006b).

2.2 Innovation education, creativity and education

2.2.1 Defining innovation

Creativity can be seen as encompassing imagination and innovation as encompassing both creativity and imagination (Craft, 2005, p. 21). The literature on innovation is large and there is a range of definitions available so one of the key challenges in discussing innovation is the lack of consensus about what the term means (The Canada School of Public Service, 2000). Innovation can be seen as original, solution oriented actions, that address unsolved problems in unique and creative ways (Renzulli, 2003). Innovation is the generation, acceptance and implementation of new ideas, processes, products or services (Shavinina & Seeratan, 2003).

Innovation can be described as the embodiment, combination or synthesis of knowledge in original, relevant, valued new products, processes or services (Harvard Business Essentials, 2003, p. 2). Innovation is the channelling of creativity to produce a creative idea and/or product that people can and wish to use (Sternberg, et al., 2003). Innovation is original, solution oriented actions, that address unsolved problems in unique and creative ways (Renzulli, 2003). Innovation is the generation, acceptance, and implementation of new ideas, processes, products, or services (Shavinina & Seeratan, 2003). Some see innovation as early adoption of a new idea, others as synonymous with creativity (Glor, 1997).

Innovation can be seen as anything new ‘under the roof’ (Gunnarsdóttir, Jónsson, & Jónsdóttir, 2007). Innovation is something new, including anything perceived to be new by the people doing it, it is something different for each organization where it is introduced (new ‘under the roof’) and is the generation, acceptance, and implementation of new ideas, processes, products or services in an applied setting (Glor, 1997).

Innovation can be improvements on existing products or services – also called ‘incremental’ innovations, i.e. as doing more of the same things you have been doing with somewhat better results (Drucker, 1986). ‘Breakthrough innovations’ or ‘Radical innovations’ take place when “Innovation is the creative generation and application of new ideas that achieve a significant improvement in a product, service, activity, initiative, structure, program, or policy” (The Canada School of Public Service, 2000).

The main differences in the definitions can be seen in the degree of newness, whether they are ‘incremental’ innovations or ‘radical innovations’ (Harvard Business Essentials, 2003). In industries such innovations go hand in hand where the course of innovation is generally characterized by long periods of incremental innovation punctuated by infrequent radical

innovation (Harvard Business Essentials, 2003). The definitions in the literature about innovation and the relations between inventions and creativity, mainly fall into two categories (Amidon, 1998). On the one hand there are those who see invention (or creativity) and innovation as distinct, since the former is the inspiration and the latter is the application. On the other hand, there are those who think the two notions are inseparable, since innovation is an artful process that requires considerable creativity (Amidon, 1998).

So depending on different definitions of innovation, it can be either initiating an idea using creativity and presenting that idea to the world or creating a new idea that is actualized into a product that significantly changes the field where it is applied. Innovation education can do both, initiate ideas and actualise them. It aims at enhancing skills to produce ideas by utilizing creativity and different knowledge (school knowledge and everyday knowledge) and skills to develop and evaluate those ideas towards actualization in the real world (Gunnarsdóttir, 2001a; Thorsteinsson & Gunnarsdóttir, [1996]a). Enhancing such skills in every citizen increases the probability of development of really innovative ideas that have the potential to significantly improve products, services, activities or policies.

Creativity and innovation are not inherently 'positive' or 'good' and continual innovation and constant changes are not necessarily desirable (Craft, 2001). Creativity and thus innovation education must build on ethics and wisdom that guides us to use creativity in responsible ways (Craft, Gardner, & Claxton, 2008; Craft 2008).

2.2.2 *Innovation education and teaching for creativity*

Research has shown that educating for creativity and innovation is possible and many methods and programs that have been tried to enhance innovativeness have shown their effectiveness (Colangelo, Assouline, Croft, Baldus, & Ihrig, 2003; Gunnarsdóttir, 2001b; Reis & Renzulli, 2003; Smith, 2003; Vandervert, 2003). Vandervert (2003) argues that innovation is a recursive neurophysiologic process that can be enhanced and trained by special methods. The control of the components of working memory in solving problems does not differ from the control of hands and feet, thus with repeated use the cerebellum makes the manipulations faster and more efficient (Vandervert, 2003).

Research and writings about creativity in education make distinction between *creative teaching*, *teaching for creativity* and *creative learning*. Thus *creative teaching* can be novel ways of teaching to make learning more interesting and effective and can lead to creative learning but does not always do that. One would expect that a creative teacher inevitably enhances creative learning but sometimes the creativity of the teacher overwhelms the learners' creativity (Craft, 2000). To be able to support learners' creativity

the teacher must acknowledge creativity as a useful and important factor in learning (Fryer, 1996; Sternberg & Lubart, 1991).

Teaching for creativity involves methods that are aimed at enhancing learners' creative thinking and behaviour with emphasis on learner choice (Jeffrey & Craft, 2004). Jeffrey and Craft (2004) emphasise that teaching creatively and teaching for creativity must be intertwined in order for *creative learning* to be achieved. Research on creativity in teaching and learning has shown that to successfully allow learner agency and creativity, teachers need to know when to "step back" and organize an enabling context that comprises flexible time and space in order to nurture the development of possibility thinking (Cremin, Burnard, & Craft, 2006).

The teacher's role and disposition

Gunnarsdóttir's research (2001a) on innovation education indicated that the teacher's role is crucial for the success of the ideation process of the learners. The role of the innovation teacher is to be a social-constructivist educator who facilitates active learning as opposed to the teacher who "feeds" the learners with finite knowledge. In innovation education the learners, teachers and the environment contribute to a 'subculture' or a small community of practice that forms in the classroom. The learners become legitimate peripheral participants in the culture and practice of innovation education in the classroom (Gunnarsdóttir, 2001a; Lave & Wenger, 1991). My own research indicated that the innovation education teacher must be "the flexible teacher" that supports the learners and is willing to accept that the learner is sometimes the specialist regarding his or her idea. The learners and their ideas are in the forefront of the lessons in innovation education and the power structure of the classroom has changed from the traditional arrangement to one where the learners have more autonomy and freedom (Jónsdóttir, 2005).

Zinn (1991) argues that a teaching style is rooted in the teacher's educational philosophies and by making your values conscious you may become a better educator. To change one's professional philosophy one needs to know what it is. Teachers need to be conscious of the educational philosophies which guide them and what effects these have on their teaching (Bjarnadóttir, 1993; Engelsen, 1993). Research has shown that to be a creative educator and foster creativity in learners a teacher must be willing to reflect critically on practice and be adaptable (Craft, 1997). Adapting to a new role where the learners are given more say about their work than in traditional schoolwork is a process that has proved to be difficult to sustain (Tyack & Cuban, 2001). A step towards embracing the role of the IEE is to accept a position as the 'flexible teacher' starting by reflecting on one's own professional philosophies and consider whether they fit this role. Do teachers' views of

their role as educators encourage or challenge innovation education? What can be done to help teachers make their orientations or professional philosophies explicit? And in relation to the value of innovation education, do the teachers perceive the need for innovation education, and is the lack of such education a problem that needs to be addressed?

Views and dispositions of teachers have various sources and have a strong influence on their work. One of the new curriculum areas emerging in the last 20 years in many countries is technology education (De Vries, 2005). Bungum (2006b) concluded in her research on technology education focusing on 14 teachers from nine schools in Norway that the preconceptions teachers bring to working with technology education are more powerful than the directions and goals in a new curriculum. In New Zealand, research showed that teacher willingness to change their own concepts of technology and technology education was influenced by the perceived need for change, background experience, subject sub-culture, level of support given to teachers during any change process, and personal disposition towards dealing with implications of these changes (Jones, 1997 in Jones, 2006). In the United States, research shows that successful elementary school technology education implementation has depended on a well-trained, energetic and creative teacher who desires to learn and deliver a new curriculum and processes and an administration willing to take some risks (Engstrom, 2006).

Flexibility and chaos angst

Research on IEE has shown that learners were given considerable freedom to control their learning and creative trajectories and teachers needed to be flexible in their control of events (Gunnarsdóttir, 2001a; Jónsdóttir, 2006b). Eisner touches on the delicate balance between control and freedom in teaching arts (Eisner, 2002). He points out that to be a good teacher it is essential to have sensitivity to self and others and an ability to communicate and inspire learners. Eisner admits that our inclination to control and predict is understandable but that *uncertainty* needs to be among the values we cherish and should have its proper place in schools (Eisner, 2003).

Georgsdottir et al. (2003) stress the importance of flexibility in the generation of innovation, in the innovators, the environment and in management. Some teachers find it difficult to exercise flexibility and lean towards more structured and controlling approaches. This raises the question of what characterizes teaching in the spirit of IEE? Consulting two pioneers, the teaching materials available and the formal curriculum where innovation education is advocated should be informative about the rationale and value of IEE.

Innovation education is organized to give learners influence over their own learning and to provide the content of most of their projects. Learners are active participants and the teacher's role is to facilitate and support the creative processes in the innovation work (Thorsteinsson & Denton, 2003; Thorsteinsson & Gunnarsdóttir, [1996]a). The innovation teacher must take care to support the creative process but many do not realize the importance of that kind of carefulness or they do not want to accept such a role as teachers. In IEE teachers must not judge learner ideas, because then learners start to be careful about what they say and cut off the flow of ideation (Jónsdóttir, 2006b).

Studies have shown that creativity training affects teacher attitudes and behaviour in the classroom and on their acceptance and openness to new ideas (Clapham, 2003). Teachers showed more positive attitudes towards creative ideas after participating in creativity programs. The importance of teacher attitudes and professional theories is vital for the success of teaching IEE (Gunnarsdóttir, 2001a; Jónsdóttir, 2005). Teachers who are taking up constructivist instruction are known to fear losing control in the classroom as they give learners more power over their activities (Bell & Gilbert, 1994; Brooks & Brooks, 1993; Butzin, 2004; Cushman, 1997; Ribeiro & Mizukami, 2005). This fear of losing control has been called *chaos angst*, as the fear is usually sub conscious and unarticulated (Fischer & Madsen, 2001; Jónsdóttir, 2006b). Freedom that can lead to chaos or structure that can become too rigid must be considered here and reconciled without losing the benefits of either. This research will explore whether innovation education teachers experience these dilemmas or are they hidden and unarticulated.

Unwillingness to change is an obstacle to organizational creativity. An emphasis on avoiding mistakes hinders creativity and reduces flexibility by not taking chances (Georgsdottir et al., 2003). I wish to find out whether teachers experience this tension.

The importance of context

Teachers work in a context that can be supportive or destructive to creativity and innovation. Research in business and education has shown that the climate of organizations determines whether innovation and creativity is welcomed and supported. In institutions where challenging goals, initiative and new ideas are supported, debate, prestige free atmosphere and tolerance for uncertainty are supportive of creativity (Amabile, 1998). Research in education has shown similar but not as conclusive findings (Ekvall & Ryhammar, 1999). Eisner (2002) advocates a culture of schooling that emphasizes exploration, discovery and surprise rather than control and that more attention should be given to what is distinctive rather than standard. This is an educational culture that has a greater focus on becoming than on being, values imagination more than facts, prioritises

valuing more than measuring and regards the quality of the journey as more educationally significant than the speed at which the destination is reached.

As schools experience new pressures from many quarters, the challenges of leading them toward meaningful improvement are in the hands of school leaders (Cushman, 1997; Fullan, 1982). Once, a school leader was usually the principal, expected to maintain a status quo that looked backward, conserving a stable knowledge base for use by society's elite but they must now educate a much broader population for a swiftly changing global society (Fullan, 1991; 2001a). The importance of school leadership is widely acknowledged in the research literature as school administrators strongly influence the likelihood for effective implementation of innovations (Cushman, 1997; Fullan, 2001; Hargreaves et al., 2001; Pálsdóttir & Macdonald, 2010; Sveinbjarnardóttir, 2004; Thomson & Sanders, 2010). It is also acknowledged that this is no easy task as the leadership that is needed must find solutions to problems that do not have easy answers, problems that are complex, rife with paradoxes and dilemmas (Fullan, 2001a). School administrators can create or influence the conditions in schools and the kind of ethos in their organisations. It is also acknowledged that it matters how they administer their support to innovations, whether it is top-down or both top-down and bottom-up, and how visible their role is (Larsen & Samdal, 2008; Thomson & Sanders, 2010). It is important for change in schools that principals provide direction and formalise the use of a programme and secure sustainability by building it into the structure and policy of the school, at the same time maintaining the vision and goals and monitoring use of the programme (Larsen & Samdal, 2008). Research on the implementation of Creative Partnerships (CP) in English schools indicated that head teachers of the schools saw different opportunities in the creative partnerships. What actually happened in the school though was related to three interwoven strands: the situatedness of the school, the head teacher's stance towards change, and the architecture of change management (Thomson & Sanders, 2010).

Many factors affect the outcomes of creativity and innovation programmes. Class size and teacher enthusiasm have shown considerable effects where the combination of small classes and teacher enthusiasm produces the greatest gains (Nickerson, 2002). Length of training for course providers and teacher approach and attitudes towards the learners are influential for the effectiveness of the courses (Davies & Howe, 2001; Gunnarsdóttir, 2001b; Nickerson, 2002). Shared professional reflection and development over a considerable period of time (a year or more) between teachers and specialists have proved valuable for implementing and sustaining creative pedagogies (Chappell, Rolfe, Craft & Jobbins, 2011; Cremin, Burnard & Craft, 2006).

It can be seen from the above that there may be many factors personal and social that influence the implementation and development of curricular areas aimed at enhancing creativity such as IEE. It is for this research therefore of interest to find out what supports IEE in practice and what characterizes the teachers and the schools that embrace it.

2.3 Creativity, innovation and the curriculum

Innovation education can be seen as practicing creativity as a life skill. IEE emphasizes practicing creativity as a skill to tackle daily life and living whether it is in connection with business, social conditions or nature and technology. It is about enhancing the competence to react to the world creatively and to act on one's ideas. This kind of competence is considered very important in the world today. Bringing about curriculum change in the complex area of innovation and creativity is a challenge for the new century.

2.3.1 Creativity as a life-skill

The need for being creative and innovative to survive and thrive in the 21st century is widely acknowledged and is advocated more and more in education (Craft 2008; NACCCE, 1999; Ministry of Education, 1999b; 2007). The ability to gather knowledge and use it in a creative way is seen as important for countries to survive in the community of nations. Innovation as a field of research combines a number of different aspects as reflected in the book *The International Handbook on Innovation* (2003) with 69 articles related to arts, management, business, education, psychology, science and sociology with only seven on innovation education.

Sternberg et al. (2003) point out the economic importance of creativity as individuals, organizations and societies must adapt existing resources to changing task demands to stay competitive. Many scholars identify the importance of enhancing creativity and innovativeness for individual and societal reasons (Clapham, 2003; Craft, 2006; Georgsdottir et al., 2003; Kostoff, 2003; Jeffrey & Craft, 2006). For me the value of innovativeness and creativity is that it can be a source of enjoyment and agency for individuals in the co-construction of a sustainable world (Sterling, 2001). No individual is worth anything without others (Finnbogason, 1903/1994). The African term 'ubuntu' indicates that you can't exist as a human being without others, you are connected to other human beings and what you do affects the whole world; if you do well, it spreads out, it is for the whole of humanity (Tutu, 1999). I support the view that education should value, sustain and realize human potential in relation to the need to attain and sustain social, economic and ecological well-being. Human potential and well-being are deeply

interdependent (Sterling, 2001). We have been educated by and large to ‘compete and consume’ but we need be educated to ‘care and conserve’ in the same spirit as sustainable education (Sterling, 2001).

Jeffrey and Craft (2006) have argued that there is a contemporary need for people to be self-directed and a need for universal creativity. Craft (2006) claims that life in the twenty-first century demands of ordinary people that they develop ‘little c creativity’ (LCC) as a life skill. Being unable to operationalize LCC may affect a person’s ability to cope with basic challenges in life and LCC is determined by the extent that the agent is intentionally open to exploring possibilities and taking action in the world (Craft, 2006).

Csikszentmihalyi (1996) showed how creative people used their creativity to fill their lives with genuine joy and fulfilment and to find purpose and enjoyment in the chaos of existence. The exhilaration of being creative and the joy of discovery are the intrinsic rewards of being creative and innovative but are too seldom communicated to young people (Csikszentmihalyi, 1996, p. 342). On the personal level innovation education might be used as a step towards fulfilling the necessity of bringing more happiness to school life. Noddings (2005) argues that happiness is the major aim of our human existence. Happiness and learning how to be happy in personal and professional life should also be an aim of education. In my earlier work I found that innovation education can give different kinds of learners more opportunities to do well and enjoy school activities than traditional school work (Jónsdóttir, 2004).

Although the personal and social aspects of enhancing innovativeness and creativity are at the core of this research it is also important to acknowledge the economic importance of such skills. Their influence is significant in generating new products and services and in creating new jobs. To stay competitive, individuals, organizations and societies must be able to use resources creatively to meet changing demands (Sternberg et al., 2003). Companies must develop and implement new ideas and therefore creativity and innovation are imperative for business (Kostoff, 2003; Clapham, 2003). As technology, environment and society change it is through novel products or processes appropriate to the new environment with which an individual or an organization can survive and prosper (Georgsdottir et al., 2003). What happens in the market place is connected to nature and social conditions and is therefore just one aspect of the potential of creativity and innovation that must be a part of general education.

I understand the importance of innovativeness and creativity development at a national level. Likewise I understand the value of sustainability at a global and local level (Sterling, 2001). I propose that education should adopt the need of *No ‘nation’ left behind*. Innovation education should work towards prosperity and welfare for all people, and for

solving problems of natural and human causes. There is an emphasis in IEE on encouraging learners to take responsibility for their actions and to respect one another (Thorsteinsson & Denton, 2003; Thorsteinsson & Gunnarsdóttir, [1996]a, [1996]b). This is a necessary foundation for sustainable development and of the attainment of well-being for all. When setting aims for education we choose which patterns of social life ought to be reproduced and which transformed (Carr & Kemmis, 2009). According to Bell (1997, p. 42) “The primary goal of futurists is not to predict the future but to uncover images of possible, probable, and preferable futures that enable people to make informed decisions about their lives”. To envisage different futures we need imagination and creativity.

As we do not know what society will be like we have to decide what kind of futures are possible and which future we choose to prepare for. Whether the future will bring breakdown or breakthrough, individuals “... will require flexibility, resilience, creativity, participative skills, competence, material restraint and a sense of responsibility and transpersonal ethics to handle transition and provide mutual support” (Sterling, 2001, p. 22). Creativity is important at individual level, when solving problems on the job and in daily life, and at a societal level creativity can lead to new scientific findings, new technology, new movements in art, new inventions, and new social programs (Sternberg et al., 2003).

2.3.2 *Diverse learning for a sustainable world*

Going to school is central to young people’s lives in the Western world and schools must therefore participate in their upbringing. In addition to traditional subjects, modern curricula have added new topics or strengthened others, such as environmental studies, information technology, traffic education, drugs education, life skills, sex education, equal rights education and vocational education (Sigurgeirsson, 1998). Education in the 21st century is expected to provide a broad range of knowledge and skills (Hilton, 2010).

UNESCO works with five pillars of learning for the 21st century (Delors, 1996; UNESCO, n.d.). They are:

1. learning to know,
2. learning to do,
3. learning to live together,
4. learning to be, and
5. learning to transform oneself and society

A wide range of competence based skills are thus advocated as the outcome of education and for this a wide range of settings is envisaged as useful for learning to be this kind of holistic socially competent person. A claim for a necessary competence in society today is 'action competence' (Schnack, 2000). 'Action competence' is seen as a qualified behaviour as it must be intentional and requires critical thinking (Schnack, 1994). Action competence includes the capacity to be able to act, now and in the future, and be responsible for one's actions (Jensen & Schnack, 1997, p. 175). Macdonald (2011) points out that the approaches in ESD are often multi-disciplinary, locally based and crossing boundaries and including many subjects. These new areas of learning and aims in education are promoted by the Decade of Sustainable development as: interdisciplinary, values-based and holistic learning, critical thinking, multi-method approaches, participatory decision-making and locally relevant information, rather than subject-based learning, memorizing and information of less relevance to learners (Macdonald, 2011; UNESCO, n.d.). This kind of focus with more emphasis on learning to live and take active part in society in addition to acquiring knowledge requires for many teachers and schools to think differently about teaching and learning and its relationship to society, and how they are best organized for living in a sustainable world.

Life skills is a new area, and a focus in education around the world, that emphasises enhancing abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life (World Health Organization, 1996). Life skills as a subject in the national Icelandic curriculum guideline was first presented in 1999 (Ministry of Education, 1999a; 1999d) and has many aims that strike a strong accord with the aims of innovation education. Life skills focus is on self-knowledge, maturity and individual development. The objective is to encourage initiative, independence, creativity and critical thinking, adaptability and moral competence in order to make individuals more competent to take wise decisions in an ever changing reality. According to Jóhann Ásmundsson¹ life skills was meant to offer an integrative approach dealing with personal factors and daily life. It was designed to help learners to actualize the invisible curriculum (ITE-JÁ). Life skills also refer to society, environment, nature and culture where issues can be dealt with that reflect local situations, that arise from the learners' immediate environments and which they have to deal with in their daily lives (Ministry of Education, 2004, p. 8-9). These skills are also developed in innovation

¹ The late Jóhann Ásmundsson led the work of two groups preparing and designing the revision of the national curriculum for compulsory schools published in 1999. One group worked on life skills and the other on information and technology education.

education and both areas were introduced in the Icelandic official curriculum in 1999, life skills in a separate curriculum pamphlet.

The subject 'life skills' was allocated one instructional period per week, in the reference timetable from grade four until grade ten, the conclusion of compulsory schooling. The idea that innovation education could be a part of the life skills subject raises a question about whether schools have integrated those two subjects, in other words, if they have located innovation within life skills lessons or used life skills to justify working with innovation education. There are apparent parallels in the discourse of the ITE curriculum and the life skills curriculum as can be seen in the emphasis of both on strengthening learner capacity to become an active participant in society. Both curricula emphasize understanding society, how the social and natural environment are closely connected, critical thinking and creativity and being able to work and live with others.

Citizenship as an important part of learning to live in a democratic society has only recently been formally introduced in Icelandic curricula. The spirit of citizenship was already present in the curricula in 1999 with for example the emphasis in the Information and Technology Education Curriculum (Ministry of Education, 1999b, p. 8) on supporting learners in being 'active doers' in their environments and in the Life Skills Curriculum (Ministry of Education, 1999d, p. 7) 'participating in a democratic society' and also in the General Curriculum where it is advocated that modern life requires people that are self-confident, can respond quickly, adapt to innovations, are able to express their opinions and are responsible for their actions (Ministry of Education, 1999a, p. 15). Citizenship as a specific focus in education was voiced in the revised Life skills curriculum in 2007 where citizenship is introduced as a relevant and rational part of practicing life skills in the emphasis on enhancing learners' capacities to be active participants in a democratic society (Ministry of Education, 2007, p. 5).

Citizenship has been on the international agenda for a longer time and is grounded in the United Nations *Convention of the Rights of the Child* (United Nations General Assembly, 1989) and in the *United Nations Decade for Human Rights Education 1995-2004* (United Nations, 1994). The principles of democracy and citizenship in education have been linked with the notion of learner participation (Flutter & Ruddock, 2004) advocating learner experiencing and practicing democracy rather than just learning about it (Maitles & Deuchar, 2006). Learner participation requires that they are given an active and direct involvement in school matters and it suggests inclusion, membership of a community where learners are valued and respected contributors (Flutter & Ruddock, 2004).

Flutter and Ruddock (2004) conclude from their research that where increased democracy is introduced in schools, the benefits for teachers and pupils are considerable, in better

relationships and learning. They also point out that although listening to pupils voices gives clearer understanding of their responses to schooling, it may not make a real difference. There are power issues which inherently tell learners what to do and how to do it. Democracy is fragile and depends on the active engagement of citizens, not just in voting but in participating and developing a sustainable and integrated society (Osler & Starkey, 2006). This theme has been introduced in the curricula of other countries such as the Scottish Curriculum for Excellence (2004) that emphasises the development of responsible citizens as one of four key capacities to be developed through education. Thus schools are encouraged to look at learners as active, competent and vocal members of society (Maitles & Deuchar, 2006).

Education for sustainable development (ESD) has been attracting attention and the need for sustainability thinking increases every day (Huckle, 2006). The main aims of ESD are to develop an understanding of what it means, individually and as a society, to respect, develop and use both natural and manmade environments, to protect human rights, to nurture multicultural settings, and to take responsibility for actions that affect natural resources and human well-being both now and in the future (Macdonald, 2009). According to an expert review of processes and learning in ESD, active and participatory learning are core processes underpinning ESD (Tilbury, 2011). Learners of ESD are encouraged to be active and productive and to take responsibility, with assistance and support, for their own learning (Macdonald, 2009). Learners are also expected to display originality and creativity in developing and utilising knowledge, understanding, approaches and methods to work towards sustainable living (Macdonald, 2009). The ethos of the ecological paradigm needed for systems interaction and sustainable education emphasizes the value of ‘capacity building’ and innovation, in order to facilitate and nurture self-organization in individuals and community as a necessary basis for ‘systems health’ and sustainability (Sterling, 2001). It seems that the aims of ESD and innovation education work well together and their integration could therefore strengthen both areas (Jóhannesson, Norðdahl, Óskarsdóttir, Pálsdóttir, & Pétursdóttir, 2011).

2.3.3 *Technology education*

IEE has many similarities to what in other countries is called ‘technology education’ or ‘craft, design and technology’ (CDT) education. It also has many of the same elements of what is known as enterprise education in Scotland which aims at a ‘can do – will do’ attitude in young people (The Scottish Government, 2007; Learning and Teaching Scotland, 2009). Deuchar (2008, p. 21) describes enterprise education as “Thus the word

‘enterprise’ has taken on a different meaning in education, and is perhaps best seen in terms of promoting pupil creativity and innovation in a range of contexts”.

Entrepreneurial education, enterprise education and entrepreneurship education are all related concepts and can be seen as education that enhances entrepreneurship in people. OEDP (n.d.) explains entrepreneurship education as having the potential of encouraging innovation in society and creating new jobs. They claim that in entrepreneurship education learners learn to become entrepreneurs or entrepreneurial thinkers through real life experiences often through launching a small business or school-based enterprise. Entrepreneurship education is commonly linked to business projects but recent European policy on entrepreneurship education emphasises that EE is also about developing personal attributes and horizontal skills like creativity, initiative, and self-confidence among others (European Commission, 2006).

Innovation education has many similarities to technology education in other countries and both have been developing as special subjects for about two decades. In both subjects understanding the interaction between the environment and man is emphasised and creativity and problem solving skills. Implementing technology education or crafts, design and technology (CDT) in many countries has been a struggle (Bungum, 2006b; Jones, 2006; De Vries, 2006). In several countries the development has been difficult and even recursive though fortunately in some countries it has been more even and lasting such as in New Zealand and the USA (De Vries, 2006). Some countries have developed a craft-oriented technology education such as Switzerland, Austria and some of the Scandinavian countries. Technology education in the United States has made significant progress in the past 20 years at the middle and high school levels (Engstrom, 2006). Successful programs in elementary school technology education (ESTE) have been offered although curriculum resource availability has not been rich (Engstrom, 2006).

Technology education (TE) is an organizational heading for a very diverse group of educational programs that has on the whole shown similar tendencies in development moving from an early focus on crafts and skills to the conception that technology education could teach intellectual processes such as problem solving and design that may be applied broadly and integrated with learning from other curricular areas such as mathematics and science (Sherman, Sanders, & Kwon, 2010). Technology education in Norway has been transformed from craft/industry/skill curricula to process/technological content curricula (Sherman et al., 2010) and has promoted TE as a multi-disciplinary area within three established subject areas, science, arts and crafts and mathematics (Bungum, 2006a).

Technology education has been developing for the last twenty years in New Zealand and has found a place in research, teacher education and classroom practice (Jones, 2006; Ferguson, 2009). The technology curriculum for compulsory schools in New Zealand developed from a technical subject defined along gender lines towards a technology curriculum for all. Associated with the development of the technology curriculum significant technology education research was conducted (Jones, 2006). Technology as a separate subject area emerged in the 1990s in curriculum reforms in New Zealand (Jones, 2006; Ferguson, 2009). During the time between the release of the final statement in 1995 and implementation in 1999 substantial teacher professional development programmes were undertaken. The Ministry of Education also published various resources to assist teachers in their implementation of the technology curriculum (Jones, 2006).

A study on views of teachers involved in implementing technology education in New Zealand gave a broad overview of the teachers' experiences (Jones, 2006). The general impression was that most teachers were rather positive about the technology curriculum statement. However, there were variations between teachers in different kinds of schools and within school types, especially between primary and secondary school teachers (Jones, 2006). Although a majority of teachers found the curriculum statement partially helpful in assessing achievement, many had difficulties with assessment in technology. The most popular way of assessing learner learning in technology was through the use of 'practical tasks'.

Support for TE in New Zealand (NZ) was substantive, as 73% of teachers received professional development in technology (Jones, 2006). The majority of teachers seemed positive towards technology education as they considered the technology curriculum should be compulsory for all learners as it provided learners with important skills. A majority of New Zealand schools integrate technology with other learning areas especially at primary level where teachers tended to integrate technology into languages and science. Secondary school technology teachers taught technology in blocks or modules or as a new subject with its own timetable slots (Jones, 2006). Teacher approaches to teaching TE were wide ranging including: choosing topics of relevance to learners; practical, hands-on learning activities; a 'problem-solving approach'; and group or cooperative learning approaches. They tended to favour a learner-centred approach to teaching technology (Jones, 2006).

Technology education in New Zealand now forms a part of all pre-service education for all primary school teachers and is compulsory (Jones, 2006). Graduate course development has also been significant since the majority of teachers who are currently teaching

technology in New Zealand were trained without any formal technology education (Jones, 2006).

As mentioned in the introduction little research has been conducted on innovation or technology education in Iceland. In light of the experience in New Zealand where implementation and research has gone hand in hand with technology education development (Jones, 2006) it is argued that Iceland too needs substantial research of innovation education and technology education to bring about further development in these areas. Technology education has diverse boundaries that differ even within countries such as for example in Finland where it is connected to different knowledge areas in different universities: at Helsinki University, technology is part of science and mathematics; at Jönköping University, LEGO kits are used in developing technology education thinking; at Jyväskylä University, technological literacy is taught with emphasis on information technology; at Oulu University, educational technology, science, mathematics and entrepreneurial skills are integrated and at Kajaani TTI, developing entrepreneurial skills and technology education are related (Kananoja, 2006). It seems that the location of technology education in several countries is still in a flux.

A recent review of research in technology education (Sherman et al., 2010) shows that even though considerable effort in several countries has been on transforming technology education with regard to teaching processes and technological content the transformation is far from complete. A range of names is used for the subject and there is not a common agreement on the essence or purpose or the location of technology education in schoolwork. The review concludes that practitioners and theorists need to focus on investigating the influences on teachers' conceptualisation and implementation of new curricular ideas (Sherman et al., 2010, p. 367). Curricular changes that introduce fundamental changes in how teachers understand and organize teaching and learning needs substantial support in various forms in addition to set aims and goals. Technology education and innovation education are learning areas where the goals apparently are meant to offer education that embraces the task of preparing people for the 21st century.

2.3.4 The formal curriculum

What is put into formal curricula builds on different ideas and ideals about what we want education to achieve. These are usually ideas we have for the future, and what all educational ideals have in common is the belief in the power of education. Beliefs in the power of education fall largely into two categories, to improve people's living conditions and enhance economy, and to improve the human being and the society. The Icelandic legislators believe in the power of education to improve persons and the society.

According to the law for compulsory schools in 2008, the role of compulsory school is to support the overall development of all learners and their participation in a democratic society that is constantly changing and developing (91/2008). Going to school is expected to build the foundation for initiative and independent thinking and skills to work with others. The law emphasises such areas as the development of self-awareness, ethical awareness, social awareness and awareness of civic responsibility and duties and on cultivating physical and spiritual welfare, healthy lifestyle and responsible interaction with life and environment (Lög um grunnskóla, 91/ 2008). The Nordic model of education rests on a democratic foundation, with a focus on equity offering an unstreamed school system for all pupils regardless of their backgrounds or abilities (Carlgren, Klette, Mýrdal, Schnack, & Simola, 2006; Frímannsson, 2006).

The belief in the power of education to enhance economic growth and to help create a better society is in many countries the foundation school systems build on (Tyack & Cuban, 2001). The governments of OECD countries have tended to put forward educational policies that emphasise the impact of education towards increased economic growth (Marsh, 1997; Marsh & Willis 1999). This belief in the power of education is not uncontested and some say we generally overrate the influence of education (Wolf, 2002). Wolf (2002) critiques the educational policies that assume that more education guarantees a better economy and she doubts that the vast expansion of education in the UK has been helping the least advantaged societies and least successful members. However the guiding belief that underpins official curricula in modern societies is that formal education makes a considerable positive difference to individuals and society (Tyack & Cuban, 2001).

The formal curricula is the testament of what we consider most important from our cultural heritage to deliver to the next generation (Hamilton, 1993). The process of making the formal curriculum in democratic societies is not a mechanistic straightforward process but is usually some sort of a compromise between different ideologies and parties of interest (Walker, 1990). Curriculum innovations, either in official curricula or in school curricula, have been tried for a long time and have come and gone without leaving fundamental changes in the education system or in the way schools operate (Tyack & Cuban, 2001). Changing the system of education is a complex matter of many influences and actors that are a part of the whole picture and some more visible than others.

The division of knowledge into disciplines of varying status (Goodson, 1993; Guðbjörnsdóttir, 2003) affects whether an interdisciplinary curriculum area such as innovation education finds a permanent position in education. The supporters of traditional subject disciplines advocate their primacy with the rationale that well defined discipline structure offers organized concepts and theory and that this knowledge is easier to acquire,

store and retrieve than in less organized fields (Eisner, 2002). Eisner argues that most practical problems of life are “messy” and seldom come in forms that the disciplines deal with. Critical curriculum studies have questioned the traditional separation of school and non-school knowledge and Young (2008) argues that the curriculum and its selection and structuring of knowledge need not and should not be taken as given. Young has also pointed out that although curriculum is partly designed to enable learners to acquire skills and knowledge it is always organized to preserve vested interests and maintain *status quo*. He furthermore claims we need to ask whether a particular form of curriculum organization such as school subjects, provides reliable frameworks for young people to make sense of the world or if it is primarily a relic of past traditions (Young, 1998). This is a question I have pondered since I started teaching and I found that IEE gave the kind of framework that was relevant and sensible for gathering learning and teaching into a meaningful whole with relevant and valuable goals.

I am interested in how we organise knowledge in schools and how we choose what is considered worth knowing. Knowing *what* has been considered more important than knowing *how* although influential establishments like Programme for International Student Assessment (PISA) have tried to draw attention to learning *how* as a matter of importance in educating young people (OECD, 2010a). Education has repressed or denied the life experience of learners as worthy knowledge and can be seen as a way of social control (Thompson 1968 in Goodson, 2005). We select and organise knowledge as classified disciplines that in the pedagogic version are translated into schools as subjects. School subjects as classified entities of worthwhile knowledge tend to be specialised and layered in a stratified curriculum where subjects receive more or less respect and tend to be isolated rather than integrative.

2.3.5 *An integrative approach to school subjects*

As the core of IEE is to enhance creative skills it is rational to look for partnerships with subjects that also emphasise and value creativity. Creativity cultivated within the arts is widely recognized. A wider focus of arts education and increased interdisciplinarity is now advocated such as merging arts and science or arts and culture education and through partnerships with agents outside schools (Gadsden, 2008; Bamford, 2009; Robinson, 2001; Thompson, 2011). Innovation and design has been placed in the science curriculum in some countries such as in Canada (Manitoba Curriculum, 2007). Integrating arts and creativity with the science curriculum has been encouraged such as in The Leonardo Effect project which is an example of how learners were motivated and engaged (Technology Education Research Unit, 2007). In the project a synchronised integration of arts and

science was implemented in primary schools in Ireland and England, building on commonalities of both subjects such as observing, experimenting, visualising and creative thinking. In the United States the acronym STEM is commonly used to group science, technology, engineering and mathematics together in journals, proposals, projects and public discussions (STEM, 2011). STEM lobbyists argue for a range of skills old and new to be developed in STEM in schools, including creative and innovative work,

Creative work such as IEE could be placed within arts and crafts but we do not know if there is space there or if it is the right place for IEE. Innovation education has elements of crafts and design education (Gunnarsdóttir, 2001b; Jónsdóttir, 2006a; Thorsteinsson & Denton, 2003) and there are distinctive elements of innovation education within the crafts and design curriculum of 1999 (see Chapter 5). Different approaches can be chosen to the use of knowledge within the frame of IEE, whether it is an approach, a subject or integrated in other ways. This calls for an answer to the question where and how innovation education is located in the Icelandic school practice. Those who experience, control and carry out innovation education can provide an answer to that question. Where and how they offer it in the enacted curriculum is related to the rationale for IEE and how it was presented in the formal curriculum.

This also raises the question of what the intentions of the authorities in Iceland are regarding innovation education. What is the official rationale for IEE? What kind of talk is present in the public discourse that can be related to innovation and IEE? And what is important enough about innovation education that some practitioners do offer it in their schools? Is there a general acknowledgement of the need for innovation education or is innovation expected to develop without the special mind-set that IEE develops? Furthermore, as this was a new area in the curriculum, what sort of support is perceived as needed for the practice of IEE?

As we will see in Chapter 5 there is a muddled message in the official curriculum of IEE regarding its identity; is it integration, subject or approach? I decided it would be useful to consider more closely what integration entails. This is related to interest aroused by Bernstein (discussed in 2.6) and in finding out how certain discourses of knowledge gather power (influence) and get legitimised as more important than others. Integration is a complex mix of teacher and learner roles and differing views of knowledge, not just one approach or organization. Kysilka (1998) and Nsubuga (2009) have analysed a range of features related to integration. Their work inspired me to develop a two-dimensional model of integration (Figure 2.1). According to this model complete integration occurs when the curriculum content is determined by the needs and interests of learners and they have the opportunity to become decision-makers, innovators and independent creators of

knowledge. Teachers who became aware of the complexity of choices in integration might embrace and welcome certain aspects in order to enhance learner engagement and understanding and/or creative use of connections between disciplinary areas.

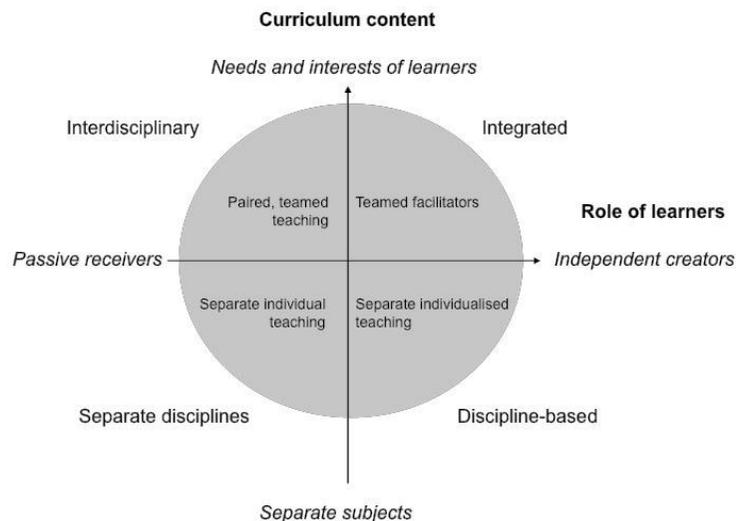


Figure 2.1 Models of curriculum integration
(adapted from Nsubuga, 2009, p. 98 and Kysilka, 1998, p. 204).

Integrating subjects might be easiest when a single teacher is responsible for teaching most subjects to a group of learners (Bernstein, in Nsubuga, 2009). Integration of subjects beyond what a single teacher can do alone requires an integration of the curriculum that recruits other teachers to collaborate together in order to achieve what must be seen as a common educational task (Bernstein, in Nsubuga, 2009). Examples might include a discipline-based integrative approach (lower right quadrant) though with learners being granted a creative and somewhat individualised role within the disciplinary boundaries. A science and technology project might be found here. On the other hand interdisciplinary integration might occur (upper left quadrant) where there might be high learner interest but learners do not have as creative a role. In the upper right quadrant it is possible to achieve an integration of learning where learner interest is high and learners have decision-making powers and are expected to be creative. It is in such a scenario that the affordances of curriculum areas like IEE can be elicited and teachers become *teamed facilitators* supporting learner development and not being in the role of direct transmitter. To shape the consciousness of learners to be creative and independent agents requires a social

relationship between teacher calls for collaboration. Thus the changes that integration and IEE requires are not only about subject relations but also can be a disturbance of existing educational, sociological and cultural structures (Nsubuga, 2009).

The prerequisite for curriculum integration is a learning context that supports independent learners as creators and content selection according to their needs and interests. It requires a school organization that enables boundaries of subjects to be crossed, that school and everyday knowledge are both valued and that there is cooperation between teachers. The model will be used to evaluate what sort of integration and degree of learner agency the basis for creativity, is present in the different versions of IEE in schools.

So far we have seen that the introduction of IEE into the national and school curriculum requires an understanding of the value of innovation and creativity for a modern education, but that at the same time it calls for an education that values the future and a sustainable approach as well as specific demands in educational settings for reassessing the roles and interests of learners and teacher perceptivity to lead learners into tackling their world in an integrative way.

In the rest of this chapter I turn from the needs and issues discussed above to the practical problems of supporting change, finding a way to describe teacher-learner actions and showing the complexity of the resulting ecology for change.

2.4 Feasible development and educational innovation

Locating IEE in Icelandic schools and understanding the form and nature of its presentation needs the support of a theory of curriculum implementation. Rogan and Grayson (2003) presented a theory that helps to understand and develop curriculum innovations in different contexts. Building on the zone of tolerance, theories of school development and Vygotsky's (1987) notion of the zone of proximal development Rogan and Grayson developed a theory of implementation that introduces a *zone of feasible innovation* (Rogan, 2007). They argued that a new curriculum cannot be implemented in one giant step but needs to be bridged by a series of smaller steps. Innovations in teaching practice seem to develop in smaller steps or stages rather than reaching for the ideal level in one step (Rogan & Grayson, 2003). The attention of policy makers is often focused on the 'what' of a desired educational change, neglecting the 'how'. Thus although policy documents contain visionary and educationally sound ideas, the implementation has been much slower and more difficult than anticipated (Rogan and Grayson, 2003).

2.4.1 *Three constructs of the theory of implementation*

Rogan and Grayson's theory of implementation includes three constructs that interrelate, a *profile of implementation*, *capacity to support innovation* and *outside support*. These profiles build on the development of rubrics for particular contexts to analyse the levels of development towards an ideal state.

The *profile of outside support* includes support or pressure that may come from agencies outside school such as departments of education or from businesses. In some countries educational innovations are sponsored by other countries or independent organisations that wish to stimulate and support innovations. A government department can make educational changes by decree, whereas firms can only use persuasion and inspiration (Rogan & Grayson, 2003, p. 1192).

The profile of the *capacity to support innovation* includes physical resources, teacher factors, learner factors and the school ecology and management. Physical resources are a major factor that influences the capacity and performance of teacher and learners. Teacher background and training and level of confidence and commitment are central to the capacity to adopt innovations (Rogan & Grayson, 2003, p. 1186). The background of learners and the strengths and constraints they bring are also influencing factors. The fourth set of factors influencing the capacity to support innovation, are the general ecology and management of the school. The school ecology pertains whether it functions properly and learning and teaching takes place all the time. Influencing this ecology is the kind of management the principal applies, whether it is leading and visible, and who is allowed to contribute to the school policy and aims.

The *profile of implementation* brings us literally to the chalk-face, to the educational setting in which the change must take place and be seen to take place. This profile enables an expression of the extent to which the ideals of a set of curriculum proposals have been put into practice with learners in their classrooms or other educational settings (Rogan, 2007, p. 1181). The profile developer assumes a notion of what 'good practice' is for that curriculum, what it is and what it looks like in the classroom but also recognizes that there will be many ways of putting the curriculum into action.

The three profiles together offer a 'map' of the learning area, the school context and capacity and the role of outside support. The development of a profile for a particular curriculum project enables curriculum planners to determine where they are and what the next step might be (Rogan & Grayson, 2003, p. 1181). However the profile assumes broad commonalities of what constitutes excellence and such notion of excellence emerges influenced by the nature and values of the curriculum (Rogan & Grayson, 2003).

2.4.2 *Finding the zone of feasible innovation*

Schools are different from one another just as the notions of how to bring about changes within schools and therefore the process of change is context specific and will play out differently in each school (Rogan & Grayson, 2003). Teachers' views towards changes differ, but sometimes like-minded teachers form a learning community to chart new ideas and practices for their schools and thus make the changes more likely to be deep and lasting (Rogan & Grayson, 2003). Rogan and Grayson emphasize the need to acknowledge the diversity of schools and advise caution in categorizing schools and that any categorization scheme is at best a broad generalization. However, such a categorization can be helpful for policy-makers and researchers if they take care not to use it to label schools but rather to better understand and serve their needs. Rogan and Grayson also advise against endorsing deficit models when approaching curriculum change so rather than identifying weaknesses, strengths are identified and developed. The levels of development are described in positive terms of what is, rather than what is not, and level 2 incorporates level 1.

Changing teaching and learning is a change of culture and not a technical matter and the implementation of the innovation should occur in manageable steps and is most likely to succeed when it proceeds just ahead of existing practice (Rogan & Grayson, 2003). The proposed *zone of feasible innovation* takes into account teacher and learner factors, resources and school ecology and management as well as outside support, and is defined by the rubric cells that neighbour the levels of implementation already achieved. Thus if the neighbour systems are meagrely developed they limit the zone of development of the other. Rogan and Grayson emphasize that the capacity to support innovation within the institutions and outside needs to go hand in hand with the development of teaching and learning practices. Thus implementation strategies are good when they proceed reasonably ahead of current practice, within the *zone of feasible innovation*. Innovations are also most likely to last and develop if outside support matches the innovation capacity in schools (Rogan & Grayson, 2003).

2.5 **The social ecology of education**

Understanding what happens as an intended innovation in education is entered into school practice is not simple or easy. Even though empirical data of a particular part of school activities is gathered it will always be connected to several issues, influences and social structures, situated in its own unique circumstances. The use of theoretical concepts and models can help us to understand this complexity but have to be chosen accordingly. The

use of simplistic linear models for scrutinizing educational practice has been criticized as they fail to consider the complexity of interactions between layers of complex systems (Johnson, 2008). Sterling (2002) in his briefing on sustainable education emphasizes the necessity of turning away from a mechanistic worldview towards an ecological view that takes into account the connectedness of everything in the world. Johnson (2008) points out that educational systems are complex and dynamic with multidirectional linkages and processes that interconnect different layers within the systems. She advocates clarifying the multiple layers within the complex educational system using an ecological systems approach and concepts of complexity. The foundation of Bronfenbrenner's bio-ecological theory (Bronfenbrenner, 1979) is the view that human abilities and their realization depend to a significant degree on the larger social and institutional context of the individual activity. Bronfenbrenner's theories of the ecology of human development were developed to understand the development of the person from childhood to adulthood but here they are used to understand the development and influencing ecology of teachers in a similar way as Lewthwaite (2006) as explained on the next page.

2.5.1 Social ecology of development

Bronfenbrenner's research showed that different environments were producing discernible differences, not only across but also within societies, in talent, temperament, human relations, and in the ways in which the culture, or subculture, brought up the next generation (Bronfenbrenner, 1979). The ecological environment in Bronfenbrenner's theory is conceived as a set of nested structures, each inside the next, like a set of Russian dolls (Figure 2.2). Different kinds of settings are analysed in terms of their structure. Environments are not distinguished by reference to linear variables but are analysed in system terms. These systems are not seen as isolated, but rather as organic, interacting systems (Bronfenbrenner, 1979).

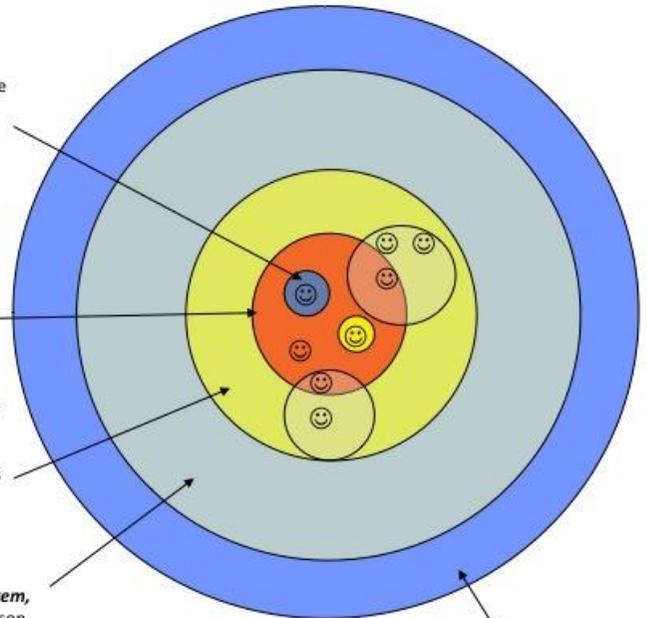
The most common use of social ecology is looking at macro and micro contexts, but as Bronfenbrenner found in his research there are other systems in between that are detectable and influences are exerted in both directions. These systems and personal factors are introduced and explained in the following sub-chapters and in Figure 2.2.

Personal level: The individual is the foundation for the development. A variety of individual or personal attribute factors will likely affect the development of a teacher.

The individual interacts with others within the **microsystem**. A microsystem is a pattern of activities, roles, and interpersonal relations experienced by the person in a given setting with particular physical and material characteristics. Within an educational context, the microsystem of a teacher is likely to be the family members, students within classrooms, and close colleagues within school.

A **mesosystem** comprises the interrelation among two or more settings, a system of microsystem. Mesosystem factors in this research could be: priorities in the school curriculum; physical arrangement of lessons; connections between subjects; school receptiveness to learning and change; school timetabling decisions; evaluation procedures at school level.

The third level of the ecological environment, the **exosystem**, refers to one or more settings that do not involve the person as an active participant but in which events occur that affect what happens in the setting containing the person. These can be parent and community aspirations towards subjects. Demands of the modern society, working outside the home, attending to own children affect these aspirations and the efficacy of the teacher to fulfill his/her professional role.



Within each society or subculture there exists a kind of a blueprint for the organization of every setting. Such generalized patterns are referred to as **macrosystems**. Here the macrosystem factors include government curriculum policy decisions; national curriculum development priorities; professional development agendas at national level; national external evaluation procedures and pay scale structures.

**Figure 2.2 The social ecology of innovation education
(developed from Bronfenbrenner's model, 1979, and Lewthwaite, 2006)**

2.5.2 Personal factors and systems

Personal attributes - dispositions

The foundation for development of a person or professional is the individual herself. That is, characteristics of the individual will influence one's development. Personal attributes of individuals have been identified as determinants in the development of educational professionals (Lewthwaite, 2006). In this research it is assumed that a variety of individual or personal attribute factors and dispositions in teaching will likely affect the development of an innovation education teacher.

Microsystem

In Bronfenbrenner's bio-ecological theory the innermost level influencing the development of an individual is the microsystem, the setting where the individuals interact. Within an educational context, the microsystem of a teacher is likely to be the family members, learners within classrooms, and close colleagues within the school.

Mesosystem

The interconnections between settings can be as decisive for developments as the events taking place within a given setting. A mesosystem comprises the interrelationships among two or more settings, a system of microsystems. Mesosystem factors in this research could be: priority placed on IEE as a curriculum area by school; school emphasis on arts and practical subjects; physical arrangement of IEE lessons; connections with other school work; school receptiveness to learning and change; school timetabling decisions and evaluation procedures at school level.

Exosystem

The third level of the ecological environment the exosystem refers to one or more settings that do not involve the person as an active participant, but in which events occur that affect what happens in the setting containing the person. These are settings such as parent and community aspirations towards innovation education. Demands of the modern society, working outside the home, attending to own children affect these aspirations and the efficacy of the teacher to fulfil her professional role.

Macrosystem

The complex of nested, interconnected systems is viewed as a manifestation of underlying patterns of ideology and organization of the social institutions common to a particular culture or subculture. Within each society or subculture there exists a kind of a blueprint for the organization of every type of setting. Such generalized patterns are referred to as macrosystems. Here the macrosystem factors are seen as the government curriculum policy decisions; national curriculum development priorities; professional development agendas at national level; national external evaluation procedures; and pay scale structures. Teacher education and the official discourses used about innovation in society and the connection (or lack of it) between the two are also a part of the underlying macrosystem.

Chronosystem

Bronfenbrenner (1994) later added a fifth dimension, the chronosystem, that comprises the element of time. Thus the chronosystem encompasses development over time in the person and also of the environment in which the person lives (Bronfenbrenner, 1994). Thus the history, the development and experience of every system and person influences them at a given point in time.

Interaction of systems and individuals in a dynamic social ecology

Bronfenbrenner (1979) pointed out that *Homo sapiens* appeared to have a unique capacity to adapt to, tolerate and create the ecologies in which it lives and grows. Bronfenbrenner's social ecology provides images for studies of teacher and school development, inviting us to look at how interactions between systems occur. Interactions within the microsystem (here the classroom or the school) influence the individuals and reciprocal influences within the mesosystem (the school and its culture) are logical and feasible. Lewthwaite's (2006) use of Bronfenbrenner's theories in an educational research project makes an important contribution to how the systems are categorized here. All the systems under scrutiny here are dynamic and influence each other. In general though, the influences from the remote systems (exo and macro) are likely to be more directional (influencing and setting conditions for meso, macro and personal) than reciprocal although it may be necessary and feasible to exert influence from the mesosystem to change the exosystem and even the macrosystem.

Developing the IEE rubric of preferable ecology

Through the research process, reading the literature and as data was gathered I developed a model to make sense of, describe and understand the complexities of curricular change built. The most common use of social ecology is looking at macro and micro contexts, but as Bronfenbrenner found in his research there are other systems in-between that are detectable and influences are exerted in both directions. These systems and personal factors are introduced and explained in the following sub-chapters and in Figure 2.2.

Supported by a similar profile as Rogan and Grayson (2003) introduced, it seemed feasible to detect where teachers and schools are in their 'journey' towards an ideal innovation education, and to identify what their conditions are like and thus to locate them in the 'educational innovation map' and at the same time recognize what the ideal innovation education is considered to be. By mixing the two theories a model of curriculum change emerged that covers the complexity of realities in education. Micro-, meso-, exo- and macrosystems are examined for the ecological properties and dynamics of social contexts

and curriculum change. The model was applied in this research in an examination of environmental factors that facilitate or hinder the implementation of IEE in the three case compulsory schools.

Implementing and sustaining innovations in education require influencing the social ecology that supports and develops in line with the novelties. I wanted to use the theories of Bronfenbrenner and Rogan and Grayson to help me to construct a picture of a particular situation in time and locate its players and systems in relation to each other not only to show their interconnection and reciprocal influences but also display an understanding of why they were located where they were and how that could potentially be influenced and changed. Thus I integrated Rogan and Grayson's theories with Bronfenbrenner's systems thinking and developed a rubric (see Table 4.4) for analysing levels of developing innovations with individuals and systems.

2.6 Key concepts in Bernstein's framework

Before I finalise my research questions I will consider and present key concepts in Bernstein's theories that are useful to this research. His theories in the sociology of education offer both an extensive overview and analytical understanding of the macro processes that appropriate knowledge into pedagogy and also tools to describe and *analyse* closely the micro and meso conditions and personal enactments in educational practice.

2.6.1 Introduction

What we see and interpret in the world depends on the tools we use and the theoretical frameworks on which we build our understanding. We typically are not consciously aware of certain influences, on how we act and react in everyday life, but these can be made visible through research and the help of powerful theories. The theory of curriculum implementation developed by Rogan and Grayson (2003) indicated factors affecting the feasibility of curricular change. I was inspired by the use Lewthwaite (2006) made of Bronfenbrenner's ecological theory of development in understanding science curriculum implementation and this helped me to build a model and identify the levels of development within different schools, showing teachers, their environments and interactions in innovation education.

I found however that I needed something more to help me analyse the nature of curricular processes and the social interaction of teachers and learners. Themes such as *freedom* and *structure* that had emerged in the early case analysis seemed to be fundamental in IEE

lessons and this called for a more precise scrutiny of what working with IEE entails for teachers and learners. Examples of emerging themes are found in Appendix IV. For this I turned to Bernstein (2000) whose theories helped me describe the transmission, acquisition, and evaluation of knowledge, as well as learning contexts in schools. Using Bernstein's theories had the potential to uncover not just where but also how IEE is located in practice. His theories provided me with concepts to define knowledge acquisition in different social contexts, the rules which govern interactions, and tools to analyse specific pedagogic discourses (Morais, 2002). These concepts offered both high levels of abstraction and the power to describe, explain and diagnose the empirical data and understand better the nature of the social ecology of IEE.

I wish to use Bernstein's theories to find out what lies behind our curriculum decisions at several levels and in different contexts resulting in the inclusion of some kinds of knowledge and skills and the exclusion of others. The sociological theories of Bernstein (2000) can be used to analyse underlying discourses and rules that operate when organizing and implementing educational actions. In this chapter I will outline the concepts in Bernstein's sociology of education that are important to my development of criteria (Chapter 4) the interpretation of the official discourse of innovation education (Chapter 5) and to analyse case study data (Chapters 6 and 7) and finally explain the integration and application of the three theories to the analysis (Chapters 8 and 9).

2.6.2 Power and control in educational settings

Pedagogic discourse and power relations

The late Basil Bernstein was a critical curriculum theorist who produced a major theory of social and educational codes and their effect on social reproduction (Sadovnik, 2001). In his theory of pedagogic practice he examined a series of rules internal to pedagogy and how these rules affect the knowledge to be transmitted and act selectively on those who can successfully acquire the knowledge. Bernstein constructed a conceptual framework that offers ways to see how knowledge is distributed and changes as it is recontextualised, from one field into another. His theories offer analytical ideas and devices to look at the conceptual links between broader social structures and the pedagogy of the classroom (Chien & Wallace, 2004, Morais, 2002, Nsubuga, 2009) and can be used to uncover influences in pedagogy that otherwise would not be visible. A growing number of researchers uses Bernstein's theories empirically grounding key concepts and developing instruments to use in research in education (Bolton, 2008; Jóhannsdóttir, 2007; Macdonald & Jóhannsdóttir, 2006; Neves & Morais, 2001).

Educational studies have shown complex relationships of educational systems with other systems, economic and cultural, national and international. Bernstein (2000) pointed out that education has taken part in the reproduction of inequalities and that it legitimises some identities and delegitimizes others. From these perspectives pedagogic communication can be seen as a carrier or a relay for ideological messages and external power relations rather than a neutral carrier of various skills (Bernstein, 2000, p. 25).

Bernstein (2000, p. 25) wanted to find general principles that underlie the transformation of knowledge into pedagogic communication, to find out what controls whether knowledge becomes intellectual, practical, expressive, official or local. He considered curriculum, pedagogy and evaluation to be three message systems, that together constitute the structure and processes of education (Sadovnik, 2001). “Curriculum defines what counts as valid knowledge, pedagogy defines what counts as valid transmission of knowledge, and evaluation defines what counts as a valid realization of the knowledge on the part of the taught” (Bernstein, 1971, p. 47).

Bernstein’s theories develop the rules of the pedagogic device providing tools to detect the underlying social construction of pedagogic discourse. Bernstein presented these as specific principles of description, in order to make it possible to understand how knowledge systems become a part of our consciousness (Bernstein, 2000, p. 4). He suggested that pedagogic discourse is a carrier for power relations external to the school, carrying patterns of dominance through a structure that enables power to be relayed. This structure, the logic of the discourse that provides the means to carry power relations, is what Bernstein’s theories describe and analyse. He explained the inner logic of the pedagogic discourse and practices and how pedagogic processes shape consciousness in different ways. he offers conceptual tools to analyse how a pedagogic text is put together and to detect the rules of its construction, circulation, contextualisation, acquisition and change (Bernstein, 2000, p. 4).

Classification and framing

Bernstein introduced two concepts, *classification* and *framing*, that explain the translation of power and power relations and the form it takes in the control of relationships.

Power relations create, legitimise and reproduce boundaries between categories of groups (gender, class, race) or categories of discourse and of agents (Bernstein, 2000, p. 6). Power establishes the relations *between* categories and establishes the legitimate relations of order. These can be concrete categories of discourse (e.g. school subjects) or categories regarding the division of labour (e.g. specialists, unskilled labourers). *Classification*

examines the relation between categories. For example, school subjects are generally well insulated from each other. Bernstein says (p. 6):

In other words, it is silence which carries the message of power; it is the full stop between one category of discourse and another; it is the dislocation in the potential flow of discourse which is crucial to the specialisation of any category.

Classification is used to categorise the construction of a social space such as school subjects or by roles such as teachers vs. learners, home and school (Bernstein, 2000). Power is embedded within a classified category, which can be strongly or weakly classified. The power of a school subject is, for example, reflected in the amount of time it is allocated and the space it gets in the curriculum, the building and the timetable of schools. A category is defined by boundaries that create the relation between it and other categories and establish its own unique identity and special voice (Bernstein, 2000, p. 6). If the insulation is broken then a category is in danger of losing its identity and if it changes its strength then the principles of the social division of labour changes (Bernstein, 2000, p. 6). The insulation around a category gives it its distinctiveness, its internal rules and its specific voice (Nsubuga, 2009). Attempts to change the insulation reveal the power relations that the classification is based on and reproduces (Bernstein, 2000, p. 7).

Categories can have either strong classifications (specialised discourses) or weak classifications (less specialised discourses) but classification, strong or weak, always carries power relations (Bernstein, 2000, p. 7). If there is strong insulation between categories they have a unique 'voice', whereas weak classification indicates less specialised identities or 'voices' (Nsubuga, 2009). Strong classification indicates categories with clearly distinguishable identities and specialised rules of internal relations (Bolton, 2008). Particular strengths of classification require specific recognition rules in order for individuals to understand the demands of particular contexts, a point I will return to later.

Control establishes legitimate forms of communication that are appropriate to different categories. Control carries the boundary relations of power and socialises individuals into the appropriate relationships, the legitimate communications. Thus power constructs relations between categories and control constructs the relations within given forms of interaction giving rise to different modes of pedagogic practice.

Framing refers to where control is located. In strong framing the transmitter has explicit control but in weak framing the acquirer has more apparent control (Bernstein, 2000; Bolton, 2008). Strong framing indicates that control is located in a category that has power, for example, a teacher or a school subject, and weak framing indicates control shared

between categories, for example, by a teacher and a learner or among several subjects (Macdonald & Jóhannsdóttir, 2006). Framing regulates relations within a context; it refers to the relationship between transmitters and acquirers (Bernstein, 2000, p. 12).

Bernstein (2000, p. 4) analysed forms of communication and how a pedagogic text is put together. His analysis revealed how power and control translate into principles of communication and how in their reproduction they differentially regulate forms of consciousness and potential for change. The pedagogical discourse is thus always conditioned by the rules of classification and framing for the particular context (Bernstein, 2000, p. 5). It is this feature of pedagogic discourse that I will explore in my data.

Regulative discourse and instructional discourse

Bernstein (2000) distinguishes between two systems of rules that are regulated by framing, the *rules of social order* and the *rules of discursive order*, also known as the regulative and instructional discourse

The rules of social order refer to the *regulative discourse* and to hierarchical relations and expectations about conduct, character and manner.

The rules of discursive order refer to the *instructional discourse* and the selection, sequence, pacing and criteria of the knowledge, elements commonly associated with the curriculum.

Instructional discourse is a part of and is embedded within the regulative discourse, argues Bernstein (2000), making it difficult to introduce change that is not aligned with the regulative discourse. Bernstein presented framing as the relationship ID/RD (Bernstein, 2000, p. 13) and this will be explained in more detail later.

The *regulative discourse* (RD) is a discourse of order, relation, and identity. The RD distributes rules of the organization on matters regarding cultural practice and values. It is “the *moral* discourse that creates the criteria which give rise to character, manner, conduct, posture etc.” (Bernstein, 2000, p. 34). The RD holds criteria for the appropriate values in the organization, for example, appropriate behaviour, conduct, ethics, manner and character as well as giving the foundation for criteria of knowledge. The RD mediates the rules of an institution relating to general morals and values and its criterion for appropriate behaviour and the sorts of characteristics that are appreciated (Jóhannsdóttir, 2007). It also creates the rules for the internal order of the instructional discourse, thus the teacher’s choices of pedagogical ideas to put into practice are not just a question of choosing an approach but are rather controlled by the RD. School traditions and expectations of learners are reflected in the regulative discourse.

The *instructional discourse* (ID) is a discourse of competences relative to a given discipline. It is about choices of tasks, how they are done, sequencing, pacing and which knowledge is considered of value in a given context and how it is evaluated. It is the discourse that articulates the kind of skills and knowledge our learners should acquire. The RD is the dominant discourse and produces the order in the instructional discourse (Bernstein, 2000).

As discussed above classification indicates the boundaries of any discourse and acquirers must be able to *recognise* the text, the relations between categories, what characterises the context, what is 'legitimate' (Bernstein, 2000, p. 17). Framing refers to how meanings are put together, the appropriate forms made public and the nature of acceptable social relationships. Framing is about whether acquirers are able to *realise* (produce) the expected text. The stronger the classification and framing is in education the more the relationships tend to be hierarchical with learners seen as being ignorant with low status and few rights (Bernstein, p. 58). To function effectively within a particular cultural group an individual needs to possess both the recognition and realization rules of that society (Chien & Wallace, 2004). The *recognition rules* are what the acquirer (usually the learner) understands to be important or correct in a given context. The recognition rules include the necessary understanding of "the rules of the game", to understand what is expected of you.

As classification always refers to relations between contexts, agents, discourses or practices (Bernstein, 2000, p. 17) it is important to understand the message that classification includes. Changes in the strength of classification alter the recognition rules by means of which individuals are able to recognize the specialty of the context that they are in. If classification changes it can leave the learners insecure as to where they stand. The classificatory principle regulates the recognition rules and power relations (p. 17). Classification is the key to distinguishing contexts; it orients the speaker to what is expected and what is legitimate in that context (Hoadley, 2006). It provides the rules for *what* is required and accepted (Hoadley, 2006).

Realization rules refer to the ability to realize the necessary skills to produce the legitimate communication within a given context, to produce the expected text – that is how to behave, how to write or speak. The realization rules determine how we put meanings together and how we make them public (Bernstein, 2000, p. 17). It is possible that learners have the recognition rules in a given context and recognize the power relations they are involved in but do not have the necessary realization rules and thus cannot behave appropriately. In other words, in schools the recognition rules determine which knowledge is relevant and the realization rules regulate what kind of learner behaviour, text and production of knowledge is judged valid. Learners must be able to recognise rules before

they can realize them but the realization rules are not a given consequence of the recognition rules. Framing regulates how legitimate meanings may be made public through evaluative criteria and make up the realisation rules referring to *how* an appropriate text may be realised (Hoadley, 2006).

In my research it will be of interest to ascertain the extent of the alignment between the ID and the RD. In IEE learners are expected to be active and develop their own ideas and have more autonomy and freedom than in traditional lessons and the teacher's role is supportive rather than directive (Gunnarsdóttir, 2001a; Jónsdóttir, 2005). If, as Bernstein says, the instructional discourse is always embedded in the regulative discourse, the dominant discourse, then there may be difficulties when the ID of IEE is not aligned with the RD. The regulative discourse communicates the institution's public moral practice, values, beliefs and attitudes, principles of conduct, character and manner. It also transmits features of the institution's local history, local traditions and community relations. I hope to understand the characteristics of the context in which IEE will thrive.

2.6.3 *Models of pedagogic recontextualisation*

As knowledge is moved into pedagogy it does not enter as a neutral phenomenon that only has virtue in itself. As it moves, it is recontextualised as pedagogical practice, it is influenced by different ideologies and according to Bernstein it takes on a form from contrasting models, the *competence model* and the *performance model* (Bernstein, 2000, p. 44).

Competence models

The social logic of *competence* is an implicit model of the social, of communication of interaction and of the subject. It has an 'emancipatory' flavour with the following features (Bernstein, 2000, p. 43):

- A universal democracy of acquisition, in which everyone is competent.
- An active subject with differences but not deficits.
- A self-regulating subject not furthered by formal instruction.
- A sceptical view of hierarchical relations where creativity is inherent in the working of the mind, it is placed outside culture.
- An emphasis on present time, the point at which the competence is realised.

Broadly summarized, competence theories include procedural democracy, creativity and virtuous self-regulation. As Bernstein points out it is not difficult to see that the idealism of competence resonates with the liberal, progressive and radical ideologies of the late 1960s

in education (p. 43). There is a difficulty though as the attention paid to the achievement of the competence may divert attention from the context, from power and control.

The *competence model* is reflected in pedagogic discourse in the form of projects, themes, ranges of experience and a group base where acquirers control much selection, sequence and pace of learning. Recognition and realisation rules for legitimate texts are implicit and the emphasis is realising competences that acquirers might or do possess. Differences between acquirers are the norm (Bernstein, 2000, p. 45) but are not looked upon as deficits.

Only a few pedagogic spaces are specially defined indicating that knowledge can be acquired in many settings. Acquirers have considerable control over the construction of spaces, and move easily since there are few regulatory boundaries. Implicit sequencing of activities combines with weak pacing such that acquirers function in the present rather than the future.

Positional control is a low priority in the competence model since there are not many ways to relay order. Control militates against the concept of the transmitter as the acquirer is self-regulating. Control is likely to be found in personal forms that vary with different acquirers. The pedagogic text is less the product of the acquirer and more a measure of competence development, i.e. the acquirer's competence. The value of the text may not be visible to the acquirer and the particular professional stance of the teacher affects what is seen (Bernstein, 2000, p. 47). Criteria of evaluation in the competence model are likely to be implicit and diffuse although regulative criteria could be more explicit (p. 46).

Each institution requires a measure of autonomy to work according to the competence model. The pedagogic resources required are more likely to be constructed by teachers and less likely to be textbooks or other pre-prepared material. Competence models are less accessible to public scrutiny and can be difficult to evaluate objectively (Bernstein, 2000, p. 48). They are more expensive than performance models. Training teachers may cost more and selection of learners stricter as the qualities required of teachers and learners are more restricted and tacit. The competence model takes more time, resources and personnel. Provision should be for teacher collaboration as the structure is constructed rather than received (Bernstein, 2000, p. 49).

Performance models

The *performance models* are in many ways the opposite of the competence models.

Performance discourse is characterised by specialisation of subjects, skills and procedures. The recognition and realisation rules for legitimate texts are explicit, performances are graded. Differences between acquirers are levels of performance (Bernstein, 2000, p. 45).

Space, time and discourse are explicit in the performance model. Clear boundaries limit access and acquirers do not have agency to construct their own pedagogic space (Bernstein, 2000, p. 46).

Strong classifications and explicit structures relay order and are resources for positional control in performance models. Being different is highly visible but personalised variations of control are not welcomed (Bernstein, 2000, p. 47). The pedagogic texts of learners are essentially the texts they produce for evaluation of performance. The evaluation might emphasise what is missing and the acquirer is made aware of the legitimate text (Bernstein, 2000, p. 46). Autonomy can vary within performance models according to the extent to which the discourse is dependent on the future, either as specialised internal autonomy ('introverted') or dependent on the economy or markets ('extroverted'). Also it is possible for institutions to have a level of autonomy on how they distribute their financial and specialist resources (Bernstein, 2000, p. 49).

The costs of performance models are guided by explicit rules that make personalised modes of control less favoured. Training of teachers is less elaborate and supply of teachers is less restricted. Accountability is made possible by 'objectivity' and outputs optimised. Models may build on ready-made packages and procedures, reducing training costs (Bernstein, 2000, p. 49-50).

Models of competence and performance and their modes

Models of competence and performance emerge in different modes according to Bernstein. The competence models have emerged in three modes, *the liberal/progressive*, the *populist* and the *radical mode* (Bernstein, 2000, p. 50-51) and performance models in three modes, *singulars*, *regions* and *generic modes*.

Competence models emphasise differences rather than deficits. Procedures do not stratify acquirers and a view of creativity as 'emancipatory' is promoted. Pedagogy may be 'invisible'. Bernstein (2000, p. 51) suggests that "... competence modes may be seen as interrupts or resistances to this normality or may be appropriated by official education for specific and local purposes." I wonder whether IEE is an 'interruption' that has been appropriated by official education in the national curriculum. Official knowledge is the knowledge that the state constructs and distributes in educational institutions (Bernstein, 2000, p. 65). Official knowledge presented in curricula has a bias as a result of a struggle among groups to make their pedagogical agenda and identity the state policy and practice.

Performance models rely on the specialisation of their texts, with different knowledge bases and social organisations and are typically found at all levels of official education.

One mode of performance has developed around ‘*singulars*’ which are structures of knowledge with a specific space, a unique name and a specialised discourse. Physics, chemistry, history, economics, psychology are examples of singulars. They are protected by strong hierarchies and boundaries (Bernstein, 2000, p. 52). Integration is difficult and deficits are the norm.

Regions are formed when singulars recontextualise into larger units that operate both in the intellectual field and in the field of external practice (Bernstein, 2000, p. 52). Bernstein points out that the organisation of discourse at school level is mainly based in singulars but the development in higher education has been towards regionalisation and suggests that a similar move at the school level is a move towards generic skills (Bernstein, 2000, p. 52).

Generic modes are constructed outside and independently of pedagogic recontextualising fields. Generic modes are mainly directed to extra-curricular experiences, life and work. Whereas competence modes are based on ‘similar to’, the performance models are based on ‘different from’ relations. Bernstein considers competence modes as therapeutic and their sponsors consider them empowering but most performance modes serve economic goals that he considers instrumental (Bernstein, 2000, p. 54). He points out that the models and modes give rise to what he proposes to call “a pedagogic palette”. Thus a therapeutic mode of competence may be inserted in an economic mode of performance, retaining its original name and character but giving rise to opposing practice (p. 56). What these models and their modes offer this study is the potential of different pedagogic identities.

The identity of most interest to IEE is the therapeutic identity, produced by complex theories of personal, cognitive and social development, theories that are the means of a control invisible to the learner (Bernstein, 2000, p. 68). This identity is oriented to autonomous, non-specialised, flexible thinking and active participation in teamwork. It is costly to produce and is not easily measured. The position projecting this identity has a weak status in contemporary arenas and the social group sponsoring it has little power (Bernstein, 2000, p. 68-69). Bernstein emphasises that de-centred therapeutic identities are not strong players in any arena as transmission does not promote specialised categories of discourse and stratification of groups. Transmission prefers weak boundaries and integration to distinct areas of experience. Management style is soft, hierarchies are hidden, and power is disguised by communication networks and interpersonal relations. The de-centred therapeutic identity position projects stable, integrated identities with adaptable co-operative practices (Bernstein, 2000, p. 70).

2.6.4 *The pedagogical device*

Bernstein's theories are sensitive to context and can therefore be used in different settings to reveal how and where respect, power and responsibility are located in social interactions. Bernstein (2000) explains the 'device' by comparing it to a language device that is a system of formal rules, which control the various combinations of language. Bernstein emphasises that the *acquisition* of the pedagogical device is ideologically free but *not* its rules. According to Bernstein, educational practice is founded on codes of conduct and traditions that have developed within organizations for a long time, and this is the pedagogic device. It regulates the communication it makes possible, and regulates the ideal universe of potential pedagogic meanings. The pedagogic device has internal rules that are about social order and what counts as legitimate skills and knowledge.

Internal rules of the pedagogic device

Bernstein defined terms that can be used to detect the internal rules of the 'pedagogic device' found in different discourses. He suggests that the pedagogic device provides the intrinsic grammar (symbolic) of pedagogic discourse and it operates through three interrelated rules: *distributive*, *recontextualising* and *evaluative*, which are hierarchically related (Bernstein, 2000, p. 28). The distributive rules regulate the relationship between power, social groups, forms of consciousness and practice. The recontextualising rules regulate the formation of specific pedagogic discourses. The evaluative rules represent any pedagogic practice and such practice is always there to transmit criteria (Bernstein, 2000, p. 28). They operate within the reproduction field when a pedagogic discourse is transformed into pedagogic practice and converted into modes of classroom knowledge in interactions with learners.

In all societies there are at least two basic classes of knowledge, one that is *esoteric* and one that is *mundane*. There is the knowledge of how it is, the knowledge of the possible against the possibility of the impossible (Bernstein, 2000, p. 29). The distributive rules distinguish between two classes of knowledge: the *thinkable* and the *unthinkable* class of knowledge. In modern literate societies with complex divisions of labour the control of the unthinkable lies essentially in the upper reaches of the educational system. There must be a gap between these meanings which Bernstein calls a *potential discursive gap*. This gap becomes a site for alternative possibilities, alternative realisations between the material and the immaterial. It is a space that is the site for the unthinkable, the impossible and can be both beneficial and dangerous. It is the meeting point of order and disorder, the site of the *yet to be thought* (Bernstein, 2000, p. 30). This is what IEE is about, the colonisation of the

gap by the realisations of learners using innovative and creative skills to actualise their ideas.

Any distribution of power will attempt to regulate the gap which is the reason for the stability of the rules of the regulative discourse. The gap can produce different relations between the two worlds and the distributive rules attempt to regulate those who have access to this site and thus to control alternative possibilities. The control over access to this site is accomplished by a selection of the agents who have been legitimately pedagogised (Bernstein, 2000, p. 31) such as certified teachers. Power relations are however subject to change. A change in power relations can re-distribute the ‘unthinkable’, the ‘thinkable’, the ‘yet to be thought’ and differentiate and stratify groups according to the altered distributive rules. The distributive rules create a specialised field of production of discourse with specialised rules of access and specialised power controls and this field is controlled more and more by the state itself (Bernstein, 2000, p. 31). The competence model and IEE represent a challenge to these rules and relations.

Fields of recontextualising

Knowledge is created in different fields and is appropriated and pedagogized as knowledge is taken from its original field and relocated as pedagogical discourse (Geirsdóttir, 2008b). Official discourse becomes the official recontextualizing field (ORF) which in turn becomes the pedagogic recontextualizing field (PRF) (Bernstein, 2000) (Figure 2.3). The official pedagogic discourse (OPD) can thus be traced back to the dominant principles of society, which are generated at the level of the State Field and then recontextualized in the Official Recontextualizing Field in laws on education and in a national curriculum (i.e. Ministry of Education) (Morais, et al., 1999). The national curriculum reflects the official pedagogic discourse that is legitimized in the area of education in a given socio-political context (Morais, et al., 1999). The official pedagogic discourse moves into the Pedagogic Recontextualizing Field where it is relocated by curriculum experts, teaching material authors, and university teachers.

As discourses move they are transformed and as the pedagogic discourse appropriates various discourses they are transformed into virtual or imaginary discourses that the pedagogic discourse selectively creates (Bernstein, 2000, p. 33). For example as ‘*carpentry*’ is relocated in pedagogy it is transformed perhaps into ‘*woodwork*’ which is an imaginary discourse (p. 33). The pedagogic discourse carries the ideology that controls curriculum, pedagogy and assessment and is generated by two discourses (as introduced above) the *instructional discourse* (about skills and knowledge) and the *regulative discourse* (about social order).

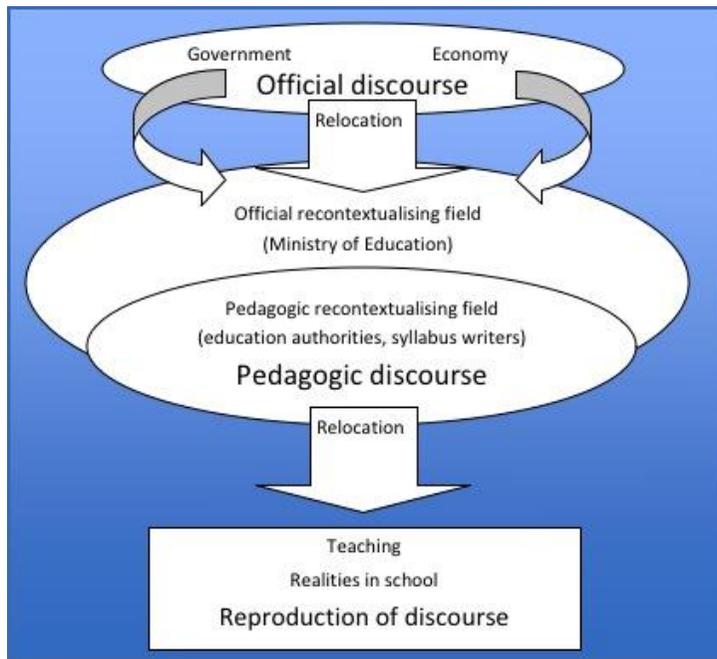


Figure 2.3 Knowledge production and recontextualizing fields

Organisational structures

On the level of institutions, there are different organisational structures. Where there are strong boundaries between the inside and outside of the organisation and within it there is a *collection code type* organisation. In this there is a hierarchy of knowledge between ‘the so-called common sense and the so-called uncommon sense’ (Bernstein, 2000, p. 10) with clearly differentiated and segmented subject frames for teachers and clear hierarchical management structure. The lines of communication between staff are weak with respect to pedagogic discourse as each is specialised in its own subject or area.

Where there are institutions that have weak classifications in structure they are an *integrated code type* organization. Boundaries between the organisation and the outside are permeable and boundaries within it as well. Bernstein points out that this model is highly vulnerable as communications from the outside are less controlled (Bernstein, 2000, p. 11). The institution’s identities are not established by its organizational structures (weak) but the staff is a part of a strong social network which should be concerned with integration of difference. The relations between staff cohere around knowledge itself, they cooperate in shared tasks, and the organisation establishes an alternative power base so the power lines

are more complex. With the weak classification there is a reordering of specialised differentiation that can provide new social bases for consensus and of opposition (Bernstein, 2000, p. 11).

2.6.5 Summary of key ideas from Bernstein used in the thesis

In this section I have introduced Bernstein's ideas on how knowledge is selected and appropriated, how it goes through social devices and change and is influenced by the pedagogic device. His ideas on how different values of classification and framing characterise different forms of pedagogic practice were also introduced.

Bernstein's theories help to identify and understand different forces that are at work and that are not visible until they are extracted and analysed. His tools look at curriculum, pedagogy and evaluation as message systems, as forming the structure and processes of school knowledge, transmission and practice. Valid knowledge is defined by curricula, and valid transmission is defined in pedagogy and valid realization of the knowledge is defined by the evaluation system.

The pedagogic discourse reflects values of classification and framing. Detecting and analysing the strength and weakness of classification, of the relations between categories of discourse, agents or practice, helps to understand our human need for organizing and segregating phenomena, for creating order out of chaos and the tendency of classified entities to hold on to the power that is well-insulated by their boundaries. Framing and realisation and recognition rules helps to understand in detail how control is enacted in a micro setting. These tools are useful in considering how IEE is organized (classified and located) and how teachers organise and enact lessons offered as IEE (framing).

The pedagogical device is a set of internal rules about social order and about what counts as important skills and knowledge. The three internal rules of the device, the distributive rules, the recontextualising rules and the evaluative rules, provide a sort of 'grammar' for the pedagogic discourse. The distributive rules regulate power relationships and different forms of consciousness through different forms of knowledge. The recontextualising rules regulate the formation of pedagogic discourses and the evaluating rules transmit the criteria for what counts as valid knowledge.

As knowledge is recontextualised from its primary field of production into pedagogy, it is influenced by two contrasting pedagogic models, the competence model and the performance model, giving rise to different identities. When knowledge is moved from the primary field of production into pedagogy it is delocated from its original site and relocated in a new context and this happens through the official recontextualizing field and

the pedagogic recontextualizing field. As knowledge is transformed into a pedagogic discourse it takes on the guise of a regulative discourse and an instructional discourse that is embedded in the former. Furthermore as knowledge is moved it creates potentials for ideologies (different identities) to claim their space (power) and thus the potentials for different understandings of the mundane and the esoteric. I am interested in finding out if the spaces created by introducing a new discourse, of innovation, allow IEE to be an influential in Icelandic compulsory schools. The questions guiding this endeavour will now be presented and explained.

2.7 Summary

In this chapter I have introduced my rationale for why creativity and innovation are important skills in modern education. The two theories introduced in the last part of the chapter have given a foundation for answering questions that have arisen and to new questions that explore further the questions that arose from the literature review.

I presented recent and current changes in western education and their relation to IEE and research in these new curriculum areas. It seems that uncertainties and rapid changes in the world today require people with creative and innovative skills in order to imagine and create a sustainable present and a feasible future. Innovation and creativity are seen as interrelated concepts and some scholars do not distinguish between the two. Innovation education builds on the view that all people are creative and that creativity and innovativeness can be enhanced.

Developing educational approaches similar to IEE has been a struggle in many countries but seems to have fared best where substantial support to in-service teachers, teacher education and research has gone hand in hand such as in New Zealand. Research has shown that creativity and innovation can be enhanced but it is not a simple matter and it depends on personal and professional as well institutional and cultural factors. Changes that include increased learner agency and creativity require flexible teaching approaches and organisation that some teachers find chaotic and unstructured and shy away from. Teaching creatively, teaching for creativity and creative learning are not necessarily the same but the first two go hand in hand to achieve creative learning and are also the approaches and also reflect the teaching skills needed for IEE.

This review of literature has raised questions that are relevant for innovation education. It would be helpful to find out how teachers of IEE view the importance of creativity and its role in IEE and especially how they rationalise IEE. As approaches of teachers in teaching

for creativity matter profoundly it should be revealing both to ask them about their approaches in IEE and also to observe them in action. How teachers deal with the flexibility needed in IEE and potential chaos angst, and the support or hindrances of their establishments, could offer answers that should be helpful for other teachers and schools. The larger context can also be conducive or limiting for enhancing creativity and exercising flexibility.

Other questions regarding IEE have come into focus in the literature chapter: How do people in the schools organize and view IEE as a pedagogical element? Is it a school subject, an approach or a policy and how is it located in relation to other subjects or subject areas? Is it organized within or as a part of other subjects – perhaps life skills, crafts, arts and crafts or science? Or is it a subject of its own that includes many knowledge areas and training of various skills?

It is possible to juxtapose the theories of Rogan and Grayson (2003) with the systems approach of Bronfenbrenner and Bernstein’s educational concepts (Table 2.1). Using these together and in collaboration makes it possible to understand the whole and different parts that make up the whole as well as the underlying nature and powers.

Table 2.1 Units of analysis in curriculum change

Units of analysis	Theory of implementation	Social ecology	The pedagogical device
	Rogan and Grayson (2003)	Bronfenbrenner (1979)	Bernstein (2000)
The learner	Profile of the capacity of the school	Learners in relation to teachers	Recognition and realisation rules
The teacher	Profile of the capacity of the school	Personal/professional attributes of the teacher	Instructional discourse
The classroom	Profile of implementation	Micro system	Classification and framing
The school	Profile of the capacity of the school	Micro and meso systems	Regulative discourse
Local and public settings	Profile of the level of outside support for change	Exo system	Official discourse
Society – culture, laws The national curriculum	Profile of the level of outside support for change	Macro system	Primary field of reproduction Official discourse Official recontextualising field

It should be interesting to find out how teachers experience their own environments in relation to IEE. These are questions that relate to all systems of Bronfenbrenner's theories. Can influences of the macro, exo, meso and micro systems be identified and are personal or professional characteristics important in implementing IEE? Within a given society or social group, the structure and substance of micro-, meso-, and exosystems tend to be similar, as if they were constructed from the same master model, and the systems function in similar ways. Conversely, between different social groups, the constituent systems may vary markedly. By analyzing and comparing the micro-, meso- and exosystems it becomes possible to describe systematically and to distinguish the ecological properties of these larger social contexts as environments for professional development. Bronfenbrenner's theories were used in this research to identify personal and professional proponents of the teachers and the properties of their social surroundings and how they again are situated in a larger context, and thus describe and analyse the social ecology and the players involved in IEE. Rogan and Grayson's theories offer a practical construct to add more precision to each case in an attempt to locate the current situation and the next feasible steps to be taken in all systems. Finally the application of Bernstein's concepts adds necessary and important detail.

This research project investigates examples of IEE in order to understand the nature and needs of IEE, the contexts in which it functions and how its progress can be enhanced. The theoretical base for understanding IEE in its various forms was presented in the previous chapter and seeks to use the theories of Rogan and Grayson (2003), Bronfenbrenner (1979) and Bernstein (2000) in an integrative way to build up the analysis. The development of the rubric based on the approaches listed in Table 2.1 is described in more detail in Chapter 4. With the rubric I construct a map of a *feasible ecology for development* for IEE. I will argue that the ecology of feasible development (EFD) for schools and teachers is made up of multiple and complex systems, and that the steps that could be taken between levels are dynamic. The use of the EFD will make it possible to show these connections and interactions in a complex but holistic picture that allows me to display the locality of each case

In the next chapter I will present the research questions, which I developed to guide my investigation, an argument for adopting a case study approach and some of the methodological issues related to the paradigm in which I situate my work.

CHAPTER 3: Research design and methodology

This research builds on a collective study of three cases of innovation and entrepreneurial education (IEE) in compulsory schools in Iceland supplemented by additional interviews and an examination of the official discourse. The research was carried out from 2006-2011 with the main period of data collection 2006 to 2008. In spite of its apparent value and timeliness bringing IEE into the existing education system seems to be a struggle, similar to other innovations of an integrative nature. I wish to identify what supports implementation and characterises IEE and sustains its development in school practice.

3.1 Design of the study

3.1.1 Research questions

In my master's research on innovation education completed in 2005, the notion of 'innovation education' seemed to be unclear in schools and sometimes principals would refer to any new approach or new project in the school as 'innovation education' (Jónsdóttir, 2005). It seemed therefore necessary to clarify characteristics of the practice of IEE in order to discuss their meaning. I thought that the vague understandings I encountered may have been related to the nature of IEE, which utilizes many kinds of knowledge and is offered in the official curriculum as a tool, method or a subject, with no clear boundaries. Perhaps principals did not see where IEE could be situated in the work of the school. My key research question is formulated as follows:

- How and where is innovation education located in compulsory school practice in Iceland?

This question reflects my assumption that the answer is not unambiguous and in order to further the implementation of IEE I need to know something about the experiences of schools and teachers with IEE since the introduction of the national curriculum of 1999. As the curriculum offers the schools themselves the agency to decide how they offer IEE, its implementation will be influenced by how it is understood and thus how and where they locate it in their practice, a practice which may have been built on a different discourse. In order to answer my key question on how and where IEE is located in practice, several main questions are addressed (Table 3.1).

Table 3.1 Overview of research questions

KEY QUESTION	
How and where is innovation education located in compulsory school practice in Iceland?	
What is the rationale for innovation education?	What affects the location of innovation education (IEE) in three Icelandic schools?
<p>What kind of talk about IEE is present in the public discourse?</p> <p>How is innovation presented in the official discourse?</p> <p>What kind of innovation education is called for in official policies?</p> <p>What kind of talk about innovation and education is present in the public discourse?</p> <p>What identities are portrayed in the IEE curriculum?</p> <p>How do teachers, administrators and learners rationalize or value IEE?</p>	<p>How do teachers work with IEE in their practice?</p> <p>What meanings do teachers give to IEE?</p> <p>Where do learners locate IEE?</p> <p>What meaning do learners give to innovation education?</p> <p>Where do administrators locate innovation education?</p> <p>What characterizes schools that embrace IEE?</p>
What characterizes the pedagogy of teachers that embrace IEE?	What are the characteristics of the social ecology of IEE?
<p>What characterizes IEE teachers?</p> <p>How do teachers experience their role in IEE?</p> <p>What challenges teachers in IEE?</p> <p>What supports teachers in IEE?</p>	<p>Where is IEE located?</p> <p>What encourages and what challenges the development of IEE?</p>

The first step seems to be to find out whether IEE is worth doing and why. Therefore it is important to ascertain what kind of rationale for IEE is given by those designing and practicing compulsory school education and whether creativity and the practical use of knowledge are linked. I ask the question:

- What is the rationale for innovation education?

As IEE is rather rare in Icelandic schools I think it is helpful to understand what characterizes those schools and teachers that work with IEE and along the way find out what supports and what discourages offering IEE. It is important to identify and analyse the conditions that support or hinder teachers and schools in adopting, developing and sustaining innovations. For example, administrative decisions, the organisational culture and the way teachers work can support or destroy creativity and innovation. I ask:

- What affects the location of innovation education (IEE) in three Icelandic schools?

Research in creativity and technology education indicates that teachers and their classroom skills and attitudes matter profoundly in implementation. The literature shows that the teacher is a key player in the development of creative skills in children. As enhancing creativity is one major aim of IEE this calls for answers to the question:

- What characterizes the pedagogy of teachers that embrace IEE?

Teachers or schools working alone are unlikely to sustain innovations in a social ecology hostile or unsympathetic to such changes. It is thus not just a question of what IEE requires of teachers and teaching. It is also a question of whether the social context within the schools and their surroundings is conducive to innovation and creativity, to working with IEE. The larger context and the characteristics of the systems that form and influence the social conditions for IEE need to be scrutinized. This led me to the question:

- What are the characteristics of the social ecology of IEE?

I am guided by sets of sub-questions for each of my questions (Table 3.1).

3.1.2 *Linking questions and methodology*

I believed that I needed to use an ethnographic approach to answer most of my questions since it is ideal for the study of culture (Bogdan & Biklen, 2003). The ethnographic tradition considers it possible to integrate a series of ethnographic observations by relating them to each other and to a cultural whole. A ‘combinative ethnography’ aims to bring into public space hidden elements of the pragmatic condition of individuals by relating the part to the whole (Baszanger & Dodier, 2004). Pettinger (2005) explains combinative ethnography as a research strategy that entails looking at several sites rather than one and is intended to take account of the complex and multi-faceted nature of a field using data from different sources. Combinative ethnography can also be seen as a version of the ‘bricolage’ approach explained later in this chapter where a sequence of representations are produced to connect the parts to the whole (Pettinger, 2005; Denzin & Lincoln, 2005). This type of ethnography offers an approach that fits my research as it can make visible a complex web of activities otherwise only apparent to some that are engaged in the situation whose. “... [C]lose observation of individual behaviour uncovers the texture of the activity by revealing the multiple operations that individuals perform in order to act in a complex

universe” (Baszanger & Dodier, 2004, p. 27). However often deeper layers of influence are not visible at first glance but can be seen with the help of different tools.

Situated in an interpretative framework my research considers ways of understanding and valuing differences and at the same time engaging perspectives across differences (Kelly, 2006). The ontology and epistemology of my research understands education as a complex social landscape influenced by many perspectives, actors and forces. By identifying these and mapping them reveals the complexities involved and help to make informed choices for change.

In the spirit of critical theory I seek to provide the means to achieve more emancipation in education (Bohman, 2010). My research is descriptive, exploratory, interpretative, collaborative and analytical. I am not searching for universal laws but seek to understand IEE as a complex social phenomenon located within multiple realities. I aim to perceive the subtle and complex, appreciate the connotative meaning as well as the denotative, making these meanings vivid through language (Eisner, 2002). My intent is to create theoretical and practical but above all useful knowledge.

3.1.3 Case studies

The chosen research methods had to provide access to the diversity of perspectives regarding the nature, purpose and value of IEE for practitioners and learners. To gain a deep and nuanced understanding of the contextual complexity and hierarchical structures involved in implementing and developing IEE in schools and to identify the causal mechanisms and multiple layers of influence that evolve over time as the participants adapt to changing realities I needed to record process, structure and context that may be hidden or distorted (Smith, 2006; Greene & Caracelli, 2003 in Smith 2006). This is what I aimed for by using case studies. By entering the field and hearing how practitioners experience and interpret working with IEE I would hear different voices, values and attitudes and scrutinising both local and remote policies further contextualizes these experiences. In this manner I could build on an epistemology that recognizes plurality, diversity and the social nature of knowledge (Kelly, 2006).

To attain a holistic view of a situation (Yin, 2009) requires a design that covers the individual, his or her close co-workers, and proximate and remote environments. Three cases form my collective case study, which involves in-depth study of instances of a subject, event or activity in its ethnographic context and accounts for the perspective of the participants involved (Gall, Borg, & Gall, 1996; Bogdan & Biklen, 2003; Creswell, 2003). Cases can be representations of highly complex, contextualized activities that can offer understanding and explanations (Mereseth, 1991). Case study as empirical inquiry is

especially relevant when the boundaries between the phenomenon and context are not clearly evident (Yin, 2009). IEE is highly contextual in nature and can therefore be expected to emerge differently in different settings. Therefore I wanted to look at cases of IEE in different settings to identify variations and how IEE and their contexts influence each other.

In a collective case study the cases are bounded by time and activity and researchers collect detailed information using a variety of data over a substantial period of time (Creswell, 2003; Stake, 2005). The knowledge of such studies is not abstract and scientific but embodied in the particular situation under study and in the experiences of informants (Mereseth, 1991) and investigators. Many aspects of IEE within three case schools are considered in this study. I focused on the work of IEE teachers in compulsory schools, but also examine the surroundings, organization and ethos of the schools, and the views of learners and administrators

Case studies can be descriptive, exploratory or explanatory or a mixture of these depending on the purpose of the research (Yin, 2009). The case studies here are *descriptive* in capturing culture, situation and persons involved in each site, but also *exploratory* in looking into situations that are not well established or are being tried for the first time. The studies are *explanatory* in looking for and revealing influences, causes and interactions that enhance or limit IEE in each of the schools. The cases in this research are *instrumental* cases to provide insights (Stake, 2005) into the IEE issue and how people deal with it in different settings. Thus these cases are also seen as *intrinsic* cases where each case provides its own unique information that is of importance and relevance emerging in that particular case. The cases are used to depict particularities of the settings and also to identify common factors. On the one hand each case can be read with interest in the case itself (Peshkin in Stake, 2005) and on the other hand the three cases can be read together to learn more generally about the development of IEE in schools, the effects of context and the complexity of change at national and local level. Each case in this research is unique and the initial inductive analysis allows for different narratives to emerge each with their own particularities and collection of histories, culture and conditions meeting in IEE episodes. By drawing on three cases and then using deductive analysis with chosen theories, the cases become instrumental in providing insight and understanding of the nature and requirements of IEE and how inherent social patterns and structures disperse power and potentials of identity formation.

3.2 Methodological issues

3.2.1 *The naturalness of practice*

The case studies in this research have a ‘flavour’ of action research or teacher research. I myself have worked with IEE for many years and I wanted to encourage the teachers to reflect and learn from their experience of working with IEE, for example, through keeping journals and talking with me. Action research is a process in which participants examine their own educational practice, reflect on it and use the knowledge to improve it (Ferrance, 2000). I wanted to understand what it was that had made working with IEE bring out qualities in learners that were not found elsewhere. Understanding teacher practice, and thus being able to contextualise mine, is important. I believe that teachers are intellectuals capable of generating knowledge from practice that reflects the complex nature of classroom life (Stenhouse, in Rudduck & Hopkins, 1985; Shulman (2004). They can take advantage of their local knowledge to become “architects of study and generators of knowledge” (Cochran-Smith & Lytle, 1993). Teacher research aims at creating a culture of inquiry that respects the voices of teachers and the knowledge they bring to the research experience (Tabachnick & Zeichner, 1999; Zeichner, 1993) and I set out to do this in my case work. Teachers build their actions in the classroom on their professional theories that may not have been articulated (Bjarnadóttir, 1993; Ingvarsdóttir, 2004).

Although my research was not initiated by teachers I wished to involve some of them at all stages, including the writing and presentation of results at conferences. I felt that through working with teachers in my research it would possible to attain a better understanding of how teachers develop and enhance their teaching and how their professionalism evolves, how they learn and what affects their actions in the classroom (Guðjónsson, 2002).

Innovation strategies build on knowing and understanding the need or problem that is to be solved. Kelley and Littman (2001), writing about the methods of innovation, emphasize using a method that comes from ethnographic studies to further understanding. The innovator observes the use of a problematic artefact or the action in question and tries to find a solution that does not change what is natural to the user, but finds a solution that makes the action easier in some way. This is what I wanted to do; not necessarily to change what teachers do but to make it easier to do. Pragmatists use a similar approach in research, as they use multiple approaches to understand the problem and choose the solutions that work in practice (Creswell, 2003). This is the stance I took in my research as much as I could, to observe the action and to understand its qualities, its demands and rewards. Therefore I needed a measure of teacher participation in order to understand what how teachers experience IEE and that way to find out what works ‘well’. I did not want to

change what is natural or necessary, rather to find what might make a teacher's work more productive and rewarding. As argued before a key aspect of innovation education lies in the teacher's attitude to the learner and teaching methods. To make those attitudes visible, I wanted the teachers to verbalise their working theories in order for us to find out the base of their educational philosophies.

3.2.2 *Qualitative and integrative methods*

In thinking of reality as a social construction and the need to focus on interpretation and negotiation of the meaning of the social world (Kvale, 1996) I accept that qualitative reality can never be captured completely and things can only be known through their representations (Denzin & Lincoln, 2005). My understanding needed to recognise local context, the social and linguistic construction of perspectives of reality and be built on openness to multiple meanings. I also took the stance of understanding human reality as conversation and action and the legitimisation of whether a study is scientific is replaced by the pragmatic question of whether it provides useful knowledge (Kvale, 1996).

Integrative research crosscuts disciplines, fields and subject matter. It breaks down situations and then reconstructs them aiming for a holistic view. Qualitative work is multi-method in focus, involving an interpretive, naturalistic approach to the subject that means studying things in their natural settings and attempting to understand or interpret phenomena in terms of the meanings people give to them (Denzin & Lincoln, 1998; Creswell, 1998). My intention is to draw up a complex yet holistic picture of innovation education. Denzin and Lincoln (1998) explain the multiple methodologies of qualitative research as 'bricolage' where the researcher uses strategies, methods or empirical materials that are at hand and invents new tools if necessary. The researcher as a 'bricoleur' understands that research is an interactive process shaped by his or her history and those of the people in the setting and that research findings alter conditions or how things are done.

By recognizing that science is not value-free I want my research to tell stories from the world I study (Denzin & Lincoln, 1998), to uncover social control (with Bernstein's assistance) and through such unveiling ultimately offer participants in IEE a chance to take control into their own hands as I myself relocate my understandings into work with teachers. The product of such research is a 'collage' that presents images, understandings and interpretations by the researcher (Denzin & Lincoln, 1998) connecting the parts to the whole such that meaningful integrated relationships are constructed.

3.2.3 *Analysing texts – discourse analysis*

I looked carefully at the language that had been used in interviews and documents. I wanted to find out how social situations were described and defined to reveal the discourse, the norms and messages implicit in conversations or other texts (Schwandt, 1997). Discourse analysis is used to seek to understanding of the actions that the talk or language signifies (Schwandt, 1997). According to Gill (2000) discourse analysis refers to a variety of different approaches to the study of texts and strictly speaking there is no single ‘discourse analysis’ but rather different styles of analysis that all lay claim to the name. What these perspectives share is that they reject the realist notion that language is a neutral means of reflecting or describing the world (Gill, 2000).

Foucault explains discourse “... as practices that systematically form the objects of which they speak” (Foucault, 1972, p. 54). Such an understanding requires looking carefully at discourse in order to find the messages they carry. The words people use is one focus of discourse analysis as there are multiple ways of describing the same person, action or scene (Rapley, 2007). Furthermore, the way things are said sometimes depict the message of what is said (MacLure, 2003), or what is not said (Rapley, 2007) and often the context in which it is said gives a clue to the implicit meaning. Discourse analysis can reveal how social actions and practices are accomplished in and through talk and interaction (Rapley, 2007). Certain discourses can be ‘read’ from texts that relay ‘messages’ of different sorts, such as messages of ‘proper gender behaviour’ or ‘this is what will save our economy’.

Palmquist (1999) suggests that discourse analysis will reveal hidden motivations. It will not provide absolute answers to a specific problem but enable us to understand the conditions behind that problem and that the ‘essence’ or the ‘resolution’ lie in the problem’s assumptions. Discourse analysis enables us to make these assumptions explicit, to view the problem comprehensively (Palmquist, 1999).

The critical viewpoint in social research is concerned with social order that is seen as historically situated and relative, socially constructed and therefore changeable (Locke, 2003). Social order and social processes are seen as sustained and constituted less by individuals than by the pervasiveness of social constructions or versions of reality that are embedded in discourses. Critical analysts view power in society as an inevitable *effect* of a way particular discursive arrangements privilege the status and positions of some people over others (Locke, 2003, p. 1). Human subjectivity is constructed at least partially by discourse and discourses are manifested in the way people *are* and *enact* (Locke, 2003, p. 2). Discursive practice refers to rules, norms, and mental models of socially acceptable behaviour to produce, receive, and interpret the message (McGregor, 2003). These are the

spoken and unspoken rules and conventions that govern how individuals learn to think, act, and speak according to various social positions (McGregor, 2003). We learn through different discourses to be learners, daughters, mothers, members of a gender group, entrepreneurs or volunteers (McGregor, 2003).

Locke (2003) explains *discourse* as sense-making stories that circulate in society and cannot easily be traced to a particular source. It is a way of making the world meaningful. Critically analysing discourse in educational research has the power to reveal the way power is diffused through the prevalence of various discourses in the educational system.

By using Bernstein's theories to trace the official discourses, their relocation in schools as instructional discourses influenced by the regulative discourses I analysed the 'innovation' discourse and changes it took as it was relocated in pedagogy (presented in Chapter 5). I used his theories again on the school data to reveal the location and nature of power and control and the regulative and instructional discourses affecting IEE (Chapters 6 and 7). I do this by developing criteria and analysing classification and framing in school activities as a part of particular discursive arrangements, in this case IEE lessons.

3.2.4 *Hermeneutical approach*

I wanted to extract the essence of the experiences of the participants in this research on IEE. I used a hermeneutical approach to find new angles to look at various data and interpretations. Hermeneutic understanding is grounded in the epistemology of understanding knowledge as social cultural construction.

Hermeneutical interpretation aims to obtain a valid and common understanding of the meaning of a text (Kvale, 1996). Although the subject matter of hermeneutics is the text, the "text" has been extended to include discourse and even action (Kvale, 1996, p. 48). 'Text' can be actual text but it can also refer to a cultural tradition, a practice, a policy, social and cultural values of a group or anything else developed by humans (Willis, Inman, & Valenti, 2010, p. 85; p. 242). The purpose of hermeneutics is searching for meaning and understanding (*verstehen*) by looking closely at context and history and the result may be more than one possible meaning (Willis, et al., p. 86). Hermeneutics is concerned with individual understanding, subjective interpretation and acceptance of multiple realities of the world (Geirsdóttir, 2008b).

The aim of the hermeneutic analysis in my study was integrative, to make sense of the whole, the experience of people of IEE, the relationship between people, the institution, and the overall settings (Myers, 1997). The hermeneutic act of interpretation involves making sense of what has been observed in a way that communicates understanding,

according to Foley & Valenzuela (2005). They argue that not only is all research merely an act of interpretation, but perception itself is an act of interpretation.

One of the main methods to gain knowledge and information in qualitative research is through the interview. Human interaction is central for knowledge production and the interview is an interchange of views between two or more people on a topic of mutual interest (Denzin & Lincoln, 1998). The medium of the interview is language and the product is 'knowledge', each language constructing reality in its own way. The focus on language diverts attention from an objective reality and even from the individual subject. It is the structure of language that speaks through the individual and controls to some extent the possibilities of describing the lived world (Denzin & Lincoln, 1998). Interviewing is one of the most common and most powerful ways used to research understandings and describe the world and others (Fontana & Frey, 1998) and my approach to analysis of transcripts is discussed in the next chapter.

Observation has served as a source of gathering knowledge through the ages (Adler & Adler, 1998) and is a part of the naturalistic approach of studying things in their natural setting (Denzin & Lincoln, 1998). Observation is often used in qualitative research, as it yields first hand data where the researcher observes and notes occurrences in natural settings. Researcher generated images are used as a 'visual record' and have been seen as giving an 'unbiased' record of reality (Prosser & Schwartz, 1998). However like field notes and other empirical data photographs may not entirely provide unbiased objective documentation of the world "... but they can show characteristic attributes of people, objects, and events that often elude even the most skilled wordsmiths" (Prosser & Schwartz, 1998, p. 116). Using photographs did not only help me recall the details in the situation it also helped with selected images to demonstrate in the thesis more clearly than than I could with words, what was happening in the episodes I reconstructed.

The researcher as an observer can take into account contextual factors that may influence the interpretation and use of the results (McMillan, 2008). Qualitative observers are not necessarily bound by predetermined categories but are free to search for concepts or categories that appear meaningful (Adler & Adler, 1998) or that shed a light on the research questions. They also focus their attention on larger trends and patterns (Adler & Adler) in behaviour. According to Gold's (1958) Typology of Participant Observer Roles, the roles of observers range from the complete observer to the complete participant. In my research my role was mainly the 'observer as participant' with minimal involvement in the social settings (Gold, 1958). I acknowledged that my attendance would lead to some disruption and therefore I tried to help out when needed either by occupying learners in

conversation when teachers were attending to others or by assisting learners that needed support.

3.3 Ethical issues in the research

3.3.1 Confidentiality

The Data Protection Authority in Iceland was notified of the research in the autumn of 2006. It is the intention of the researcher that personal identification cannot be made and linked to specific knowledge gathered in the research to avoid any potential harm from sensitive information. In the cases where personal identification can be made of the teachers it is with their consent and by choice such as when they choose to introduce findings with me.

Ethical issues in this research are about assuring that those who participate are not harmed in any way and remain unrecognizable especially where controversial matters are presented. In Iceland it is particularly hard to guard the anonymity of the researched as the community is so small and clearly described circumstances in papers can be read into and persons and schools identified. In delicate cases it can be dealt with in writing about the research, or by changing facts (gender or location) that do not matter in the findings. In writing up interviews and observations all persons and places are given pseudonyms except in the cases of the two pioneers of IEE Rósa and Kolbrún, which was done with their consent.

The main participants were sent the chapters with the findings of the research about their schools and asked to comment on what was introduced there and asked if they wanted anything omitted. When findings are introduced, schools and persons will be presented with pseudonyms. I have been doing joint introductions with teachers from two of the schools and in those cases the school's name was inevitably be known. Such introductions were made in collaboration with consent from the schools and teachers. Pictures from observations will only be used in presentations or publications with permission from the persons that can be recognized, in the cases of learners with their permission and of their parents. Such permission has been secured for the pictures appearing in this thesis.

3.3.2 Informed consent

All participants were informed beforehand verbally and in writing about the study and participation was voluntary, no one of those approached refused to participate. Written consent was obtained from participants and from parents of learners for interviews and

participants had the opportunity to withdraw from the study at any time if they wished (consent forms in Appendix II). Raw data including interview transcripts, field notes and photographs were securely stored for the period of the research and not accessible to anyone other than the researcher.

3.3.3 *Bias*

As the researcher I am aware of my own impact, as I have taught innovation education to many of the teachers involved. I have a very positive view towards innovation education and that influences what I see and when documenting and interpreting the findings and I had to constantly remind myself of this positive bias towards the research topic. Researching my former workplace and the work I had laid the foundation for was a sensitive matter both for my successors and me and had to be handled with care. Examples are given in the findings in Chapter 7 (for example, trying not to come across as the ‘besserwisser’ or raising myself ‘above’ my former colleagues).

Trying to protect the identification and honour of participants may result in a bias that forces me to exclude some information.

3.3.4 *Benefits*

I should mention first that I will personally benefit from this research as it will provide me with a degree. My hope though is that this research will have much wider benefits, for the community and schools that want to offer IEE and perhaps most importantly for learners and consequently for society.

I am very grateful to the participants for their contribution in this research and hope they have gained something from taking part. Research has often been conducted on people and participants often have no knowledge of what the results showed and they gain little or nothing themselves from the research. The participants in this research are seen as significant contributors to the knowledge built in the study and thus I find it important that they also gain from the work, and therefore they were involved as much as they wished in presenting findings that were directly about them. I wanted the teachers and administrators that took part to benefit and learn from our partnership and in that spirit I worked with them, both as an advisor in their work on IEE and on introducing the findings and lessons learned from the research. Coaching and expert support from me the researcher for the teachers and administrators within the three main schools was a part of the collaboration throughout the time of the research and was offered without cost on their behalf. In the IR research we wrote an evaluation report on each school visited which were sent to them to use as a part of their development and evaluation process (a list of reports in Appendix

VIII). I also made a similar report for City School that was published and sent to them to use at their disposal (Jónsdóttir, 2007). The lead teacher from City School and from Trio School have introduced findings related to their own schools with me on three separate occasions in Iceland (Jónsdóttir & Hlöðversdóttir, 2007; Jónsdóttir & Didriksen, 2009, 2010).

3.4 Credibility of the findings

How can my readers know that my study is believable, accurate and valid? What standards of quality and approaches for verification will be used to secure the credibility of this research?

3.4.1 Transparent process

Careful reporting of findings of research is important but equally important is reporting carefully what was done to achieve those results, who was involved, what was investigated and how it was done. If the procedures and the research processes are clear it increases the credibility of the research and it will be easier to compare to different cases and circumstances and potentially use the same or similar procedures in other investigations.

3.4.2 Insider-outsider - researcher's position

I have since the start of the research been positive towards IEE and I have regularly reminded myself of that position. I ask how my findings have been influenced by this stance. I have reflected on my own experience from teaching in compulsory school for 28 years and teaching IEE for ten years when interpreting and understanding instances and issues in the research. I am aware of my subjectivity and that it matters. I am the main “tool” for investigation, my choices of what to notice, what to ask, what to photograph are steered by my attitudes and experiences in addition to my research questions.

There is considerable literature about ethical and methodological issues when the activity of a researcher cuts across roles in a school setting, often called insider-outsider research. Some outsider research has not benefited schoolwork directly, resulting rather in the development of action research and self-study (Carr & Kemmis, 2009; Cochran-Smith & Lytle, 1999; 2004; Costello, 2003; Ferrance, 2000; Zeichner, 1993). Educational research has also been criticized for being disengaged from the field in that researchers come and look at schoolwork as if looking at experiments in a laboratory. In these cases the researchers think they are neutral ‘tools’ that do not influence what knowledge was

extracted from praxis (Cochran-Smith & Lytle, 1999; Hargreaves, Earl, Moore, & Manning, 2001 ; Lincoln & Guba, 1985; Maletud, 2001). This critique has called for critical consciousness (Kincheloe, 2004), for making the researchers a visible part of the educational process (Charmaz, 2005) and for critical reflection on their part to make their agendas, attitudes, and bias visible with the different ‘glasses’ that come with their ontological grounding and epistemological understandings. A part of reducing the influence of sources of bias is to become aware of them and make them visible to the readers of the findings. I have tried throughout this research project to acknowledge the influence of my experience, my worldview, my thinking about learning and of my sense of right and wrong, on what I notice in the field and how I interpret it and present it. Acker (2000) suggests that the insider-outsider question cannot be completely resolved, but that we can try to work creatively within the tensions it may create. And in the same spirit Corbin Dwyer & Buckle (2009) propose that the complexity and richness of the space between the insider-outsider perspectives can be explored and embraced.

When I was doing my research I was relatively close to the experience of being a teacher as I was only just starting out as a researcher having taught in a rural compulsory school for nearly 30 years. Visiting the case study schools I was entering a world I knew by experience though I realized that each setting had its own characteristics giving way to different teaching experiences. I tried as much as possible as a researcher from the outside to immerse myself in the culture and daily realities of the schools I visited and with time I felt that I had an understanding of teachers’ reality as I came from that kind of work experience. I did not take on the responsibilities of the teachers or take on their work except when I felt I could lend a helping hand but not disruptive during observation of lessons.

I am however also known as an expert in IEE and thus had the status of the “one who knows”. I felt that I had some expertise to offer in return for getting the opportunity to peek into the teachers’ realities in their schools. As a specialist in IEE and a teacher with many yerars of experience of teaching I had on top of the positive views towards my subject the power of being the specialist in the area I asked the teachers about and watched them do. That can be an uncomfortable situation for the teachers and might be construed as a test on their professionalism in IEE. In order to be less intrusive in the observations I never offered advice to the teachers “on the spot” or made comments on how the IEE work was evolving. After lessons, when students had left, I would answer the teachers’ questions and discuss their concerns. Sometimes we talked as equals, as colleagues with similar experiences, and sometimes I would answer questions with reference to my experience or knowledge of IEE. Sometimes I would lend an understanding ‘ear’ to worries or

complaints that the teachers were grappling with and at the same time I enjoyed hearing about their victories and joys.

My role as a researcher-outsider was thus influenced by my former experience as a teacher that helped to make the collaboration more worthwhile than only “looking from the outside in”. The more I watched, recorded and discussed lessons, the more my research knowledge became entwined with my expert teacher knowledge, and these began to merge and inform the way I worked with teachers. The teachers valued the support they felt I gave them in this research-advisory collaboration and the teacher leaders in City School and Trio School expressed gratitude for my support and felt that it was an important part of developing IEE in their schools. I also felt that the teachers were somewhat pleased with the interest I took in their work as something worth researching and telling others about. They were also being seen as specialists in their own teaching and their own situation. I had therefore multiple roles in my visits to the schools: researcher (outsider), former teacher (insider), specialist (outsider), an assistant (insider), confidant (insider) and sometimes cheer-leader (outsider-insider).

I was most sensitive to and concerned about potential conflict in the different roles of outside researcher versus advisor when I was researching my former workplace, as I describe in the second case study. There I also had the additional roles of the concerned community resident and former teacher at the school with strong views about issues concerning fairness and justice in the school and the community.

I also grappled with some self doubt throughout the research in relation to the shift from being a compulsory school teacher to becoming an academic researcher and whether my mission of enhancing IEE was worth doing. At these times of doubt I would reflect on my experience as a compulsory school teacher, and the time I worked with IEE. I remembered the professional fulfilment I experienced as I saw formerly disengaged learners become active and enthusiastic in IEE work. This became my lodestar throughout the research and the justification for thinking that I could talk to other teachers about something worthwhile.

3.4.3 Ecological image - multiple sources

Guba and Lincoln (2005) prefer to use the image of ‘crystallisation’ rather than ‘triangulation’ as the image for validity. They say that the triangle is a rigid, fixed two-dimensional object but the crystal combines symmetry and substance with an infinite variety of shapes, substances, transmutations, multidimensionalities and angles. Crystallization provides a deep, complex, thoroughly partial, understanding of the topic (Guba & Lincoln, 2005). In this research I hope to draw up a complex, multidimensional

image of my research findings that may even be more ‘alive’ than the crystal image indicates and I find that I need yet another image for its validity such as ‘ecology’.

The main claim for credibility of this research is multiple sources of data. I have three cases with one being the most substantial. I interviewed teachers and administrators in the schools and groups of learners (frames for interviews in Appendix I). I also interviewed and had access to other interviews with teachers about IEE, administrators and learners from other schools in the IR research. I have observations from the field of the main cases in the form of written data and photographs. Furthermore I compared these and analyse various documents such as teaching materials, policy, reports, speeches and curricula, both national and from the schools.

A detailed description of the groups and individuals and what they do should help the reader to see in his or her mind’s eye what is going on. The final product of such efforts is a holistic portrait of a social group and incorporates both the views of the actors in the group (emic) and the researcher’s interpretation of the social life described (etic) (Creswell, 1998). In this research I intended to draw up a picture and overview of a cultural scene by pulling together multiple aspects learned about IEE and those involved and thus showing its complexity.

Spending time with the people in the situations being investigated increases the chances of seeing and understanding their daily realities. Interviews can give substantive information but engaging for a long time or repeatedly with the participants in their daily work gives other kinds of information that adds richness to the information from the interviews and can confirm or contradict what has been said. I found it informative to visit the three schools repeatedly to come to grips with the daily realities of teachers and feel the ethos of each location.

3.4.4 Collaboration, voice and fairness

Even though teachers have been from the start the main focus of my attention I have found it necessary to listen to the voices of other stakeholders and influences. In order to make the picture clearer and more versatile I have also sought the voices of administrators and learners and the more distinct “voices” of policy and official discourses.

The voices missing in this research are the voices of the general society, mainly of parents. I have come through the research process to see that these are voices that have a lot at stake and exert a subtle influence in education but are often overlooked, such as here.

As mentioned in the benefits section, the participants in this research are seen as significant contributors to the knowledge built in the study and that they directly gain from taking part

in the research. In that spirit I worked with them, both as an advisor and with some of them on introducing the findings. I have also sent the chapters on each case to the main IEE teachers and the principal of City School for reading over and commenting on. Sadly the principal of Country School passed away in 2011.

3.4.5 Peer review

Alongside gathering and interpreting data I attended conferences and seminars internationally and locally, where I introduced emerging findings and received feedback from academic peers and practitioners. I have introduced parts of findings with participants in the study from City school and Trio school as mentioned before. Collaboration with my main supervisor has been close and constant throughout the period of the study and we have introduced findings from my research at conferences (see appendix VIII Introductions of research findings).

3.4.6 Limitations

This research is one of a few that has been or is being conducted on innovation education in Iceland. It is limited in scope as it only has three schools as main cases though a number of teachers outside these schools were also interviewed and consulted. It may also be seen a limitation that the majority of data was collected in one school and much less in the two other schools. The views of crafts/carpentry teachers that were perhaps most affected by IEE have not been gathered though indications of protective or negative views have emerged in their group. General views in society, particularly those of parents towards innovation education and those of learners of different ages also need to be more clearly identified and voiced than was possible in this research.

3.5 From methodology to method

In the next chapter I extend the issues introduced in this chapter into the practical problems of methods of data-gathering. I outline my procedure and my key informants, the techniques I used and data gathered. I then describe my analytical journey, from themes to criteria and the development of models in order to answer my research questions on the pedagogy and integration of IEE in practice.

CHAPTER 4: Methods

In choosing the most efficient and useful method to research a problem, it is the nature of the problem as well as the researcher's perspective that indicate which methods are best for finding answers. My ontology and epistemological understandings require methods that support interpretation and different understandings. I assume that there are differences in people's ideas of the world and that their perceptions and interpretations are influenced by culture and social interactions. Similarly I believe that knowledge is acquired through social interactions, direct or indirect, and that these are influenced by the culture one is brought up in and the socially constructed tools that make attaining knowledge achievable and comprehensible though sometimes may also be limiting.

The subject researched here, the location of IEE, was somewhat unclear at the outset. It seemed useful to use methods that allowed participants to express directly their experiences and understanding. It was also useful to observe them in realistic conditions. To answer my questions I needed to gather data from schools, by observations of lessons, by interviews with teachers, administrators and learners, and by analysing text (speeches, reports, law, curricula) and photographs.

4.1 Data generation

The three schools selected for the research were chosen from the limited number of schools that offered IEE as a formal programme and because they were willing ready to take part when I started my research. For a few years I had been one of the few available specialists offering training in IEE in Iceland and when I started my doctoral studies in 2006 I had been the chair of the teachers' association of IEE teachers from its inception in 2005. My master's research on IEE in Icelandic compulsory schools had given me the opportunity to find out which schools were formally offering IEE and to what extent (Jónsdóttir, 2005) Thus I had a good overview over what was going on concerning IEE and knew that a minority of Icelandic compulsory schools were offering IEE. I came into contact with the teachers in the case study schools through an in-service course on IEE held in August 2006 by my colleague and myself. I had already been admitted to the doctoral program with the idea of doing case study research. The interest shown by the teachers in the course gave me an opportunity to propose a research partnership. My thinking was that I could offer advisory support in exchange for access to classrooms and the possibility of taking interviews. I knew that I would have to tread a fine line between roles of adviser and researcher an issue that I will return to later. The three schools in this study are City School located in Reykjavík the capital of Iceland and two rural schools,

Country School and Trio School (all pseudonyms). All personal names in the research are pseudonyms except the names of two pioneers of IEE used with their consent.

In Iceland there is a certain level of “flatness” in socio-economic status and the general view is that there is little or no class stratification in our society. This may however be a false assumption that disguises differences that are not obvious on the surface but matter for the potentials of learners of different backgrounds. According to the PISA survey in 2009 (OECD, 2010b) socio-economic status does not explain differences in Icelandic student overall results. The three case schools were located in different parts of the country but had similar economic and social situations, and none of the schools were atypical of Icelandic schools. Most Icelandic compulsory school children attend their local school and almost all schools are public schools.

4.1.1 Case study schools

City School is the main case and site of data collection and is in the capital area of Iceland. Teachers were trying innovation education for the first time in 2006-2007, as a ‘special subject’. City School was established in 2001. The school building and its operations were designed with the “open school” in mind, with a special emphasis on arts and manual subjects and on integrating traditional school subjects. I started my research in City School in autumn 2006 and was able to visit them regularly all winter and thus gather considerable data on implementing IEE.

The key informants in City School are as follows:

- Principal Linda
- Runa textile teacher, head of department of arts and crafts
- Bryndis arts and crafts teacher
- Asa art teacher
- Heidi student teacher

By the end of one school year of researching IEE in City School I started to feel that a level of saturation had been reached in my data. I decided that I also wanted to look into other schools that had started working with IEE, but under different conditions, so I contacted two smaller rural schools and got permission to visit them and collect further data.

Country School is located in a farming area in a recently merged municipality. A small rural school, it has around 40 learners on primary level (age 6-12) and I taught there for 28 years until spring 2006 and was responsible for implementing and teaching innovation education for ten years. I also taught art and design and crafts.

The key informants in Country School are:

- Principal Ragna
- Sunny art teacher

Trio School is a small school of around 90 learners operating at three sites, one in a village by the seaside and two in nearby agricultural areas.

In Trio School the key informants are as follows:

- Acting principal Karl
- Principal Sigmund
- Sif lead teacher in IEE, language and class teacher
- Fanny class teacher
- Erik design and crafts teacher
- Rakel class teacher
- Julia textile teacher
- Gunna art instructor
- Abba class teacher
- Ben and Lisa department heads

Most data comes from the three case studies and are based on interviews, observations, documents and background data.

Innovation teachers were interviewed individually in all three case study schools and also as a focus group in City School and Trio School. Data from lessons were collected from all three schools. The teachers sometimes asked for advice from me as a ‘teaching advisor’ when needed, as had been agreed with the principals. The principals were also interviewed. Groups of learners in City and Trio Schools were interviewed, but not Country School, where the learners that I could have interviewed about IEE were my former learners. I expected them to be positive towards me and consequently innovation education, or not feel free to be honest about it.

I considered interviewing learners’ parents especially after realizing that the exosystem surrounding most Icelandic schools would be one of the factors that might support IEE or hold its development back. But I realised that I would not be able to cover any substantial research with parents in this research without reducing other aspects of it. I have realized that the lack of depth in this aspect is a limitation of the research and requires further scrutiny.

4.1.2 Other informants

In addition to the text of the national curriculum itself there were two main sources of other materials.

I added to my data nine interviews with seven teachers from schools other than the case-study schools. I felt I needed more data on the pedagogy of IEE. These included design and crafts teachers and teachers trying new teaching materials for innovation education. I also took four interviews with two pioneers responsible for implementing and developing IEE in the Icelandic school system. I consulted the teaching materials that were developed from their experience. The additional teacher interviews outside the cases were used to add colour and detail to the picture of IEE in Icelandic compulsory schools, especially in Chapter 8.

Official discourses on IEE and innovation were also analysed and other texts consulted. I also got permission to use two interviews from an earlier research NámUST on the implementation of the information and technology curriculum in 1999 with two of the leaders of the work on the revision of the curriculum.

During the early period of the research I took part in a research project called *Intentions and Reality* (IR) on science and technology education, visiting compulsory and upper secondary schools, taking interviews with teachers, administrators and learners in five different areas in Iceland. In this doctoral research I used three interviews taken during the IR research, as well as general information from interviews with administrators.

My choice of individual interviewees was as follows:

- Two pioneers, experienced IEE teachers Rósa and Kolbrún (two interviews each) – chosen as they were experienced IEE teachers and I wanted to hear from some of the pioneers.
- Three crafts and design teachers: Paul, Sedna and Hanna (one each) - identified during visits in another research projects, chosen by the principals as they were responsible for IEE teaching in their schools.
- Two crafts and design teachers: Sigurd and Gunnar (one each) - chosen as I knew they were teaching IEE as a special subject (Gunnar) or project (Sigurd) and Sigurd was trying out IEE teaching materials I had written.

I also collected some supplementary data from the case schools. I asked three of four teachers in City School, Country School's teacher and the lead teacher in Trio School to keep a journal of their innovation education lessons. The same teachers also made mind maps of how they visualized themselves as the teachers that they think they are and they

aspire to be. This is built on Tony Buzan's method of mind mapping (Buzan, 2006; Árnason, 2006) and has been used before in teacher research (Guðjónsdóttir, 2004). The mind maps were used in the interviews and as data for analysis for constructing an image of the teachers as professionals.

In addition to focus groups with learners in City School (one group) and Trio School (two groups), learners in the annual innovation contest for compulsory schools were interviewed answering verbally a short questionnaire and observed in a workshop for selected learners in the contest.

4.1.3 Interview schedule and record of observations

The type of interviews used in this research are semi-structured, sometimes open interviews with individuals and small groups. Semi-structured interviews allow for the “interchange of views”, multiple meanings and the expression of the meaning that the phenomenon in question has for the participants. The interview progresses much like a normal conversation but has a specific purpose and structure (Kvale, 1996) that honours both the aim of the study and the responses of the interviewee.

Observations in this research were made in IEE lessons in all three case schools. Teachers were later interviewed. I noted down in my field book what was going on in the classroom or other places in the school, noting the space, the social interactions and the ‘invisible’ such as the ethos or ‘feeling’ I could sense in each situation. I also took digital pictures to support my field notes. Observations of lessons in innovation education gave me a picture of what was going on, what the teacher was dealing with, how he or she interacted with his or her learners and how the learners reacted to the learning opportunities offered. In the interviews I sometimes referred to the lessons and other activities I had observed in the school and in some interviews showed pictures from the lessons and asked for comments.

4.1.4 Time frame

An overview of the time frame of data gathering can be seen in Table 4.1.

Data gathering started in City School where I reached an agreement with the principal and innovation education teachers in August 2006. During 2006-2007 data was gathered in City School (27 visits). I also spent two to three days a week for five weeks in Country School (11 visits). After the formal data collections I sometimes contacted the lead teacher in City School and Sunny in Country School by e-mail asking for additional information or to comment on my analysis. A two-day visit was made to Trio School in autumn 2007. Interviews with individual innovation teachers from other schools were taken from 2006-

2008. Data in the Intentions and Reality project were gathered in 2006-2007; four interviews concerning innovation education are used in this research.

In the spring term 2009 further gathering of data was conducted in Trio School in the north of Iceland in a two day visit. Interviews with the principal, individual teachers and groups of learners were conducted and observations made in innovation education lessons and group meetings of teaching team. In 2009 and 2010 additional information from the lead teacher of Trio School was gathered by e-mail communication.

Table 4.1 An overview of the time frame of data gathering

	2006-2007	2007-2008	2008-2009	2009-2010
City School	27 visits.	e-mail information.	e-mail information.	
Country School	11 visits.	e-mail information.	e-mail information.	
Trio School	Two visits.	Two day visit.	Two day visit.	Additional information by e-mail and phone.
Ceremonies and IEE contest workshop	Science and innovation celebration	Science and innovation celebration. IEE contest workshop		
Individual teacher interviews	Six interviews (four IR teachers).	Three interviews with two teachers/pioneers.	One interview with teacher/pioneer.	
Texts	First collection – law, policy, curricula and reports.	Second collection.	Additional texts – developing new official curricula.	Interview texts from the NámUST research. New policy.

4.1.5 Overview of field data

Transcribed interviews and field notes make up approximately 800 pages. Additionally I have other data from teachers, curricula from schools, official speeches, official curricula, law and reports. A compact summary of my data sources is provided here in Table 4.2 and a more thorough overview in Appendix III.

Table 4.2 Compact overview of data

Case – informants	Data
City School	28 sets of field notes: open ended interviews with 4 individual teachers, one group interview with the same teachers, one group interview with 2 teachers, one with the principal and one group interview with learners; 20 observations in lessons. Teacher journals and mind maps.
Country School	11 sets of field notes: one with the IEE teacher, one with the principal; 9 observations. Teacher journal and mind map.
Trio School	18 sets of field notes: three open ended interviews with learner focus groups, one with the principal, two with the lead teacher, one with a group of teachers and four with individual IEE teachers; observations in five lessons and two teacher group meetings. Lead teacher journal and mind map, several correspondences by e-mail, additional information about evaluation and curriculum.
Individual teachers	9 interviews with seven teachers, two of them pioneers of IEE, four from the IR research
Other data	Innovation contest of compulsory schools workshop, ceremonies, speeches, reports, law, curricula.

4.2 Data analysis - the analytical journey

Here the methods of analysis and the analytical journey are described from gathering data in schools through thematic coding of data to formulation of criteria and the development of models. The main phases in the analysis were:

- Generating data and initial analysis
- Coding and thematic analysis
- Design of social analysis rubric (ecology)
- Making friends with Bernstein
- Developing models

This process was not linear as these phases were interactive and iterative. Some parts were recurrent as the research progressed and the development of criteria was refined by repeatedly consulting data and theories, back and forth. My research questions guided me throughout the research process and influenced the data I gathered, the theories that I chose to use and the kind of methods I used to analyse the data.

4.2.1 Gathering and generating data and process of analysis

When data was collected through observations and interviews, I jotted down comments and descriptions on location in a field book. Pictures taken on a digital camera were noted

and numbered in the field book. Immediately after visits I wrote careful descriptions and uploaded the pictures into the notes. More detailed field notes were then constructed with observer's comments in brackets. Thus the analytical journey began as I gathered the data, choosing and thereby eliminating what to record first in the hand-written notes, and then again on the computer.

I hired a transcriber to type up the interviews and then I listened again to them to see if there were discrepancies and to check parts that were unclear. Each set of the field notes had a separate cover page and were given numbers and names with matching acronyms, for example, Trio School 9 interview with teacher Finn, shortened TS9IF. All names were written as pseudonyms except Rósa's and Kolbrún's, with their consent.

Methods of analysis

Methods from the tradition of qualitative research were deployed, such as open coding, thematic coding, a hermeneutic approach and discourse and image analysis. These methods supported giving voice to the participants and enabling their settings space to emerge, respecting the cultural, social and the personal. Different data was used with and against each other as a part of triangulation, not just to validate findings but to add breadth, complexity, richness and depth to the inquiry (Flick, 2006).

Analyses of reports and policy documents were conducted and considered in the light of other data and conclusions drawn. Analysis of the official discourse that appeared in speeches, policy, reports, law, teacher courses, teaching materials, curricula and information about the preparation of the national curriculum in 1999 was conducted in the spirit of discourse analysis. As I carefully read the texts sentence by sentence, I asked myself whether they carried messages, explicit or implicit, about norms, of how individuals should learn to think, act and speak. In the first phases of analysis, I asked 'What is being said here?' and 'What kind of messages are presented about the kind of people that are wanted in the Icelandic society?'. In the latter phases I asked with the support of Bernstein's concepts, What sort of preferred characteristics are depicted? (the regulative discourse) and How should these be attained? (the instructional discourse). Although I did not use word counting I did infer the importance of the message from the amount of space it was allocated, for example, in the curriculum.

Pictures taken on site were analysed as part of the field notes. They often added details to the description of the location and indicated both the material context and examples of interactions in the space. Pictures were analysed for their content (Bell, 2007) and also interpreted (Rose, 2007) as a part of the situation described in the field notes. Selected

images were used as a part of the description in the thesis to show detail and vividness and support claims. Analysis of photographs also formed a part of the triangulation of data.

Some methods from Grounded Theory were applied in the research especially in the early stages, in the emphasis on interplay between data collection and analysis, the inductive approach and using open coding and thematic coding (Creswell, 2003). Open coding is a method used to sort data into categories or issues that seem to be important or appear repeatedly in the data. The researcher reads the data carefully and notices certain words, sentences or patterns of behaviour that can be categorised together under codes (Bogdan & Biklen, 2003). It is important to be open to whatever appears in the data even if it seems irrelevant in the beginning (Esterberg, 2002). The codes and themes in the data started to emerge early as the transcripts and other texts were read. Codes were found by using the hermeneutical view and discourse analysis. Gradually the codes were categorised into themes that indicated important issues in the findings (Creswell, 1998).

When each full set of field notes was complete, I read over the text critically in relation to the research questions asking: what is to be found here, what is interesting, what “jumps out”, what is repeated and what is there but not so obvious (first reading)? At the end of the notes I wrote reflections, examples of which are:

A.TS9, IF: “He is not convinced that IEE is a subject with all the ‘extras’ such as advertising and other issues that deserve special attendance, at least not in ‘his’ lessons.”

B. Co8, o: “The boys become impatient as the lesson progresses – Sunny experiments with letting them run around the building.”

Finally I printed out my notes with a large margin on the right side for a space to handwrite codes and comments.

On my next visit to a case school I had in mind the final comments and questions I had made at the end of the previous field notes. Thus the initial stage of data organisation and analysis enabled me to focus on the next stage of data collection.

Finding themes

Soon after I had printed out the field notes I started to read them a second time and using different colours I underlined interesting sentences, still asking similar questions: how does this answer my research questions? I tried to be open to unexpected answers asking: what is there – what is this telling me – what issues are visible? This time I gave the coloured issues/matters names or “codes” that either were one word, a short sentence or a symbol, such as “control”, “caring”, “women’s workplace”, “freedom” and “busyness” (see a

photocopied example in Appendix V). I wrote these codes in colour on the right margin, sometimes with a memo or explanation for myself.

During the third and fourth readings of my field notes I began to gather the codes under general themes looking for patterns that could help understanding and reduce the data (Punch, 1998). I found ways of grouping the open codes into phenomena that were similar to one another and sometimes codes became themes on recurrent issues such as “organization”. I worked inductively as the themes emerged from the data analysis. As I worked further on developing the themes I could see how many of them could provide part of the answers to the research questions, such as “attitudes”, “conditions in the school”, “learner voice” and “invisible part of teacher work” that answered the questions related to the rationale, the pedagogy applied, the location of IEE in practice, challenges and support and about the social ecology. After going through the data several times and analysing inductively I started to use the main theories outline in Chapter 2 to interpret and organize the findings.

From this point I began to move from an inductive analysis to a more deductive analysis introducing some of my chosen theoretical concepts (Table 4.3).

Table 4.3 Sorting codes and emerging themes

City school	Theme - category		
		Code – emergence – field notes (FN) nr. Pg.nr	Conclusion – comment - reflection
The school			
	Open spaces – open organisation – flexibility.	The housing is open and flexible to a certain level 1,3 – school ethos open and organization, many kinds of work going on at the same time 1,2; 2,2; 2,8; 2,9; 4,2; 4,3; 4,6;5,2; 5,3; 5,4; 5,6; 6(1,2,3,); 7,7; 8 (2,4, photo pg 6,8,9; 22); 11 (photo 2); 13,3; 14,7; 16,9; 18,3; 20,3 Team teaching Learners working in different locations (FN 20) requires flexibility,8; 1,9; 2,9 Open curriculum 20,7 Thematic work FN20 Large number of students reduces flexibility – more complex 26,31 Organization is a “headache” 26,38	Is the flexibility more on the surface? Is there a different kind of RD working silently against?

For example, the use of Bronfenbrenner enabled me to organise the open coding and the themes that were emerging in the different settings. New themes came out of this phase of the analysis so the next step was to gather them together, making a study for each school

where I made use of Bronfenbrenner’s systems to allocate themes and issues to systems from the personal, the macro and meso to the exo and macro. Bronfenbrenner’s frame did not restrict my sorting of the data and helped me to see relationships between themes and issues, shown more comprehensively in Appendix IV.

As the analysis progressed I began to refine the research questions, dropping some and fine-tuning others. I was guided by the main research question: “Where is IEE located in Icelandic compulsory schools?” but I added the ‘how’ and it became “Where and how is IEE located in Icelandic compulsory schools?” as I began to see how the ‘how’ was crucial for IEE. It finally became: “How and where is IEE located in Icelandic compulsory schools?”

4.2.2 *Design of social analysis rubric (ecology)*

In the process of analysing and organizing the findings from the three case schools I started to construct a rubric *The ecology of feasible development* (Table 9.1). I designed the rubric by integrating the ideas of Rogan and Grayson of steps in development with Bronfenbrenner’s and Lewthwaite’s ideas on systems of social ecology (Table 4.4).

Table 4.4 Prototype rubric for understanding teacher and school development

4	Ideal					
3			EFD	EFD		EFD
2		EFD	x	X	EFD	x
1	Basic	X	x	X	x	x
Settings →	Levels	Personal factors	Microsystem factors	Mesosystem factors	Exosystem factors	Macrosystem factors

I identified four levels of development towards an ideal, an educational goal related to the intended innovation, leading to a description of four levels of development from basic to ideal within each system (Table 4.4). The lowest level of the rubric is the basic level which includes descriptions of a required minimum of elements of a proposed innovation for each cell at the first level. At the second and third levels there are indicators of further development towards the fourth level that describes the ‘ideal’ form of the proposed innovation. I developed a prototype from my early findings and then refined it by testing it empirically on new findings, as described in detail in Chapter 9.

I used the rubric and my findings to interactively identify descriptions for the different systems and levels of development from observation and interview data, the curriculum, IEE teaching materials and general information about official evaluation procedures in Iceland. This was an iterative process of consulting research questions, theories and data. I

was then able to use the rubric to describe and analyse the location of each of the three schools, their teachers and their local and remote surroundings with regard to the development of IEE. With this tool I got a clearer image of the location of IEE in the three schools and their level of development, although this is not a permanent location if schools are working on development as introduced in Chapter 9.

To avoid confusion in the current research I use the term *ecology of feasible development* (EFD) and not the term *zone of feasible innovation* (ZFD) used by Rogan and Grayson. The EFD for IEE in schools and teachers consists of multiple, complex interacting systems. To move between levels requires a dynamic approach.

By using the ‘final’ form of the rubric with my three cases I could describe the social ecology of IEE, developing a profile of the extent to which IEE can be found in each case. For example, in Table 4.4, a school could be found to show IEE activity at the levels marked ‘x’. The feasible steps to the next level, marked EFD, are both sequential and neighbouring or interactive, and the ecology of the situation can be discussed with school leaders and teachers.

4.2.3 *Making friends with Bernstein*

As the data grew and grew and I had been attending a course on Bernstein’s theories I found that his concepts were influential and started to appear in the latter phases of the analysis of the three cases and became a part of the description of the codes and themes, tuning the focus and adding detail to the analysis of the micro and personal systems.

The first time I re-analysed the data from the three cases, with the support of Bernstein’s concepts of classification and framing, working with themes and issues that had emerged and also consulting raw data when needed, I got results that showed that the teachers usually practice a mixture of strong and weak framing and classification that was in itself interesting.

I felt that I needed more precision and detail in describing the various aspects of ‘power’ and ‘control’ in the classroom as giving learner’s agency is a foundational element in IEE. Thus I turned to research that has applied Bernstein’s theories in schools and classrooms to help me construct my own ‘language of description’ for the relevant activities and elements in IEE. When consulting Morais (2002) I began to understand the importance of making the social interactions characterised by strong or weak framing visible. Other research using Bernstein’s theories showed me how to operationalize classification and framing to analyse pedagogic texts, and describe classroom interactions (Nsubuga, 2009; Bolton, 2008; Hoadley, 2006; Neves & Morais, 2001).

It had become clear to me through my field work that the conditions of teachers and the settings their schools offer are very important for how IEE is offered. Morais (2002) suggests that any pedagogic practice at the school level is the activation of the pedagogical code and thus presents its orientation through specific values of classification and framing. The sort of settings schools traditionally offer build on an organisation (strong classification) that is not conducive to crossing boundaries (school subjects, agents or location) and can be limiting to learner agency (strong framing). It seemed necessary to look into what sort of settings the schools offered with regard to this particular area of IEE that builds on crossing boundaries and learner agency. I found Bronfenbrenner's systems approach also useful here to analyse and structure a description of the conditions in the 10 schools on which I had information from the cases and the interviews. It helped to identify the level of support of administrators and colleagues in each school and how differences in school organisation affected leeway for IEE. I had seen in my data how the views of administrators and a collegial atmosphere in the schools could soften edges and reduce rigidity and strong classification, so it was not just a question of strong or weak classification of traditional categories.

I was able to create a language for description (a set of criteria) of IEE lessons, develop indicators of framing and classification and use these in the analysis of the data and findings to get a deeper understanding of the social relations. I developed four sets of criteria for use in further analysis:

- Classification of IEE in school (Table 4.5)
- The pedagogic features of the social base in lessons (Table 4.6)
- The framing of selection in lessons (Table 4.7)
- The framing of pacing, sequence and criteria of knowledge (Table 4.8).

Classification influences the social base, the interaction in the classroom (Table 4.5): who decides where work is located, who speaks to whom and when and what sort of messages are given about the accepted behaviour is produced through different strengths of classification thus giving rise to the regulative discourse (RD). It seems that although teachers intend to allow creativity and independence they may not be aware of the silent 'rules' in the RD that influence how they act and react to learner's work and conduct. A sensitivity to several factors of how these 'rules' appear may be helpful to develop a pedagogy supportive for creativity.

Table 4.5 Classification of IEE relations in several Icelandic school

	C + + very strong	C + strong	C – weak	C – – very weak
Structure of timetable	Traditional 40 minutes lessons each (one or two) for one independent subject. Very little or no flexibility.	Traditional arrangement of lessons in 40 minutes but some subjects get double time. Flexibility limited.	Long periods (70-100 minutes or longer) arranged for IEE or other project work. Some flexibility for out of school visits.	Half or whole days taken for IEE when needed. Much flexibility in the timetable for seizing unplanned opportunities and visits out of school.
Group arrangements	One set class with same age.	A set class group of same age, sometimes individual work or smaller groups within the class.	A home group of mixed ages. Individual work or small group work with different individuals.	No set groups. Group work or individual work according to learners own choice.
Physical location of IEE work	In a set classroom.	Main work in a set classroom but sometimes work can be extended to other classrooms.	Work is mainly in one location within the school but sometimes other locations are used with teachers approval. Some visits/fieldtrips to locations of work life or museums.	IEE work is intermittently done in a crafts room, ordinary classroom, library and computer room – learners choose locations which they find appropriate. Frequent visits to locations of work life and other relevant places.
IEE teacher - collaboration	One teacher specialist in IEE. No collaboration with other teachers in the school. Collaboration may occur with similar specialists outside the school.	One teacher specialist in IEE but may collaborate with one teacher inside the school on limited tasks. Other colleagues not familiar with IEE.	A team of IEE teachers work together on implementing and developing the subject in the school.	General collaboration within the school on IEE. Learners visit work sites and visitors from work life come to lessons.
IEE lessons, content/nature	Independent subject and isolated from other school work.	IEE lessons have their own content, seen as a subject that is not deliberately integrated with other areas of knowledge.	Deliberate integration of knowledge and skills from some subjects and some connections with life and work life. Often as a project.	Lessons make use of knowledge from several subjects and knowledge of life and work life as needed for the projects or themes and each learner or learner groups.

Bolton's (2008) research on art education gave me an insight into how I could develop relevant and relative indicators of control in the classroom and the school. Consulting Bernstein (2000), Bolton and the data I constructed a table of indicators for identifying the RD as it appeared in framing in lessons. Indicators (Table 4.6) were used to identify the RD through the strength of classification and framing in IEE lessons:

Table 4.6 Pedagogic features of the social base in lessons

Social base – communication	Strong classification – distinct separation or no separation Strong framing		⇔	Weak classification – blurred Weak framing	
Social space – location of work C	Location of work is set throughout the lesson – predetermined by teacher.	Location of work is different according to different tasks – choices offered by teacher.		Location of work is negotiated between learner and teacher.	Learner selects location of work .
Social space – learner teacher C	Teacher and learners in separate locations in the classroom, some movement between these.	Teacher and learners in separate locations, considerable movements between these.		Teacher and learners in the same locations, teacher moves between individuals and groups.	Teacher and learners in the same locations, teacher moves between and individuals move to teacher.
Communication F	Teacher controls all communication, he/she is mainly talking, learners ask permission to speak.	Teacher controls some of the communication, learners ask permission to speak to teacher.		Teacher and learners freely communicate, (atmosphere of a workshop), learners speak together.	Learners and teachers freely communicate and take on each other's roles – learners speak together, help each other – teachers learn about learner's ideas.
Behaviour – conduct F	Teacher controls learner behaviour through a system (for example PBS) with rewards for good behaviour.	Learners work quietly and do as they are asked. Teacher relies on learner's internalization of behaviour system and uses reminders or rewards for good behaviour.		Learners are immersed in interesting work and mostly handle freedom and seldom need reminders of what "good behaviour" is like.	Learners work autonomously and responsibly.
Roles – identity C Division of labour	Learners have very limited agency and are receivers. The teacher is the specialist who transmits knowledge and criteria of behaviour. The control in lessons is distinctly with the teacher.	Teacher controls most aspects of lessons and is the specialist. Learners have agency within certain well defined areas.		Learner have agency in defined areas and are aspiring innovators. Learner and teacher communication is often on equal footing though the teacher has the power to decree.	Learners have ample agency and are innovative i.e. creative and active. Learner and teacher roles are often interchanged; learners are experts and teachers learners.

As the analysis of the case school data revealed, ‘selection’ turned out to be the part of framing that varied among the teachers (Table 4.7). Therefore I found it necessary to break ‘selection’ up into smaller parts and identified six elements that teachers and learners had control over in different degrees: knowledge, needs, tasks, methods, materials and design or direction of developing ideas.

Table 4.7 Framing of selection – control

Framing	Strong framing – teacher control		↔	Weak framing – learner control	
Selection of	F ++ very strong	F + strong		F – weak	F – – very weak
Knowledge – content and themes	Teacher decides what is to be learned, content, themes or issues to handle in the lessons with one set focus.	The teachers offers a specific content, theme or issue but accepts/allows learners’ ideas to enrich the main focus.		The focus of the content is greatly influenced by learners’ ideas and suggestions.	The focus and content of the theme or issue is set and developed around learners’ ideas.
Needs to address	The teacher selects which needs to address.	The teacher offers a limited range of needs to address.		The learners suggest several needs and learners select which they want to address conferring with teacher.	The learner selects which need to address.
Tasks – topics	The teacher selects tasks such as “make a 3D cube”.	The teacher offers a limited range of tasks and learners select from those. Learner chooses how to develop.		The learners suggest several tasks and the teacher offers a range of them and learners select.	The learner selects the task independently.
Methods	The teacher decides the method.	The teacher offers a limited range of methods.		Teacher and learners come up with a collection of methods, and choose from them.	The learner selects the method independently.
Materials	The choice of materials is decided by the teacher.	The teacher offers a limited range of materials to choose from.		Learners have a wide range of materials to choose from.	The learner wishes to use specific materials that are procured.
Direction of developing ideas	Teacher takes makes decisions in developing solutions .	Teacher suggests choices in development of ideas or influences learner choice.		Learner with teacher’s support develops his or her idea and learner makes final choices.	Learner controls the development of his or her ideas and teacher supports.

With the help of Table 4.8 I was able to identify more clearly the instructional discourse with regard to indicators of strength of framing in the curriculum i.e. who controls pacing, sequencing and the criteria of knowledge.

Table 4.8 Framing of pacing, sequencing and criteria of knowledge

Framing	Strong framing – teacher control		↔	Weak framing – learner control	
	F ++ very strong	F + strong		F – weak	F – – very weak
Pacing	The teacher decides when each task is to be finished.	The teacher sets an overall time frame for when projects are to be finished.		The learner chooses his or her pace within a set but flexible time frame.	The learner sets the time frame and the pace of work.
Sequencing	Teacher has a set sequence of tasks within projects or themes.	Teacher has a set sequence of some parts of projects or processes.		Learners can do some alterations to sequence of tasks or processes.	Learners can have any sequence of tasks that fit their object/goal.
Criteria of ongoing work in the classroom ²	Criteria of work is clear and visible from the outset. The teacher monitors constantly learners work and makes comments – to the whole class and individuals to indicate appropriate performance.	Criteria is visible off and on in the process – teacher corrects and guides. Clarifications for what is expected made off and on either to individuals or whole class.		Criteria of knowledge is developing in the process. Teacher makes a few comments when asked – the criteria for successful production are not made explicit to all.	Criteria of knowledge is invisible – teacher seldom corrects work – comments not extended to the whole class.
Criteria as formal evaluation	Teacher uses guidelines and criteria for evaluating learner achievements that is partially built on the RD.	Teacher offers guidelines and criteria for what is going to be formally evaluated and makes these explicit.		Goals and criteria for evaluation are negotiated between learner and teacher.	Lerner sets goals and criteria for evaluation.

The criteria for accepted performance in the schools was either visible in lessons for the on-going work or as formal evaluation at the end of lessons as seen in one of the schools. Bernstein connected the visibility of criteria of assessment to strong framing. I do not agree and suggest that visibility of criteria of assessment is a foundation for the weak framing of evaluation i.e. that learners have control over their own evaluation. Thus if a learner knows what will be evaluated he/she can negotiate her/his own goals and set the criteria for evaluation accordingly.

I also used my ‘language of description’ as an analytic tool to describe, analyse and interpret the making of the official curriculum for compulsory schools in 1999 and to analyse the messages being relayed by the IEE curriculum itself, the IEE teaching materials and the teacher courses in IEE (Chapter 5). This helped me make some of the

² Indicators of criteria in lessons developed from Hoadley 2006.

macro conditions visible which was needed as the message of IEE has not come across widely in practice yet but can be elicited with the help of Bernstein's theories and my descriptive language.

4.2.4 *Analysis of the official curriculum*

The analysis in Chapter 5 of the official discourse on innovation and its relocation in the national curriculum was carried out after the field work for the case studies and the additional interviews and was necessary to consider the conditions for IEE in Iceland and the basis for it as a school subject area.

With support from a colleague I translated the chapter on IEE into English (Appendix VII) and then did a careful reading of it as textual data. I used Bernstein's theories for displaying decontextualising and recontextualising discourses. This research activity, similar to one carried out by Nsabuga (2009), forced me to reconsider some views that I had more or less taken for granted in my long affair with IEE. My analysis of the official curriculum also helped me to get a better understanding of what might happen in the process of taking a general discourse of innovation and relocating it into school practice.

4.2.5 *Developing and using models*

The *integration model* (Figure 2.1) helped me to analyse and display the kind of experience that learners have with different forms of integration as well as the likely demands integration makes of teachers and schools. I used the model to identify forms of curriculum integration in IEE lessons that I had come across in the research and the IEE literature but had not been theorised. I was thus able to identify the types of experiences available for learners in IEE.

Using Bernstein's theories helped me to identify further elements and issues I could focus on in the school data. I began to see not only how personal-professional attitudes were a strong influencing factor of how IEE was presented but also how the settings and external factors created different conditions for the 'enacted curriculum'. I went over my results once again, now with the indicators for framing and classification (described above), sometimes consulting my initial field notes. I was able to sharpen my tools for exploring my own analysis using indicators of framing and classification.

A model of IEE pedagogy was developed and I was then able to place each teacher within one of the four modes of IEE pedagogy that I had identified from combinations of different strengths of classification and framing in IEE lessons (Table 8.4). Settings for IEE were also important. A model of the interaction of support and structure based in part on

Bronfenbrenner's theories was constructed. This enabled me to locate favourable or disabling settings and structures for IEE in each of the 10 schools where the 13 teachers worked. With the criteria and the models I was able to call forth images of what was going on in IEE lessons and schools which offered IEE.

4.2.6 Summary of the analytical journey

The process of generating and analysing data in this research has been one of inductive analysis in the early phases with theories taking on a bigger role in the later phases and thus increasingly a deductive analytic process. The theories helped me to get more out of the findings than I could have without them. They have helped to sort and organise the findings in a comprehensive way, using models, but also made it possible to dig deeper (analyse) and hence display influences with precision and depth and at the same time show the interconnection of factors, the systems, powers and players. With this work I have been able to use the data, the theories and the processes of inductive and deductive analysis to construct a version of reality that offers theoretical understanding of the practice of IEE and also tools to use in practice with better understanding of IEE and potential for more precise pedagogy.

When I did the final analysis for Chapter 8 and 9, I had already done the initial four to five rounds of analysing inductively the interview data for the seven teachers and analysis and interpretation of data on the case schools. Although I describe these as relatively straightforward sequential phases with inductive analysis in the beginning and deductive analysis in the latter phases I have also realised that analysis is never completely inductive as I was from the outset influenced by my research questions, my experience and theoretical knowledge in the collection and interpretation of data.

I now move from the literature review and my methods to my results. In Chapter 5 I define IEE by analysing the intended curriculum from 1999 and consider its recontextualisation in courses and teaching materials. In Chapters 6 and 7 I present three case studies of IEE in practice, where I build on the experiences of teachers as well as their administrators' views and attitudes and learners' experience. Through this process I extract where IEE is detected and how it is present in school work (Chapter 8). I look more closely at IEE as it appears in the classroom or other settings applying the theories and criteria I constructed. Finally I link the curriculum analysis, the case work, and the teaching analysis in what I call 'an ecology of preferred development', a tool to help schools and groups of teachers to work towards the aims of IEE (Chapter 9).

CHAPTER 5: Official innovation discourse translated into pedagogy

5.1 Introduction

What is presented and heard in official discourse can be seen as something important, something worthwhile, delivered publically. People to whom we have granted power through elections or other democratic means prepare official text for others to hear and value. Such discourse is created in the primary field of knowledge production and as it moves is decontextualized and located in the national curriculum in a new context. As it enters pedagogy it undergoes further changes and is allocated pedagogical status.

In this chapter I give a short overview of education in Iceland, then I show examples of official discourse, introduced by Icelandic ministers, tracing innovation discourse in policy documents and curricula and giving an insight into the preparation of the national curriculum in 1999 (Table 5.1). I identify the regulative and instructional discourses of IEE in the curriculum, the Pedagogic Recontextualising Field (PRF), and then I present the discourse found in the IEE teaching materials and IEE in-service courses, the Official Pedagogic Discourse (OPD).

Table 5.1 Innovation discourse and recontextualising fields – data analysed

Official discourse on innovation	Public statements Speeches of ministers
Official recontextualising field ORF	Educational policy documents Interviews with developers of the national curriculum 1999
Pedagogical recontextualising field PRF	The national curriculum 1999, 2007, 2011
Official pedagogic discourse OPD Regulative and instructional discourse	Teaching materials IEE teacher association IEE course materials
Reproduction of discourse	Case studies (Chapters 6 and 7)

The processes in the recontextualizing fields are not simple nor mechanistic in democratic societies but rather sites of conflict and compromise where forces, parties, agents and institutions strive to make their agendas visible and influential in the curriculum (Walker, 1990). Groups and individuals that take part in the deliberation and preparation of a curriculum integrate multiple and different views and values and the curriculum may represent a compromise of competing issues (Geirsdóttir, 1998b; Reid, 1994). The national curriculum is an effort to contextualize policy on education and sets the main benchmarks for school activities. When discourse has been contextualized and published as a curriculum it may attain legal status, as is the case in Iceland.

The purpose of this chapter is to identify and analyse the discourse of innovation in the economy and the society, its delocation and relocation as a discourse of ‘innovation education’, first in the national curriculum and then in teacher courses and learning materials. The analysis is based on texts covering the period 1996-2011. Some are available in published documents and some I have compiled from information known to me from IEE activities. Finally I made use of two interviews taken in a related project³. I consider key parts of the “pedagogic device” to see what kind of messages are carried forward regarding innovation and how that discourse emerges as the official pedagogic text (table. 4.1).

5.2 Locating the official innovation discourse

Innovation is considered important in modern societies and Icelandic cabinet ministers and other politicians often mention the importance of innovation and creativity to society. A former prime minister of Iceland spoke of the power of education, research and innovation for the good of the nation’s economy:

It is exactly with these long-term aims in mind that the governments of the last years have emphasized the importance of education and strengthening research and innovation as those are the vital driving forces of economic growth. (Haarde, 2007)

³ In this chapter I will be citing two interviews from 2004. One was with the 1999 curriculum revision project manager Jónmundur Guðmarsson (ITE-JG). The other was with Jóhann Ásmundsson (ITE-JÁ) the head of two curriculum development groups, life skills and information and technology education. These interviews were taken by supervisor Allyson Macdonald and Þorsteinn Hjartarson in the research group NámUST (researching information technology) in 2004.

The official discourse in Iceland has been positive towards innovation and many examples of this can be found, as indicated by the Minister of Industry in a speech in 2008: “Innovation is the prerequisite for diversity in Icelandic businesses and the foundation for its strong competitive status” (Iðnaðarráðuneytið, 2008, p. 2). He claimed that knowledge, innovation and creativity are important skills in all people:

The modern economy, with its emphasis on adding value by means of better use of knowledge and rapid innovation, requires a broadening of the creative skills base involving the whole population. (Iðnaðarráðuneytið, 2008, p. 2)

The discourse of innovation as being ‘good’ is also heard from Europe. A European Union policy document for education in 2009 focused on ‘creativity and innovation’ (Commission of the European communities, 2008). ‘Innovation’ is generally taken to be a positive trait and is typically introduced without reservation or explanation.

The above remarks were all made before the world-wide recession in late 2008 when the Icelandic economy suffered a blow that shook the foundation of the welfare state. Now, even more than before, we hear ‘innovation’ discourses that suggest that an innovative way of thinking can help restore the economy. In a speech at a meeting in May 2010 about the economy and support for innovation in Iceland, the Minister of Industry said:

Now the economy of the world and of individual countries needs to rise again after this deepest low that has occurred since the Great Depression almost a century ago. ... It is at a time like this necessary to let entrepreneurs and people with business ideas have sufficient support to realize their ideas. (Iðnaðarráðuneytið, 2010)

The newly formed Science and Technology Policy Council (2004) in Iceland presented their first policy statement for the period 2003-2006. The report stresses the importance of innovation and how to support it in Icelandic society. ‘Innovation’ is seen as an essential part of the nation’s competitiveness and economic growth and is linked to knowledge, education and research:

When evaluating the competitive advantage of nations, the role of education and achievements in the field of scientific research and business innovation weighs heavily. Recent resolutions of the OECD Ministerial Council underline how education, research, innovation and entrepreneurship are the driving power for economic growth in societies that develop by acquiring and utilizing new knowledge. Member states are encouraged to increase their support for science and research, creating favourable conditions for innovation based on new knowledge. (Science and Technology Policy Council, 2004, p. 3)

The policy promotes ‘innovation’ as a positive and desirable element in science, technology, business or economy. The policy identifies priorities for enhancing scientific research and technological development such as increasing research funds, improving the infrastructure of science and technology, the establishment of incubation centres, improving property rights, facilitating public access to research and data, encouraging women to take an active part in research, influencing research through tax concessions, and all in all shaping a creative research environment. Education is seen to be the foundation for continuing economic growth “...by acquiring and utilising new knowledge.” The main strength of the Icelandic society is seen to be competent people that receive high quality international education, and have ambition and use knowledge to achieve success. Such aims are to be achieved by solid research and enhancing a conducive research culture. Collaboration between different groups internationally and nationally is encouraged in order to reinforce innovation in various fields:

The Science and Technology Policy Council emphasises that universities and research institutes in regions outside the capital city area should continue to be enabled to carry on research and technological development in fields especially well-suited to reinforcing innovation in the local economy and business life of the respective regions. (2004, p. 12-13)

Even though ‘innovation’ is seen as a positive element, the role of basic education in creating this kind of culture is not mentioned in the 2004 document, neither as a prerequisite nor as a priority. ‘Innovation’ as an activity is found in universities and among adults but the development of innovation skills is not a concern of this policy.

The policy of the Science and Technology Policy Council (2006) for 2006-2009 does assign education a role in the Icelandic society and economy. The messages of the 2006 policy are directed at fundamental education and places “Education at the frontier” (Science and Technology Policy Council, 2006, p. 6). This time it is asserted that a policy for education is also a policy for economy and employment. The policy calls for better primary and secondary schooling through coherent and continuous education that is sensitive and responsive to the needs of society (Science and Technology Policy Council, 2006, p. 6). The Council promotes creative thinking and entrepreneurship to harness knowledge and promote innovation with competition as a healthy way to do this (Science and Technology Policy Council, 2006, p. 7). As in the former policy ‘innovation’ is a focal element seen to have positive effects on business and economy:

Active innovation in companies is the prerequisite for the growth of well-paid jobs that create added value from knowledge. It is important that the business

sector increases its research and innovation efforts. (Science and Technology Policy Council, 2006, p. 11-12)

Although the council has only advisory power, five ministers have seats on the council. Its two working committees are made up of individuals and specialists in different knowledge areas from both the public and the private sector. External evaluation indicates that the council has reached many of its objectives and has had an impact on the development of innovation based on science and technology (Forss & Taxell, 2007).

5.3 Relocating innovation discourse in education policy and the law

Before and around 1999, when innovation education was first introduced into the national curriculum, was a period of considerable change in education in Iceland. Some reorganization of knowledge was apparent with new areas entering the curriculum and its overall revision opening spaces for a different organization and views of knowledge. As the discourse of innovation from economy and competition moved into pedagogy it adopted a certain ideology and became an ‘imaginary discourse’, the real discourse is appropriated as a pedagogic discourse (Bernstein, 2000, p. 33). Discourses of knowledge have the power to inculcate a worldview and identity and when a discourse moves there is space for new ideologies and influences. Struggles between individuals and parties can be expected in the revision of a national curriculum as it is an arena of potential influence on the thinking of the young and thus eventually on society.

In 1989 under the lead of a left wing government a new official curriculum for compulsory schools was developed and presented under the caption *Towards a new century* in 1991. Later the same year there was a change of government and a member of the right wing Independent Party became the Minister of Education. An official committee was established to review the policy on education and presented its final report in 1994. The work of the committee was said to have had a great influence on the changes that were made after 1995 at the same time another new Minister of Education was appointed (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005). Substantial changes were made to the school system in the new law on compulsory education in 1995 that transferred the responsibility of compulsory schools from the state to the municipalities. The official curriculum and the monitoring of schools were left in the hands of the state.

The Minister of Education appointed in 1995 was a lawyer by education, a former reporter and editor of a newspaper, and an experienced politician, who had a special interest in information technology (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005). He was the

first minister in Iceland to set up his own website, where he kept a journal on his political activities, his speeches and his views on various issues. The minister established two committees with representatives nominated by all political parties headed by a member of the Independent Party, one to develop a policy for the upcoming revision of the curriculum and the other to advise the minister on issues of information technology.

The minister wanted to improve education in Iceland through revising curricula and decentralizing control, increasing the practical and financial autonomy of schools, and increasing monitoring of quality of school work in order to lead to increased efficiency (Bjarnason, 1997b). He had criticized Icelandic schools for lacking discipline and ambition and indicated that teachers might have listened too much to academics in pedagogy and psychology. Declining discipline in schools and society was frequently discussed and used to explain how unsuccessful Icelandic learners were in comparison to learners in other countries (Johannesson, Geirsdottir, & Finnbogason, 2001). Having hinted at the imperfect professionalism of Icelandic educators the minister still chose to include them in the revision process. He had a clear idea about how he wanted to go about revising the curriculum and it was to be managed according to a tight time schedule and a very structured framework (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005).

The minister launched in 1996 the large project of revising the curricula for pre-, compulsory and upper secondary education that were presented in 1999. He strongly and actively promoted the new policy in a nationwide campaign by visiting several places in Iceland and holding open meetings to discuss this new policy (Morgunblaðið, 1998). The public and professionals were encouraged to acquaint themselves with the new policy and give their recommendations and comments before the formal curricula were finalised the following year.

In 1995 a new law on compulsory schools had been passed and was in place until 2008. The law can be seen as supporting creativity in schools and also aimed at finding a balance between vocational and academic learning (Article 29, 66/1995). The policy *Even Better Schools* (Ministry of Education, 1998) introduced the 1999 curriculum for compulsory schools and depicted the creation of a modern international globally competent competitive individual as was reflected in the headings of the main themes addressed in the document:

- Independent individuals
- Stronger individuals
- Special needs met
- More learning in a shorter time
- Information technology a tool in all subjects

- A solid foundation
- Language skills on a global scale.

These themes all indicate that education in Icelandic schools should cultivate strong independent individuals who learn a lot and master languages and technology; there is though some compassion for those with special needs. The strongest theme is one of competing individuals in a modern society taking part in the global community. The 1998 policy emphasises information and technology skills:

The new general curriculum also responds to the technological progression and the computer revolution by implementing teaching in the so called information and technology area which among others includes learning to use computers, information technology, **innovation** and technology **education** (p. 16. Bold letters my emphasis). (Ministry of Education, 1998, p. 35)

There in the midst of other modern skills the need for ‘innovation education’ is first introduced. The rationale for innovation education is that it supports skills to be mastered for the good of the nation in competition with other nations:

If we are to secure the competitive status of the nation in development and innovation in industry, education and technology we must be on the lookout for international demands within this subject. (Ministry of Education, 1998, p. 35)

In all areas of work in our society we need individuals that have the qualities that are developed within arts education; initiative and innovation. (Ministry of Education, 1998, p. 39)

Individuals need to develop initiative and innovation as skills for work. The policy indicated that arts education is meant to foster initiative and innovation and also presents links between innovation, crafts and IT:

New approaches to crafts teaching are in the new curriculum area of information and technology education, since in the new curriculum the traditional crafts/woodwork teaching will be linked to technology and innovation. (Ministry of Education, 1998, p. 16)

Finally the policy introduces innovation education as a subject that is infused by knowledge from other subjects. At the same time as the policy promotes arts to enhance creativity and initiative, it introduces innovation education independently into compulsory school education:

In the compulsory school a new vocational subject will be based on *innovation and the practical use of knowledge*. In this subject the learners will gain practical insight and skills in producing practical products from the knowledge they gain in other subjects (such as grammar, arts, mathematics, science, languages, social subjects and physical education). (Ministry of Education, 1998, p. 48)

Here a strong practical tone is introduced; IEE is presented as a ‘vocational subject’ at the same time as it is linked to general knowledge from other school subjects.

Life skills was also a new subject introduced in this curriculum but did not get a special time allocation. The overall message of the policy is to modernise compulsory school education with better use of computers and information technology and a new subject called ‘innovation and the practical use of knowledge’. These elements are placed in a curriculum otherwise built on traditional subjects and time allocations. These new areas require a fundamentally different approach that calls for a holistic organization of time and objectives. This duality, this contradiction, was to give rise to tensions and dilemmas in the actual curriculum as we will see later.

5.4 Making the new curriculum in 1999

The process of making an official curriculum is usually invisible to the public and is problematic and complex. The official curriculum for compulsory schools in 1999 in Iceland was in some ways revolutionary and different from the curriculum in 1989. The new curriculum in 1999 was presented in 12 pamphlets whereas the curriculum of 1989 was a 200-page book. In the 1989 curriculum the use of computers was covered in one page but in the new one information and technology education was covered in 84 pages in one of the twelve pamphlets. At the same time as there was a visible intention of distribution of power the state was executing a major centrally steered project in educational policy thus keeping considerable power with the state.

5.4.1 Preparing and making the curriculum

The preparation and the making of the curriculum in the period 1996-1999 was conducted in the spirit of *deliberation* (Reid, 1994) a process which allows for interaction and influence of various stakeholders on the curriculum (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005). The Ministry of Education asked the teacher associations in Iceland to nominate representatives to take part in the preparatory and working groups for the revisions of the official curricula. The Minister of Education emphasized active

participation of stakeholders collaborating on the revision: teacher associations, the employment sector and the academia (Bjarnason, 1997a). He wanted separate issues and subjects to be discussed within teacher subject associations and encouraged them to arrange seminars to discuss and scrutinize the intended changes. The process was meant to encourage an open and honest discussion, a deliberative process that offered all interest groups a part in revising the curriculum.

The Minister of Education appointed a project manager for the revision process and coordinators for each of the subject areas. The preparatory groups were composed of representatives from schools, business and academia. They formulated the main aims for each subject area. In the Information and Technology Education preparatory group the representatives were four teachers from compulsory and upper secondary level, a university lecturer (a former compulsory school teacher) in design and technology in education and a professor of philosophy. The head of the group was a university professor with a Ph.D. in electrical engineering. Furthermore the co-ordinator of the ITE group was a trained carpenter with a university degree in sociology and anthropology and had training in information technology (Ministry of Education, 1997). The group had thus a strong link with school practice and knowledge of pedagogy and philosophy but was led by an engineer, a specialist in research.

The work of the preparatory groups and the project management group built on the educational policy presented in a report in 1994 (Ministry of Education, 1994) and the new compulsory school law (66/1995). The lines of communication were relatively direct as the project manager reported to the minister himself and the project committee had easy access to the minister (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005). The preparatory groups consisted of people with relevant academic background and wrote final goals for each subject. According to the project manager, many people wanted to take part in this work and the ministry had to select from those who asked to take part. Some co-ordinators in these groups were university academics (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005).

Clear and measurable goals and aims

The project manager said in an interview that he thought that the earlier curriculum of 1989 had not been successful in achieving the goal of being a good and practical foundation for school work and that it did not have an organized progression of learning aims. The kind of organization they were constructing in the new curriculum was meant to fulfil those aims better. A lot of discussions in the preparatory and working groups had been about how particular the curriculum should be, if it was to be general like the one in

1989 or detailed, but the conclusion was that it should be instructive, but still not completely the opposite of what had been in the previous curriculum. It was to be focused enough to guarantee harmony in learning and have a natural progression and still leave enough leeway for teachers' decisions. The aims and the objectives were meant to be advisory so as not to alienate the teachers, not to direct them too much – and as the project manager pondered, it was perhaps a play with words to say that “here are the final aims and they are regulative/controlling but the objectives are here and we are not telling you how to do your work” (ITE-JG).

Working groups led by the subject area co-ordinators were then appointed, to develop aims and objectives for each subject area in line with the goals set by the preparatory group. Choosing the people for these groups was done in a similar way as for the preparatory groups except this time members were mainly teachers and teacher educators (ITE-JÁ). The groups were expected to formulate measurable aims for year 4, 7 and 10 and objectives for each year in most of the subjects. Jóhann explained their task as being similar to an athlete that sets his main goals then develops measurable aims on the road to his goal and finally divides them into steps (ITE-JÁ). The directive from the project management group, according to Jóhann, was to make the objectives in the curriculum clear and measurable. Further elaboration was to be found in final goals, aims and objectives and these emerged in the work process partially out of the novelty of the national intermediate exams in year 4 and 7 (ITE-JÁ).

Most of the working groups presented their aims for reference or as guidelines, but not necessarily for all learners to attain. Aims to be attained were to be set by the schools and teachers. The project management committee then decided that all of the aims were to be attained (ITE-JÁ). Jóhann said that many of the teachers taking part in the preparation of the curriculum tended to want the curriculum to present *how* to teach (ID) but he emphasized that the curriculum was to model the content, the *what* (RD) of learning, not *how* to teach (ITE-JÁ). Presenting only the content for IEE may not be enough guidance for teachers as the *how* in IEE is just as important as *what* is taught (Gunnarsdóttir, 2001a; Thorsteinsson & Denton, 2003; Jónsdóttir, Thorsteinsson & Page, 2008).

Some disagreements and conflicts – mostly a creative process

The deliberation process in curriculum making can be slow as it involves many different stakeholders that are ready to fight for the importance of their subject area or topic either to keep power or to gain power (i.e. control over areas in the curriculum, influence on learners and their thinking). An example of conflicts and clashes in the preparatory work for the curriculum of 1999 is that two leaders of groups were sacked in order to be able to

continue the development (ITE-JÁ). Jóhann Ásmundsson, coordinator of two of the subject groups (life skills and ITE), said that the development of the curriculum in 1999 was mostly a process of creation, diplomacy and politics in settling disagreements. He admitted that there was some steering from above and the management group made it clear that *they* carried the professional responsibility of the curricula and nothing would be put in there unless they could accept it.

Jóhann felt that the big faults of the educational policy that was created in these years were that everyone felt that their own subject was the most important foundation for everything else and that resulted in restricted freedom of choice in practice. So for example, this meant that if a learner did not choose a particular subject he or she was banned from “travelling in large areas of the knowledge landscape”. Jóhann continued with this metaphor pointing out that it seemed to be a reaction of a system that believes that there is only one starting point to particular knowledge; just one defined gateway and everyone that wants to take that route must go through this particular gate.

Jóhann argued that the constraints to free choice in a traditional school system should be lifted and changed into different ways of thinking about and organizing education. The traditional system is organized from the point of view of groups or blocks of groups, whereas the declared objective in the Icelandic school system is individual learning; this is a contradiction that was to be resolved. He suggested that one of the reasons for this tendency to organization in the compulsory school system is because the higher levels of school set the entrance parameters and thus influence what is done on the lower levels. As the upper secondary and university level are usually thoroughly organized according to subjects and vocations it puts a pressure on the compulsory schools to act accordingly (ITE-JÁ).

5.4.2 New ways versus traditions of the school system

The curriculum for compulsory schools of 1999 was meant to be a blueprint for modern education in Iceland with new ways of organizing and thinking about knowledge.

Liberation from the textbook

In the interview with Jóhann he expressed what kind of ideas were meant to be realised in schools through the new curriculum. He felt that one of the goals of the 1999 curriculum was to liberate the curriculum from the textbook. The curriculum called for: competences, understanding, knowledge and experiences that are to be found everywhere in the learner’s environment. It refers to the learner. Jóhann said that unfortunately the curriculum had not become the liberation from the textbook as intended. There are still particular pages in the

textbooks that are the real curriculum in school practice, not the world and the self that the child is supposed to discover with the help of teaching aids as needed (ITE-JÁ). In this respect it seems that a competence model (Bernstein, 2000) was intended to be influencing the design of this part of the official curriculum of which the new ITE area and the IEE subject are examples. By referring to the learners themselves and their environments as sources for knowledge the boundaries of subjects were weakened and the call for competences that Jóhann described are in the same spirit as *competence models* as defined by Bernstein.

The new ITE area – and “the new baby” IEE

Jóhann said that one of the tasks in developing the curriculum was to design the areas of integrated learning (í. ógreinabundið nám) and that included technology education according to the IT policy: *The power of information*. Every teacher was to integrate the use of computers into their teaching. Technology education was though a troublesome concept according to Jóhann and there was some confusion with the concepts ‘technology’ and ‘information technology’. Craft, in particular woodwork, had been struggling with its own image crises in the previous years as it seemed uncomfortable being grouped with the arts and appeared to fear losing its characteristics. There had been demands for making the handicrafts more technology and vocationally oriented. Craft infused with technology and innovation elements was put under the hat of ITE as a part of this ‘modern’ curriculum now called ‘design and craft’ (í. Hönnun og smíði).

The process of designing the ITE curriculum to cover the old subject of craft and the new information technology and technology elements resulted in the “conception” of a new subject *Innovation and the utilisation of knowledge* or “the new baby” as Jóhann referred to it. The main aims in ‘innovation and the utilisation of knowledge’ were to open up the possibilities for learners to realise that they could make a product or develop a process based on practically anything they learned (ITE-JÁ).

Similarities between the Life Skills and the ITE curricula

Jóhann explained how the new life skills subject came to be in the 1999 curriculum as a collection of “all the other learning elements” that the school was supposed to introduce to learners according to the law and demands from the society. It was allocated time in the Hours of Instruction table in the curriculum from grade 4. The life skills subject rises out of integrative learning dealing with everyday life. As a “real” subject it had to have a “backbone” consisting of certain virtues, not in conflict with those who have different values (ITE-JÁ).

There are certain similarities in the overall ‘gist’ of the curricula of ITE and Life Skills. In both cases there is a discourse that introduces schooling as a holistic process where subjects are blurred or subordinate to the purpose of educating the learner. As Jóhann pointed out, the life skills subject was meant to actualise the invisible curriculum, to make visible the education that learners might get indirectly and without clear goals. “Life skills study is intended to strengthen a pupil’s overall development” (Ministry of Education, 1999d/2004, p. 7). This strikes the same chord as the holistic view of the ITE curriculum in connecting the capacities of learners to use and understand creativity and innovation, information, technology and environment. The ITE curriculum introduces the learner holistically, as one and the same within and outside school, making use of knowledge and skills from life and school subjects. Innovation and information technology in the ITE curriculum are seen as a tool to use in making connections and understanding how to live and learn successfully in a modern world. Some goals of Life Skills are similar to goals found in the ITE and IEE curriculum. For example:

Making life skills a special subject is a response to contemporary demands that pupils be better prepared to face the challenges of life. (Ministry of Education, 1999d, p. 7)

A special emphasis is put on the contemporary technological environment, which is characterized by ever changing technologies and constant development of new knowledge and skills that individuals must continuously acquire throughout their lives. (Ministry of Education, 1999b, p. 7)

Emphasis should be put on connecting learners’ ideas and projects to real circumstances... (Ministry of Education, 1999b, p. 31)

The design and crafts curriculum is introduced in the traditional way as a separate subject but is also meant to connect issues of modern life such as innovation, technology and sustainability (Ministry of Education, 1999b). Other parts of the compulsory school curricula in 1999 were introduced in a more traditional way with single subject areas each presented in separate booklets.

The official discourse of ‘innovation’ is a discourse of the current times that sounds like a magical discourse that can cure many faults in society especially the failing economy. In this chapter I have so far traced how the compulsory school curriculum in 1999 came about, its preparation and how the innovation discourse was relayed as IEE in the ITE curriculum. There seems to be a good fit between the official innovation discourse and giving innovation education space in the curriculum. Since innovation is seen as being important it is logical that its cultivation and know-how is a part of the basic education.

Looking deeper into what sort of area or subject IEE is, is the object of the next part of the chapter.

5.5 The official innovation education curriculum

5.5.1 *A school subject or a new way of thinking about knowledge*

The official curriculum in 1999 on innovation education gives mixed messages. Firstly it is introduced as a ‘subject’ but not quite. Time allocation is a symbol of a subject’s respect and power to influence learners (Goodson, 1997). The overall area of Information and Technology Education (ITE) has a special time allocation that is meant to cover the two of three ‘subjects’ of IT and IEE, and use of computers is to be woven into all learning (Ministry of Education, 1999b, p. 5). Design and crafts got a special time allocation but not IEE or the use of computers:

Innovation and the utilization of knowledge has a somewhat unique position within the subject areas. There is no dedicated time allocated to the subject, but rather the decision is up to school administrators, whether they use the aims to integrate the components of technology and innovation into other subjects.

Use of computers in compulsory school, a separate component, is also without dedicated time allocation in the subject area of ITE. Learning goals for information technology in each of the school subjects are introduced. The minimum teaching time in information and technology education refers only to *design and crafts* and *information education*. According to the reference timetable of the Ministry of Education a minimum of two instruction hours per week are to be allocated to subjects within the area. School administrators have the option of choosing to add lessons to specific subjects and components. (Ministry of Education, 1999b, p. 5)

The text on ‘innovation and the utilization of knowledge’ fluctuates between calling it a subject and a special method (bold letters are my accentuation):

Innovation and the utilization of knowledge is not allocated a separate time in the reference timetable of the Ministry of Education. The **subject** cuts across knowledge areas and should be integrated with one or more subjects. Innovation and the utilization of knowledge is a **special method** that schools can use to transform each subject into a vocational and technological subject. Thus innovation and the utilization of knowledge can provide good support for the objectives of other subjects by putting the content into a new context

and connecting it to learners' reality, creativity and playfulness. (Ministry of Education, 1999b, p. 31-32, bold letters my emphasis)

This flexible nature is also a characteristic of its varying classification; it is either a subject or a method and can be a support to objectives of other subjects. However this flexible nature depicted in the curriculum can be seen as the modern view of education, a holistic, integrating view that fits the needs of individuals in a constantly changing society, a view that is rationalized in the curriculum:

Modern economic life is increasingly built on knowledge and working with ideas. Its surroundings are continuously changing due to constant innovations in technology and knowledge. To be able to deal with this economic reality individuals must be able to adapt to innovations quickly, be able to spot opportunities in new knowledge, and must have the skills to utilize new knowledge and develop from it valuable products. (Ministry of Education, 1999b: 31)

As a new area or subject in the curriculum IEE was put into an already overcrowded school agenda although the curriculum suggests ways for schools to operationalize this new demand:

Presumably innovation and the utilization of knowledge can be integrated into school operations in three ways. First, it can be integrated with the allocated time of other subjects. Second, the school can utilize elective hours for the subject. Third, these two arrangements can be mixed. (Ministry of Education, 1999b, p. 32)

One more option has been offered to learners of IEE i.e. as a free choice course after school hours funded by the municipality (Jónsdóttir, 2004).

5.5.2 The regulative discourse of IEE in the official curriculum

According to Bernstein (2000) there is a moral discourse in education that creates order, relations and identity. It is a regulative discourse (RD) that indicates what sort of character, manner and conduct is appreciated according to the culture of an institution. The chapter on IEE in the curriculum of 1999 can be analysed for the RD of IEE. The RD detected in the IEE chapter in the curriculum indicates: that learners develop capability for action, become creative and innovative, are technologically and environmentally literate (analytical), entrepreneurial and responsible, can work independently and with others, are systematic and can think and act as complete persons using skills and knowledge from life

and school interactively. These characteristics require a certain manner and conduct that can be inferred from the RD messages.

Capable of action

Learners in the IEE and ITE chapter are depicted as confident, independent, systematic, creative, ethical, willing and capable of reacting and acting. The overall message of the chapter is that learners acquire a “can-do, will-do” attitude, an action capability. “It is important that learners acquire a view of being active doers in their environments” (Ministry of Education, 1999b, p. 8). The word ‘entrepreneurial’ might also describe this manner but it has negative connotations at least in Iceland because of the financial crash. However, a version of this capability is missing in IEE, to be able to react to your environment creatively and do something about it. It requires the confidence of the view ‘I can do it – and I will do it’. The competences to be developed in IEE form some of the building blocks of action capability and can be found in the other characteristics detected in the RD of the IEE curriculum.

Technologically and environmentally literate

A technologically and environmentally literate person is attentive to the environment and technology in order to understand their interaction and influences on each other, thus requiring the capability to be analytical. Identifying and analysing problems and developing appropriate solutions require and enhance analytical thinking and a systematic approach. Some of the aims specifically mention the analytical component such as: “can create and analyse main ideas that guide a work process” (Ministry of Education, 1999b, p. 35) and “have examined select examples from professional life and be able to analyse how they have changed ...” (Ministry of Education, 1999b, p. 41). The learners should think and act analytically, bridging their world of school, life and work.

The entire *Information and technology education* curriculum wants learners to become technologically literate; to understand and be able to use technology actively, as technology and work skills are tools to meet people’s needs in interaction with our environments (Ministry of Education, 1999b, p. 7). Technology is presented as “...people apply their imagination, creativity, knowledge and practical skills to tackle their environments in a deliberate manner” (Ministry of Education, 1999b, p. 7). Technological understanding is to be built on a holistic view that acknowledges how nature, society and culture are integrated in technological utilization (Ministry of Education, 1999b, p. 7). Two of the three core components in the IEE curriculum are: *information and technology literacy* and *individual, technology and environment* (Ministry of Education, 1999b, p. 33) showing the importance of the technologically literate character. Technology is seen as

closely related to creativity as technology is the result of creative reactions and interactions of man with the environment.

Creative and innovative character

The capacity to behave in a creative and innovative manner is what IEE wants most clearly. The Icelandic word ‘nýsköpun’ includes both the innovation and the creativity as it literally means ‘new-creation’. Creative skills are considered important as modern work life is increasingly built on knowledge and the skills to work with ideas, adapt to innovations, and spot opportunities and utilize them (Ministry of Education, 1999b, p. 31). Enhancing creative capacities through IEE can be understood as being about enhancing ‘possibility thinking’ (Craft, 2006) and innovativeness about developing chosen ideas that fit the opportunities and identified needs. Applying creativity is one part of becoming technologically literate: “Technology is created as we interact with our environment, because of situations we want to alter, influence or utilize” (Ministry of Education, 1999b, p. 7). IEE calls for learners to act in a manner that requires creativity and innovation, to be able to understand needs and problems and to be able to meet them or solve them, usually with some kind of technology, tangible or systematic. Learners are trained and have skills that see opportunities to make the world better by applying knowledge and creativity and making the results visible. It is the making of confident, creative and innovative people.

Systematic manner

The creative and innovative person developed in IEE is to be able to develop procedural knowledge and work systematically. “...the learner is trained in systematic methods to develop his or her ideas from the first glimpse of an idea to the finished product” (Ministry of Education, 1999b, p. 31). The learners are to acquire professional methods of ideation, and to know how to develop and get products manufactured (Ministry of Education, 1999b, p. 33). They can work through project plans, and act systematically according to a prepared organized plan such as a “...time plan and work description” (Ministry of Education, 1999b, p. 42). In every single component of the IEE curriculum there is an element of a technological process, a system or a plan to be incorporated. For example in the general aims for IEE under the component *Information and technological literacy* the learner is to know how to make use of: “work drawings, technological handbooks and instructions...” (Ministry of Education, 1999b, p. 35) and in the component *Idea, solution, product*, the learner is to be able to: “organize time, manpower and raw materials to achieve a set goal” (Ministry of Education, 1999b, p. 35), and “...be able to work according to a work schedule and project description” (Ministry of Education, 1999b, p. 39).

Entrepreneurial and responsible – ethical

The entrepreneurial manner of the IEE RD can be seen in IEE’s emphasis on ‘initiative’, in the introduction of the chapter (Ministry of Education, 1999b, p. 31) and in the final aims for year seven and year ten. The entrepreneurial ‘spirit’ wished for can be seen in the overall message of the ITE curriculum and the individual aims towards being able to participate actively in society. An entrepreneurial capacity, as in entrepreneurship, is to be gained as different skills and behaviour in business. By the end of year 10 learners should:

- be able to identify a target group for a product, service or a method
- realise the demand for and potential sales of a product/service/method
- be able to rationalize the value of a product for society
- ...
- be able to produce and distribute a fully made product (good, service or intellectual property)
- be able to advertise products and make plans for presenting them.

(Ministry of Education, 1999b, p. 43)

Alongside the call for entrepreneurship is a call for ethical behaviour in IEE. The purpose of activating learner ideas through using knowledge and skills to solve problems and create goods that make a difference is meant to strengthen an ethical sense and initiative through creative work (Ministry of Education, 1999b, p. 31). Learners practice developing solutions to take responsibility for their ideas. They learn about “...both the negative and positive influences of technological changes on society” (Ministry of Education, 1999b, p. 44). Their sense of ethics is also strengthened by the emphasis in IEE on the whole, on the connectedness of innovation, work life, the local society, society at large and the international conditions (Ministry of Education, 1999b, p. 31). The call is for entrepreneurial capacities guided by ethical conduct.

Works independently and with others

The aims and objectives refer to what each learner is supposed to be able to do such as “be able to work independently through the need-solution-product process” (Ministry of Education, 1999b, p. 41). The character of independence is nurtured, of being able to work independently, showing creativity, initiative and systematic ways of working as an individual, the characteristics of the confident and independent individual.

Although the discourse in IEE is aimed towards the individual and the person there is also an emphasis on developing collaborative skills. The conduct and manner of collaborative capabilities are also desirable. Several aims refer to the importance of being able to work

with others, such as: The learner “should be able to work in a project in a group where everyone has a specific role to play or a set task (role play)” and “have tried working in a group to collect data ...” (Ministry of Education, 1999b, p. 37). A whole section of aims for group skills and collaboration is introduced for the end of year 10, for example: “...show initiative in ideation work in a group and respect for others’ ideas” (Ministry of Education, 1999b, p. 38) and “...to be able to work in a group according to a plan where the whole class works in collaboration” (Ministry of Education, 1999b, p. 39) and “...be able to work independently in a group according to a delegated work plan ...” (Ministry of Education, 1999b, p. 42).

Complete person – school person and non-school person integrated

There is considerable emphasis on connecting learners’ lives with knowledge and skills practiced in IEE thus offering opportunities to be one and the same person in school and life rather than segregating the knowledge and skills applied in each arena, school and life. Learners are to be “able to discuss how products and or technology related to the area appear in his or her daily life” (Ministry of Education, 1999b, p. 37). The IEE curriculum emphasises connecting learner ideas and projects to real circumstances and to understand how the skills and knowledge of school learning emerges through work in society (Ministry of Education, 1999b, p. 31). Learners should understand the reciprocal connections between individuals, technology and the environment (Ministry of Education, 1999b, p. 34).

The character, conduct and manner that exemplify this complete person are to be creative, innovative, systematic, entrepreneurial and ethical, technologically literate, independent and collaborative and capable of all this in her or his own life, in school or any other life space. The whole person is one who is capable of action.

Evaluation – criteria of knowledge

The IEE curriculum offers criteria for evaluating learning that are presented as final goals giving a holistic picture of what learners should be able to do (Ministry of Education, 1999b, p. 5-6). The final goals explain the general purpose of learning and what learners in IEE should have acquired by the end year 10. An example of final goals is: “The learner – can identify needs, opportunities and potential in designing and producing an artefact, system or surroundings according to a main idea...” (Ministry of Education, 1999b, p. 35)

Three sets of aims are also introduced as the main benchmarks of learning for grades 1-4, 5-7 and 8-10. These aims are open to evaluation or measurement of the extent to which they have been attained (Ministry of Education, 1999b, p. 5-6). Evaluation in the form of

exams is not expected in IEE, as learning is usually project oriented, i.e. the learner makes something. The curriculum suggests that the teacher evaluates in the form of a checklist that is put together and shown to the learners before the project begins (Ministry of Education, 1999b, p. 34). Examples of aims for the end of year 10 are: “The learner is able to... show initiative in looking for needs or problems in his/her immediate environment. ... work independently and in a systematic manner through the process need-solution-product” (Ministry of Education, 1999b, p. 41). The benchmarks for evaluation fit well the RD of the chapter and seem to offer a practical support to teachers for the evaluation of what has been attained.

Although the criteria for evaluation are rooted in the regulative discourse they usually emerge as a part of the instructional discourse.

5.5.3 *Instructional discourse of IEE*

The curriculum explains what IEE is about and what it is supposed to achieve. It also provides guidance on how it is to be put into operation, not just on how it should be organised and located in schools' curricula, but also about micro interactions in the classroom. The instructional discourse (ID) is indicated by introducing the special role of the teacher in IEE that is to be a ‘guide’ or ‘a process manager’:

The role of the teacher is to be a kind of process manager and a guide in the solution and production process. He or she is not in the role of the one that knows all the answers but rather guides and navigates the way towards the solution, i.e. the teacher's role is to teach a certain methodology to develop an idea into reality. (Ministry of Education, 1999b, p. 32)

Other indicators of the ID are not directly presented in the curriculum but can be seen in the indirect messages that can be “read” out of various objectives, such as are presented in the intermediate objectives by the end of year 10:

- show initiative in looking for needs or problems in his or her immediate environment
- be able to work independently through the need-solution-product process. (Ministry of Education, 1999, p. 41)

This message is not an explicit message to teachers, as they need to realise from the objectives that in order to have gained such skills as showing initiative in looking for needs and be able to work independently, learners would need to have opportunities to develop initiative in the classroom tasks, requiring framing that encourages and supports their

agency and initiative. For example in the chapter about Learning and teaching: “It is important that learners acquire a view of being active doers in their environments (Ministry of Education, 1999b, p. 8).” Jóhann Ásmundsson said he wanted ITE to be the expressive form of the curriculum, to express the *what* but not the *how*, but my conclusion is that in the case of IEE the *how* direction needs to be clearly stated. However in the teaching materials available (Thorsteinsson & Gunnarsdottir, [1996]a,b,c,d) and in IEE courses for teachers, learners are to have agency (see later in this chapter)..

The meagre practice of IEE in Icelandic compulsory schools seems to indicate that schools generally choose not to offer IEE. The message that IEE was indeed to be offered in compulsory schools can be seen in several objectives of IEE presented in the curriculum in 1999, which highlight the ‘duty’ to offer innovation education. In the foreword of the curriculum the message is: “In the subject area of *information and technology education* there are three school subjects, design and crafts, innovation and utilization of knowledge and information education” (Ministry of Education, 1999b, p. 5). The chapter on IEE presents clear and quite detailed objectives as intermediate objectives for learners by the end of 4th grade and by the end of 7th grade and final objectives for learners by the end of 10th grade. There is a message about the choice of *how* to do IEE in the schools, not whether to do it, where schools and administrators can choose the form and organization of the training inherent in IEE.

The discourse in the curriculum seems to expect IEE and the use of computers to come into school work in a similar way, as neither has a time allocation and both are to be integrated into other subjects, but the decision of how and where they are to be fitted in is left to the school administrators. The use of computers in compulsory schools in Iceland is common although there is considerable difference in the quality of their equipment and conditions (Macdonald, Hjartarson, T., & Jóhannsdóttir, 2005) but IEE is generally not in their curricula (Macdonald, Hjartarson, Th., & Jóhannsdóttir 2005; Jónsdóttir, 2005). However according to Icelandic research the use of computers and information technology has not been applied as the transformative tool in education that the curriculum and policy intended (Macdonald, Hjartarson, T., & Jóhannsdóttir, 2005).

5.6 Recontextualising the official discourse

5.6.1 Textbooks and teaching materials for IEE

Teachers in Iceland tend to use textbooks and teaching materials to organize their teaching (Karlsson, 2007; Sigurgeirsson, 1992). The textbook and covering certain pages in the

textbook are for many teachers the “real curriculum”. On the other hand good quality teaching materials can be an excellent support for teachers and learners and if so used they can guide and be constructive without being controlling.

For many years the state funded National Centre for Educational Materials (NCEM) (í Námsgagnastofnun) had a monopoly on school materials and published the majority of teaching materials used in compulsory school in close accordance with the national curriculum guidelines. In the case of IEE the pioneers developed teaching materials in collaboration with teachers in a compulsory school in Reykjavík and published them in 1996 on their own as the NCEM did not want to publish them because IEE was not yet in the official curriculum. It was only in 2010 that the NCEM published for the first time teaching materials to help teachers and learners engage in IEE.

The IEE teaching materials that were developed in the 1990s started to develop through the collaboration of a teacher Guðrún Þórsdóttir (1951-2010), engineer Paul Jóhannsson, inventor Bragi Guðmundsson (1930-2002) and crafts teacher Gísli Thorsteinsson. They started their experiments in IEE teaching and the foundation for the teaching materials was a week long summer camp for children interested in inventing, held in a small compulsory school at Ketilsstaðir with the collaboration of the principal and teacher Kolbrún Hjörleifsdóttir (also in Chapter 8). Gísli Thorsteinsson and physics teacher Rósa Gunnarsdóttir (also in Chapter 8) at Foldaskóli carried on with developing the teaching materials and published them in four folders under the name of *Innovation and Science* (Jónsdóttir, 2005). These teaching materials were the only teaching materials in IEE in Iceland since they were published in 1996 and have been used in courses for in-service teachers held by the pioneers.

The teaching materials *Innovation and Science* (IS) (Gunnarsdóttir & Thorsteinsson, [1996]a) are not in the form of a traditional textbook that is given to the learner. They were presented in loose-leaf folders with a combination of teaching instructions, explanations of ideology and concepts, potential hindrances and supportive materials, materials for photocopying for learners and ideas for evaluation of learner work in IEE. The teaching instructions guided teachers as to how to arrange the lessons, how to prepare, what materials were needed and the process of each lesson and a potential plan with a defined end covering around 10-12 weeks depending on the length of lessons. The lesson instructions for teachers were that they should unfold in different forms, sometimes starting with a short introduction by teacher and discussions with learners and active input from them, learners discussing in small groups, learners working on projects individually or in small groups and every now and then brainstorming in the whole group. One tip in the materials was to arrange IEE lessons as small group lessons (10-12 learners) and do

that in collaboration with the class teacher to be able to divide the class, as many of the tasks are developing ideas that require one on one conversation between teacher and learner and about making their ideas into tangible materials.

Much of the advice for the teachers in the IS materials is about how the teacher is to approach his or her teaching in IEE. It has quite a clear message about the instructional discourse, for example in the chapter “Keys” where teachers are advised to approach learners’ idea development with great care, that all ideas are valid, to use positive constructive criticism and to view the learner’s idea and the learner as one and the same (Thorsteinsson & Gunnarsdóttir, [1996]a). Further indication of a weak instructional discourse is elaborated in the same chapter with advice and explanations for teachers such as about:

To find technological solutions

The role of the teacher or the teacher’s aid is mainly to support the learner in developing his or her ideas and find technological solutions that get them to work.

...

The right to self-determination

It is not the role of the teacher to dominate the creative process; he or she must respect the right of the learner to take his or her decisions even if the teacher knows that the learner is on the wrong path. The learner must be allowed to take his or her own routes, make mistakes and thus develop his or her sense of judgement and appreciate that mistakes are usually a way to develop the idea further. (Thorsteinsson & Gunnarsdóttir, [1996]a, Chapter 9)

The whole set of materials (four folders) emphasises the role of the learner to be active, that he or she is listened to, that learners make/build their ideas and introduce them and that they take part in evaluating their own work. They emphasise both elements, *innovation*, having ideas and developing them, and *entrepreneurship* with an emphasis on making things, carrying out their ideas preferably in connection with the world outside the school.

The IS materials (Thorsteinsson & Gunnarsdóttir, [1996]a, b, c and d) introduce innovation education as a school subject: “Innovation is a new school subject that has been emerging in the last years” (Thorsteinsson & Gunnarsdóttir, [1996]a, p. 1). The introduction indicates an optimistic tone on behalf of the situation of IEE as it says that it has “... managed to become permanent in the electives of nine to twelve year old learners”

(Thorsteinsson & Gunnarsdóttir, [1996]a p. 1). This did not happen however as IEE is not permanent nor generally offered as an elective or obligatory subject for Icelandic compulsory school learners (Jónsdóttir, 2006a). What did become true was that IEE was introduced in the curriculum in 1999 and thus became part of the official pedagogic discourse.

5.6.2 Courses on IEE for in-service teachers and student teachers

Courses for in-service teachers in IEE were offered sporadically after the introduction in the curriculum in 1999 (Jónsdóttir, 2005). Teacher education for learners in the Icelandic University of Education did not include IEE although some elements were to be found in the education of teachers in design and technology (Jónsdóttir, 2005). A group of people interested in enhancing and supporting IEE established an association of teachers at all school levels in 2005 called Félag íslenskra kennara í nýsköpunar- og frumkvöðlamennt (FÍKNF) (e. The Association of Icelandic Teachers in Innovation and Entrepreneurial Education) (FÍKNF, 2006). The FÍKNF association has been the main provider of in-service courses for teachers since its foundation offering two to six courses a year at different locations around Iceland. These courses have mostly been funded by the Teachers' Union In-Service Fund or the governmental fund for courses, usually initiated and organized by FÍKNF offered for compulsory school teachers and upper-secondary school teachers (FÍKNF, 2006; Jónsdóttir, 2008a). These courses have been organized and taught by me and my colleagues. The discussion in the following sections is based on course materials from teacher courses some of which were designed by myself.

Typically IEE in-service courses have been one or two-day courses introducing the main elements of IEE and offering a blend of theoretical and practical knowledge. The courses are often focused around one main theme or issue, such as the use of specific design programs, technology, science, environmental literacy, ESD or 'local pride' (Jónsdóttir & Didriksen, 2009). Three IEE courses that most of the teachers teaching IEE in City School, the one in Country School and all IEE teachers in Trio School attended were analysed for their structure and content.

The courses had the main goals of introducing the basic elements of IEE and that teachers should become capable of creating conditions in their schools for teaching IEE. They aim to spark teachers' interest through applying the pedagogy of IEE. The teachers "learn by doing" as they try out the main pillars of IEE such as looking for needs, using the note book, developing ideas and publication (drawing, explaining, introducing). The courses link directly with teachers' surroundings and conditions both through using the IEE

process identifying needs and working out how teachers can choose feasible routes to implement IEE in their own schools.

It is suggested in the course description that IEE can strengthen schoolwork to fulfil aims such as:

- learners can utilise knowledge from subjects and life in a meaningful way and have a purpose to seek further knowledge
- subjects and various other knowledge, from life and work life are rationally integrated and comes naturally
- real life projects reflect and connect to the local society
- the link between creativity and everyday life is strengthened
- versatile ways of learning are offered
- technological, environmental and societal literacy is enhanced.

The courses also provide information on where teachers can get support, the IEE association, available teaching materials and useful web sites such as the one about the innovation competition for compulsory schools.

Weak classification of IEE in the courses

IEE is introduced in the courses as interdisciplinary and integrative and having different forms and emergences in practice. Using IEE enables crossing boundaries of subjects and boundaries of school and society. The courses introduce different forms of doing IEE in practice depicting its flexible nature. The courses suggest that IEE can be found in school practices such as:

- a theme
- a course
- formal lessons in IEE built on the teaching materials
- integration of subjects (for example science and crafts)
- projects in science lessons
- web/internet based projects
- taking part in the innovation contest
- a basic part of the school curriculum.

IEE is also introduced as a tool or an approach that can be used within a subject. Its boundaries are open as it builds on everyday experiences where anyone's knowledge is applicable as material for creativity and innovation. IEE can contextualise subjects in learners surroundings and takes its content from there. The teacher is expected to be the

catalyst in connecting the school activities with the life outside schools, learners' lives, parents and work life.

Creative, inventive, analytical and entrepreneurial

The regulative discourse of IEE introduced in teacher courses describes learners as being creative and inventive and having the potential of becoming active doers in their lives, their society and in the world. The learners that go through IEE will be prepared to tackle life and have experienced their own strength and know what they are capable of achieving. Learners are to take on the identity of the inventor, to think and work like they do. Inventors scrutinize their environments and identify and analyse needs and problems and are skilled in coming up with ideas to solve and meet those. Finding and analysing needs requires attentiveness and analytical thinking. Creativity is a wealth that is underused and needs to be utilized more than has been done before. In bringing creativity and everyday life together learners who think they are not creative experience that they can be creative and inventive. A certain sense of happiness is expected to emerge through using creativity and versatile learning routes in IEE which cultivates characteristics that fulfil need for creative and happy citizens:

In Iceland we certainly need creative individuals to find new ways to create jobs or to solve other problems. If we think globally we also need creative and happy individuals. (Teacher's PPT, notes)

The learners are to be independent, attentive, creative, inventive and entrepreneurial or 'action competent'. Their competence for action is to be strengthened by letting them use their creativity and initiative to tackle real needs and problems and actualize their solutions and thus they exercise their entrepreneurial skills. Learners are to become capable of creating new ideas, inventions and designs and be able to develop them into valuable products. To see the impact learners can make on the world with their knowledge, creativity and experience, they are to practice introducing their ideas to the world in different ways. The RD of the courses acknowledges that versatile characteristics are valuable as various ways of learning allow diverse learners with different capabilities to "blossom".

Technologically and environmentally literate

The learners become technologically literate by inventing and developing technology that makes life easier, more fun or enjoyable. They are also expected to enhance their sensitivity and understanding of the environment, man-made, natural and social, as they are trained to notice and critically analyse their surroundings in order to improve them one

way or the other. A part of ‘environmental-social literacy’ is having an understanding and experience of work life through establishing their own enterprise and producing valuable goods that respond to identified needs.

The instructional discourse of teacher courses

The instructional discourse is emphasized in the teacher courses. One of the main emphases of the courses is for the teachers to understand that they have a different role than the traditional role of the transmitter to relatively passive receivers. The new role is introduced as the role of the flexible teacher where he/she is meant to organise IEE activities that offer learners opportunities to learn on their own premises. It is an ID of weak framing as the learners are expected to be autonomous and have some freedom. The learner is considered the expert in his/her own ideas and learner and teacher are partially equals. There are no right or wrong answers and it is even allowed to say ridiculous and funny things. The teacher is to guide and support. He/she is not to sit in the “judge’s seat” but must respect the learners’ ideas, give constructive criticism and see potentials rather than limitations and faults. The teacher must control the pace so that ideas have time to “ferment”. He/she must help to spark ideas, offer freedom and flexibility and minimize criticism in the ideation process. The teacher is also expected to be a catalyst for connecting activities to homes, parents, work life and other school activities (weakening classification of roles).

5.7 Summary

In this chapter I demonstrated how ‘innovation’ in official discourses is presented as something positive depicting a belief that innovation can enhance economy. In the policy of the Minister of Education IEE is presented as a subject that enhances initiative and innovation. Innovation is introduced as a subject area within the curriculum of Information and Technology Education. The chapter in the curriculum was called *Innovation and the practical use of knowledge*, which is partially descriptive of what it entails but it was not generally thought of as a subject area or a special task at that time. The name it was given may have played a role in that it was not widely understood or offered in schools (Jónsdóttir, 2005). It does not have the connotation of a school subject. Other factors were influential also and it is clear that other countries also have struggled with finding a name that fits the task, as described in the literature review on enterprise, technology and design and technology education.

Having shown what sort of attitudes towards innovation can be seen in the official discourse, how they reappear as a curriculum discourse with messages for the schools, I turn to the main undertaking in this thesis of looking for examples of where and how these discourses emerge when they have been relocated in the practice of schools. As I presented in Chapter 2 ‘Innovation’ was presented in the curriculum in 1999 as ‘innovation and the practical use of knowledge’ as a weakly classified phenomenon that builds on the view that “things must be brought together” (Bernstein, 2000, p. 11). It was put into a curriculum and a system that builds on strong classification where “things must be kept apart” (Bernstein, 2000, p. 11). This can result in contradictions and conflicts. However if as Bernstein (2000, p. 9) pointed out “...every time a discourse moves there is space for ideology to play” there should also be a space for the ‘unthinkable’ for the ‘possibility of the other’ (Bernstein, 2000, p. 7), for something new. What awaits any discourse when being relocated in a school setting is a reality with its own nature that consists of rules embedded in language and traditions, principles that Bernstein identified as the pedagogic device through which knowledge is appropriated and pedagogised. I will now be moving on from the intended curriculum described above to the relocation in realities in schools. How these discourses are located as innovation education in school practice will be traced empirically with the help of the research questions and theories.

CHAPTER 6: IEE in an urban school: stimulating creativity

6.1 The case of City School

In this chapter I introduce my findings of how IEE was offered in my main case, City School, a compulsory school with children from the age of six to sixteen (1st-10th grade). It was chosen as it was one of few compulsory schools in Iceland offering IEE as part of the school timetable. The teachers and administrators were willing to participate in the research. The school was established in 2001, is located in Reykjavík, the capital of Iceland and is considered a progressive school organized around an open school policy with an emphasis on individual learning, cooperation and teamwork, mixed age groups, arts and crafts and thematic project work.

I wish to examine innovation education in Icelandic schools to find out what kind of support is necessary and useful to enhance IEE in school practice. As City School was beginning to work with IEE for the first time in the autumn of 2006 I found it a good opportunity to follow the development in IEE for one school year and as a specialist to support teachers in any way I could. I was excited and honoured to have the opportunity to work with this new school as it was gaining a reputation of being innovative and different from traditional schools.

6.1.1 *School background*

The school started in mobile housing classrooms in 2001 but moved into a new and elegant building in 2005 (Figure 6.1) designed in a process led by architect Bruce Jilk, who designed the basic concepts of the building, and Icelandic architect Sigurður Björgúlfsson, who finalised the design in collaboration with the school staff. The school was designed through consultation with its users, learners, teachers and the wider community through the ‘design down process’ (Burke & Grosvenor, 2008). According to the ‘design down process’, working from the general towards the special, a group of people from various stakeholders in the community worked with the school’s architect to develop a building in harmony with the chosen school policy (Friðriksdóttir, Sturlaugsdóttir, Gautadóttir, & Hlöðversdóttir, 2004). The design is meant to support many different possible uses of space that emerge over time (Friðriksdóttir et al.). The work of the school is planned around an individualized curriculum with an emphasis on flexible instruction, integration

of year groups and subjects and teacher teamwork. Theme work and practical subjects (home economics, arts, design and crafts, textiles) are emphasized in the curriculum



Figure 6.1 City School in Reykjavík

The policy and pedagogy of the school is aligned with general school policy in the Reykjavík Community that aims at meeting the needs of learners and society in the 21st century (Óskarsdóttir, 2001). The main characteristics of the ‘modern school’ according to this policy are flexibility in teaching methods, use of information and materials, flexibility in use of space, organization of work and between school levels (Óskarsdóttir, 2001). City School has been the ‘flagship’ of individualized learning and open organization in Icelandic compulsory schooling and as such receives many visits from teacher learners, teachers and administrators in other schools.

Innovation education invites weak classification, that is, it crosses subject lines, and it utilizes many kinds of knowledge (i.e. Icelandic, crafts/woodwork, mathematics, business, arts, technology and information and communication technology) in a practical way. Innovation education often requires variable work time, as the flow of ideation in the creative process does not always suit a clear cut 40 minute lesson structure (Jónsdóttir, 2005). City School therefore seemed an ideal candidate for studying innovation education

with its open physical and curriculum structure. Learners in City School were encouraged to work independently and autonomous work is one of the characteristics of IEE.

From my first visit I was impressed by the striking architecture of City School and the elegance and clever use of forms and spaces. Secondly I was struck by the intricate and careful organization of time, groupings and related arrangements. The emphasis on practical subjects was reflected in the connectedness of spaces. The school has no traditional classrooms but large shared teaching and learning areas where a cohort of two grades are arranged in different groups (Burke & Grosvenor, 2008). City School was built according to a policy and pedagogy emphasizing learning and learners as main focus, making the school a ‘learning community’ where quality and effectiveness depend on the school community forming an integrative whole (Óskarsdóttir, 2001). This policy requires teachers willing to work with this kind of pedagogy.

There are wide, open areas for large mixed age groups of learners working under the supervision of teacher teams creating versatile environments. Learners work at diverse projects independently or in groups (Óskarsdóttir, 2001). The flexibility of the policy is reflected in the architecture and its forms and arrangements such as the curving forms of the walls of the hallways (

Figure 6.2) and large open spaces (Figure 6.3).



Figure 6.2 City School hallway

6.1.2 Research participants in City School

Three of four teachers working with IEE in the school year 2006-2007 in City School had taken part in a course on innovation education in the summer of 2006 taught by a colleague and myself. In the autumn of 2006 I contacted the IEE lead teacher, who also was a department head of arts and crafts, to ask for their collaboration and participation in my research. This was arranged with the support of the principal and agreement with the other IEE teachers. The agreement included observations of IEE, other lessons and school life, individual and group interviews with teachers, principal and learners as well as my guidance and support as a specialist in the field. My first field visit to City School was in mid-September 2006 and I visited regularly during 2006-2007 returning in December 2007. The teachers that I worked with were Runa the IEE leader and a skilled textile and arts teacher, Bryndis and Asa arts teachers and Heidi an art instructor. In December 2007 I interviewed Runa again with Gudrun a designer and teacher that had started working with IEE.

In this chapter I describe the pedagogic discourse of IEE and how tradition, even in a new school, regulates innovation in school activities. As the learner is expected to have a lot to say about content and pacing and ideally is considered to be a specialist in his/her idea then framing in IEE is weak. This research offers opportunities to analyse in more detail framing in IEE practice. The next section includes the principal's views and perspective, and a description of the contents and characteristics of IEE in City School, teasing out signs of framing and classification to trace the regulative and instructional discourses. The location of IEE in the school curriculum resulting from the RD and the ID is then described. I also discuss teacher rationale for IEE and the role teachers engage in and the demands they face. Learner voice is given some space and finally a condensed view of the educational ecology of IEE in City School is presented.

An excerpt from my first field notes visiting City School sets the scene:

The rain was pouring down as I drove towards City School along the long and winding road up the hill through the newly built district in the outskirts of Reykjavík on the morning of September 14th 2006. I drove past a group of huge rusty-coloured water tanks as I entered the school grounds. The school has a modern look and is painted in greyish tones with dark brown window posts and doors. There is a large pavement between the play area and the school building and vegetation has been planted that is still very young and is just starting to show.

I walked into a small corridor with big glass doors and from there I walked straight into a large hall with a high ceiling and an overview of the teachers'

lounge on the left, a canteen straight ahead, windows on the left showing the gymnasium, ahead towards the right two floors with curving walls alongside the corridors, a large area on the right with lots of tables and chairs looking like a canteen and a continuous open area further along, containing a library with shelves, books and flowers and an area further back in the same space that I could not identify. It was a bit like walking into an immensely large cave as the ceiling high above was black or very dark and curved as the form of the roof seen from outside portrays. (Figure 6.1 and Figure 6.3)



Figure 6.3 City School canteen-library-hall

6.2 Organisational management and leadership

Before visiting the school I had heard people mention that schools like it were disorganized and chaotic but as I got to know the school I saw that activities were actually carefully planned. I had expected the openness of the space and activities but not the intricate organization that I saw repeatedly. I also saw the necessity for such careful arrangements as diverse groups, multiple goals to achieve, limited time, and flexibility were calling for even more or at least different organization than when you have typical subjects arranged in 40-45 minutes lessons and same age cohorts. The learning periods were arranged as 50, 75 or 110-minute slots with breaks for refreshments, lunch and free periods outside. Arranging learners into large or small groups, with different distributions of teaching staff, required careful planning.

One of the obligatory subjects in compulsory schools in Iceland is ‘crafts’ (typically woodwork) but City School was not successful in securing a certified crafts teacher partially because the school wanted a teacher that adhered to their integration policy rather than focusing strictly on crafts.

6.2.1 The principal’s view

Linda the school principal has considerable teaching and administrator experience. She graduated as a teacher in 1990 teaching first in the countryside and later in Reykjavík. She has been a principal since 1997 in the countryside and in Reykjavík and knows different kinds of schools (Ci20Ip, 3). She took part in preparing and developing City School and was the principal from the start in 2001.

Linda has a clear vision of a school policy in which individualized learning, collaboration, working in themes and an emphasis on the ‘arts subjects’ are guiding principles. She is open in her administration and thinks that the staff should decide on how things are best organized: “I have no 100% ideas about how things are best done, that’s one of the things we have to figure out together.” She supports access to the school welcoming visitors from teacher education, both student teachers and researchers, and other schools, as well as collaborating with other compulsory schools and upper secondary schools and specialists in education. Thus she weakens the classification of the school opening it up for interaction.

Allowing for flexibility and individual agency and seeking to fulfil the requirements of the official curriculum and expectations of learners, parents and staff needs careful planning. The loosening up of the timetable and age groups gave more space for individual pace and coverage of learning. Linda acknowledges the need for thorough organization and is also focused on what ends it should serve:

It is just like in any other teaching, you need careful planning, and you just have to know where you are going and how you are going to get there. Having a clear plan has helped us in fitting things together, we are aware that it must at the same time not restrict or limit us. We need planning to secure that we are teaching, what we are meant to be teaching and covering what we want to cover. (Ci20Ip, 3)

Linda wants all materials they have developed in the school to be available to others and puts as much as possible on the Internet. She also wants information for parents to be available from the Internet as that is more accessible and readable than “thick tomes” that don’t work well (Ci20Ip, 10). These actions can be seen as weakening the insulation between school and home, and between school and daily life.

6.2.2 *Control and stabilisation*

A part of the support Linda gives the arts subjects is that she introduced the post of ‘head of arts subjects’ that is not usual in compulsory schools. Linda trusts Runa the lead teacher of IEE, accepts her recommendations and relies on her professionalism in her practice: “Runa has a broad view on how the arts can be taught in versatile ways. She is open and positive and she more and less administers this area, I can completely trust her and rely on her” (Ci20Ip, 6). Linda finds it important that learners “... find their own needs and create something entirely from the beginning” (Ci20Ip, 6).

According to Linda the next priority in the development of the school is stabilization, to focus on the good things they are doing, do them well and allow things to ‘settle’:

We need to slow down a bit in all this developmental work but still be constantly working on development, that’s just the nature of the job. We have to focus on practical things, things have started to settle in the younger classes and we need to do the same for the older classes. We are going to keep at developing the evaluation and assessment procedures. We have to finalize them. There is a huge amount of things we have accomplished; we need to make them visible to ourselves and to others. (Ci20Ip, 9)

The constant developmental work in the school is necessary but a period of stabilizing would be useful. Linda mentions that even though teachers in the school generally are enthusiastic and committed, some have quit for less hectic jobs and more pay. She says that the terms of a teacher’s general contract is restrictive, not allowing the school to enjoy the flexibility needed in developmental work. Other recent Icelandic research points to these restrictions that hinder innovations and developmental work in Icelandic schools (Viktorsdóttir, 2011; Ágústsdóttir, 2011).

6.3 **Characteristics of IEE lessons**

In IEE courses and teaching materials certain attributes, activities, attitudes and approaches are emphasized. Many of these were visible or expressed in City School though in different degrees.

6.3.1 *Learning the inventor’s ways of working and thinking*

Certain basics are considered necessary in order to practice and adopt the inventor’s ways of working and thinking. These include looking for needs, analysing and looking for

solutions, using the ‘small notebook’, brainstorming, making models and prototypes and experimenting.

These basics were all covered in the City School lessons though this was not practiced over and over again like when you are teaching to read or write. The use of the notebook was introduced to learners but the teachers said it did not go smoothly and soon seemed to be given up as a regular part of the training. In a group interview Runa said: “In the end I completely stopped thinking about using those small notebooks” (Ci26It4, 26). An active use of the notebook is considered to be a basic attribute of the inventor’s way of working and in IEE it should link the school activities to the world of the learners, including their life outside school as well as to their unconsciousness.

The learners were offered the opportunity to make models of their inventions or designs. They got to choose what kind of materials they would use for their models, paper, cardboard, clay or styrofoam (cut in a special heater) and most chose the styrofoam and the cutter. The learners usually loved the part when they got to make things and so making the models was the most popular part of the lessons, mentioned in learner and teacher interviews and was obvious in observations.

When learners are developing their ideas I have seen that they often hesitate to introduce solutions that initially may seem to be unusual or odd, as they seem to experience their ideas as a part of themselves and therefore reactions to their ideas are taken as reactions to their person (Jónsdóttir, 2006a). Those who criticize ideas and point out their faults and limitations are considered to be playing the role of the devil’s advocate (Kelley & Littman, 2005) similar to what Edward de Bono calls using the ‘black hat’⁴ (De Bono, 1971; 1987). Bringing in criticism at an early stage of idea development can be destructive. This is emphasized in training courses for teachers and they are urged to ‘listen to’ their own reactions. The ‘devil’s advocate’ would appear every now and then in the way teachers

⁴ De Bono is well known for his strategies to enhance creativity and thinking. His idea to put on six different thinking hats where the colours of the hats represent a certain attitude or standpoint of the person wearing it, is well known and has been widely used in business settings and in education. The six hats and the ‘mood’ or ‘attitude’ that comes along with them are: A green hat: a wealth of creative ideas, white: neutrality, objectivity, looking for facts; red: feelings and emotions; yellow: positive focus; blue: defines, the big picture; the black hat: points out negatives, is cautious (De Bono, 1987).

reacted to learner suggestions and ideas but more so in learner reactions to each other's ideas and in judging their own ideas. The teacher asked a girl in class what she would call her idea and on answering 'Pet-shop-table' a group of boys laughed (Ci17o, 2). Often learners would react to other learner ideas with comments like: "We don't need the shoes that melt snow because we already have 'ice crampons' " (Ci14o, 5). A teacher's 'black hat would be more subtle, where the tone used in asking a girl about her idea "Oh you want to do it like that?" would indicate doubt by a stress on 'that' (Ci17o, 4).

6.3.2 *Structure versus freedom and flexibility*

The teachers arranged the lessons with a structure that allowed learners some freedom to control their work. In the first phase, the teacher introduced the intended work for the lesson, sometimes explaining concepts or encouraging ideas by brainstorming. In the second phase the learners would work on tasks set by the teacher, or work on their own ideas, and the third phase would be clearing up and standing by their chairs at the end of the lesson. Throughout the lesson learners worked and interacted with the teacher and each other under the control of the teacher or apparently their own control. Within this structure the teachers showed different strengths of framing and consequently offered different degrees of freedom for learner work.

One of the most important attributes of IEE is that learners have freedom and agency to decide, develop and make their ideas real. The teachers in City School often displayed this approach by being supporting rather than controlling although the tendency to control learner work and behaviour emerged at times. One teacher exerted more control than the other three. This teacher would say: "Now I want you to make folders for the paperwork you have done. You are to make it by folding this paper together and stapling it here and here..." (Ci17o, 2). The teacher was both choosing the solution to the problem of disarranged paper and the method and appearance.

The flexibility that the teachers allowed learners was more limited in the initial round of lessons than later on where I saw more flexibility and freedom for the learners. Runa and Bryndis were generally more at ease than Heidi and seemed to balance tensions between freedom and chaos well, especially the second time around, where I observed them allowing learners more freedom in designing according to their own interest than with the first groups. Runa confirmed this in the group interview (Ci26It4, 27).

Creativity is at the core of innovation education, using knowledge and creativity in solving problems and actualizing those ideas in the world. The teachers all expressed the view that creativity was important in IEE and in school work in general. They wanted teaching subjects and projects that included creativity in their work and the work of learners.

Creativity on a personal level was frequently witnessed in IEE lessons with learners often deeply immersed in their work almost as if in a state of 'flow' (Csikszentmihalyi, 1996) (Figure 6.4 and 6.5). These episodes, when learners were active and engaged, were described by the teachers as a 'good working spirit' (Ci13o, 9). The teachers considered such episodes, sometimes covering whole lessons, as successful and enjoyable. In one such lesson when everyone was immersed in work Runa described another example from a class in IEE she had recently taught:

They started by looking for needs, analysing them and working on solutions. They began to throw ideas between themselves and one started working on a solution and that gave the next one an idea and so on. The working spirit was so good; they often needed assistance from me but they also reached for help from each other and gave it. (Ci13o, 9)



When learners got going in making their ideas into tangible objects I often saw them deeply immersed and focused as in a state of flow.

Figure 6.4 A. Immersion (Ci13o, 22) and B. Construction (Ci11o,12)

Every now and then I witnessed such an atmosphere of learner engagement in the IEE lessons (Figure 6.5 A and 6.5 B) and although it seemed most common when the learners were active in making tangible things (Figure 6.6 and 6.7), they were also often immersed in paper work of some kind, drawing, writing or cutting out forms (Figure 6.5 and 6.8).



Learners were often actively engaged in their projects that sometimes were their own designs and sometimes framed by the teaching materials such as the making of the 3D cube and 3D drawing.

Figure 6.5 A. Engagement (Ci13o, 4) and B. Everyone active – working on 3D objects (Ci9o, 16)



Figure 6.6 Making tangible things (Ci13o, 29)



Figure 6.7 Activity in paper work (Ci7o, 1)

Often episodes in which learners were deeply engaged would be when they were working doing different things such as in the lesson shortly before Christmas break where they had designed a car that they were making (Figure 6.8 A). Everyone was active (Figure 6.8 B), some were sawing, some gluing, others sandpapering or refining drawings and I heard sawing and rasping sounds, metal rattling and low chatter. The learners were making their own ideas tangible and were immersed in their work. It seemed that they were constructing their identities along the way as they constructed their ideas as real things, experiencing directly how they change the world.



In this lesson the learners were learning about technology and they had each designed their own car and were starting to make it in tangible materials.

The learners could work at their own pace and were at different stages doing different things in this moment. The teacher moved between the learners and helped when needed.

The atmosphere was 'buzzing' with activity, sounds of sawing and rasping, metal rattling and low chatter could be heard.

Figure 6.8 A. Making real things (Ci11o, 13) B. Different stages of making the car (Ci11o, 8)

6.3.3 Possibility thinking and the creative conversation

A major aim in IEE is enhancing creativity and at the core of creativity is 'possibility thinking' (Chappell, Craft, Burnard, & Cremin, 2008; Craft, 2006), which is a concept that can be used to describe one of the competences IEE is striving to enhance. Although all the teachers acknowledged the importance of creativity and gave learners the opportunity for creativity they did not always succeed in keeping the openness that enhances possibility thinking.

Three of the four teachers showed more openness to learner ideas and suggestions and they were also more flexible in their framing i.e. control of pace, choice of materials, location of work and criteria of what is a valuable idea. When discussing with a boy that had designed a toy Runa asked open questions like: "How do you want to use it?" (Ci15o, 4) and when he had described it further she asked: "Can you do anything else with it?" thus opening up further possibility thinking. In the same lesson Runa let the learners decide which materials, choosing from a range of materials, they wanted to use to make models of their designs and also what to design within the frame of 'design a toy'. The time they had to deliver an idea that was somewhat flexible, giving the task a mixed though mainly weak frame (choice of materials F -, design F +, pace F -) thus giving learners agency.

One of the elements mentioned by the City School teachers and that I recall from my own IEE teaching is the notion of a ‘chat’, a relaxed conversation between learners and teacher where the teacher is on a similar level as the learners. These conversations could be about the learners’ inventions, about the needs behind solutions, about influences of inventions on environment or about how to realise an idea.



Runa often engaged in relaxed conversations with the learners either by their initiation or hers. Sometimes these dialogues were between her and the group or between one learner or two and her.

Figure 6.9 A. Relaxed conversations (Ci70, 1) and B. The creative chat (Ci130, 2)

The characteristics of these conversations were that they would occur in an interaction of equality, trust, a relaxed atmosphere and a flow-like experience. Bryndis describes the qualities of such an episode:

The easiest part of teaching IEE are these discussions that often develop in lessons, interesting reflections about how all things connect, looking and analysing your environment, pondering how things are related, why this artefact was invented and so on. (Ci14IB, 14)

I saw these stress-free conversations between teacher and a group of learners (Figure 6.10 A.), teacher and one or two learners (Figure 6.10 B) or sometimes among learners alone. I propose to call this kind of developmental tool, the ‘creative chat’ indicating its relaxedness. Chappell and Craft (2009) and Chappell, Rolfe, Craft and Jobbins (2011) have identified a similar concept in their research on creativity in education in England that they call the ‘creative learning conversations’ although their concept is more comprehensive and the ‘chat’ may be one aspect of ‘creative learning conversations’.

6.3.4 Promoting learner engagement

One of the features of IEE is that the tasks often need activities and knowledge outside school through looking at needs or problems that learners identify in their lives and wish to solve. They gain ideas and knowledge by visiting places, factories or operations of daily life. The IEE teachers in City School introduced the search for needs or problems and asked the learners to find some needs from their own lives to talk about in classes. The teachers felt that the learners were slow in ‘delivering needs’ from home and that connection to their own lives was not strong in the lessons, maybe because they were not used to this kind of work and shy about exposing their personal lives. Bryndis said: “They were very active in finding needs in lessons but when it came to their homes they were just ‘blanco’ they didn’t know a thing” (Ci23ItB, 7). Asa said that it was easier if the needs were related to issues less personal than their homes:

The connection to learners’ lives in IEE was mainly through finding needs and thinking about the environment. It differed a lot between learners whether they brought needs from home but sometimes if one started then the ball would start rolling. (Ci24ItA, 4)

One of the projects in IEE was about making name tags with materials of choice and it turned out to be a source of great interest and active participation. Asa said it surprised her that the learners enjoyed this name tag project so much:

Of course it is so personal your own name. I was surprised how many different versions of name tags the learners created. They were endlessly pondering about possibilities. We [the teachers] thought at first ‘ok, just a name tag no big deal’ but it is a big deal for them. (Ci26It4, 15)

The name tag project can be seen as one of mixed towards weak framing with the selection of task as F+ (strong), the choice of materials F – (weak) and with F – (weak) of pacing.

Bryndis often tried to link to learner interests when they were developing inventions or designs. In one lesson Bryndis told the learners that the task was to design a new toy, or change an existing toy, that could be intended for younger children or teenagers or even for animals. A snapshot from my field notes shows how she supports learner agency and links to a learner’s interests in the creative process:

Some of the learners (ten in all) start sketching on their papers, two girls chat together in a low voice, one boy seems to be thinking and another yawns. Bryndis walks between the learners and looks at their drawings. One boy is in doubt about his design and Bryndis suggests: ‘Which book do you like? Think about it’. (Ci19o, 4)

Although one teacher would mainly stick to the rules she set out with in lessons, she once grabbed an opportunity to connect IEE lessons to learners' lives and interests when she was substituting for another teacher. In this lesson a learners came to her with graffiti designs on paper. She allowed the learners to continue developing their ideas and impressed them with using the correct terms she had learned from her son (Ci26It4, 37). She had deployed very weak framing (F - -) of choice of tasks which was unusual in her framing repertoire. Maybe she was more secure in this area and thus able to allow more freedom than in other unfamiliar tasks.

There was also a connection with work life outside the school in IEE in City School. Runa organized trips to visit different locations, an energy knowledge centre, a plastic bag factory and a company developing and manufacturing orthopaedic artefacts. Thus the classification of the physical location and of content was weak (C-) as it crosses the boundaries of school and work life in content and location. The visits were in some cases connected to the work that was going on in the IEE lessons (Ci6o) i.e. energy, production of goods or finding and developing solutions. Connections differed somewhat among teachers. Some teachers had the learners write descriptions of their visits (Ci25ItH,7) and used the visits as grounds for discussions about the themes and to practice using concepts (Ci23ItB,7;). Bryndis said about the visit to the plastic bag factory with the IEE lessons: "We discussed the process from an idea to a product and about patents and such" (Ci23ItB,7). Thus the weakening of classification between school and work life was an opportunity for integration that the teachers utilized to different degrees.

IEE allows learners opportunities to develop agency, to decide what they find important and how they can develop ideas. Teachers often stepped in to make clear or remind learners about 'correct' or 'allowed' behaviour. This can be seen as the regulative discourse appearing in the day-to-day practice, the discourse that directs how conduct and behaviour is to be. Enhancing learner agency seemed to come easily to three of the four teachers. The tendency to 'know the correct answers' and to control activities was most apparent in the fourth. She was constantly educating them with interesting information that she felt was important for them to know and she talked kindly to them even when she was giving orders for what they should do and how. The other teachers would often pass decision-making back to the learners when they were asking what they should do. For instance, when a girl asked what she should write about in her report after visiting the orthopaedics firm the teacher replied: "What did you find most interesting? What had you never seen before?" (Ci7o, 9) thus using very weak framing for criteria of work (F - -).

All teachers agreed that IEE had several positive attributes and potentials. They said it was a constructive area for several reasons.

Bryndis thought that IEE offers learners the chance to:

... gain the confidence to carry out what they intend to do, you see, whether that is through product design or what they are doing in their own lives, so that they acquire a belief in their own power. (Ci23ItB, 5)

After working with IEE for one school year one teacher said: “I just thought it was awesome to see how the kids found themselves powerful; some of the kids that I knew weren’t as strong in the class lessons” (Ci26It4, 18). Another also noticed learners gaining confidence:

You would see them ‘grow a few inches’, they feel good and their confidence grows. They dare to do different things and help each other, you just see their compassion grow and they start to look for help from him or her because he succeeded in doing this, and how they become more secure about themselves, it is just wonderful. (Ci26It4, 19)

Runa also found that learners gradually grew as independent learners in IEE and progressed from asking the teacher for permission to claiming their own route in the tasks. Bryndis said that she thought it was incredible to see how the learners gained skills and confidence and independence in their work in IEE lessons:

I have a tendency to jump in and work for them before I realise it. Once that happened and one learner said to me: ‘Listen to me, trust me, I completely know what I am doing’ – and then I stepped back. (Ci26It4, 20)

In IEE learners and teachers often find themselves in a new role, where they are located at a similar level, the teacher is not omniscient and the learners know the answers. Asa said: “I was surprised to see how well they responded if you didn’t know how to do things and you sometimes had to try with them to find out” (Ci26It4, 19). Learners would sometimes take on the role of teachers in assisting their peers as Bryndis described: “When they are charged and interested they just go to the next and assist, become a kind of little teacher. I just loved it” (Ci26It4, 18). In these cases the framing of communication was very weak (F – -).

The teachers said that some learners seemed to thrive in IEE from the beginning but it took a longer time for others. One said that she noticed that there are many learners that enjoy the arts subjects more than the academic work and that was also the case in IEE. She also said that often learners excelled in both areas (Ci26It, 15). Another said:

There are some learners that ‘blossom’ in IEE lessons. I remember one learner that simply immersed himself in his IEE project. I just thought to myself:

“Ok, he’s just sitting still and working” because this learner is usually very difficult in any lesson. (Ci12ItR, 15)

The teachers all saw IEE as a way of enhancing the creative spirit in learners and also to get them to think:

I think one of the gains of IEE is that we are activating learners’ creative powers and getting them to think, pushing them ahead, not feeding them with some assignments that they are to do such and such. (Ci12ItR, 9)

In IEE learners would analyse things in the environment and ponder about why a tool was initially invented and that created fruitful discussions (Ci23ItB, 14). IEE was considered productive for learning:

I find this ideology very good to get them to think a bit and ponder about their environments and to get the opportunity for trial and error ... to let them try things and ‘hit a wall’ and try again. (Ci12ItR, 15)

IEE is useful as learners see through the processes how all material things are first ideas and “... did not arrive fully created in the box, that things don’t become created by themselves, there are persons that have created them” (Ci25ItH, 5).

The teachers found IEE rewarding for them in many ways. Usually it was the ‘good working spirit’ episodes that the teachers enjoyed most:

I really liked when the learners had begun their projects and started working and started to use the styrofoam cutter and one would see the different versions of various things, you would see emerging various individuals that acted very independently. I always liked this hands-on work with the learners. It’s great when everyone is working hard and they find themselves self-reliant and can do things and I am just one of them and can help them. (Ci12ItR, 18)

One teacher described a rewarding episode in an IEE lesson: “There they were three of them - in their corner, - working enthusiastically deeply immersed and they would ponder and collaborate constantly. Such experience gives the best reward; it just made my day” (Ci26It4, 18).

6.3.5 *Time to develop*

A part of flexible pedagogy to support creativity and learner agency is giving learners opportunity to control their own pace. Long slots of 70-100 minutes gave room for more diversity of work than shorter periods of time giving learners leeway to follow their ideas into production, enhancing their agency.

Time is a recurrent theme or thread in the interviews and visible in the observations as well. Many of the basics of IEE take time and often something is happening that is not visible and seems to be a poor use of time but is a necessary part of the creative process. As Bryndis realised: “We need to give learners time to think, to do nothing” (Ci18o, 4) which reminds us of the necessity for the teacher to ‘step back’. The teachers also noticed that it takes time to develop the kind of thinking IEE requires:

It took me some time to get them going, to get them to understand properly why we were looking for needs and those things in the beginning. But then it started rolling. You have to give it to them bit by bit and remind them of it again and again, to have a look around themselves and ponder. (Ci23It4, 14)

Thus they offered learners opportunities to work at tasks at their own pace within a set time framing pacing as weak to very weak (F – to F – -). This flexibility was also important as it takes time to build up trust between learner and teacher and among learners in revealing their ideas. Bryndis said:

It takes a bit of time to build it up somehow. I remember one that spent quite some time on an idea and he said it was silly. I said to him that ideas were allowed to be silly and then all of a sudden all the others that had been silent got going with their ideas (Ci23ItB, 10).

The most general feature of time that was mentioned was that it was too short, too little, too limited. The IEE teachers mention that they compete with other teachers for the time of learners:

We are constantly in competition with the class teachers for time. They don’t want to lose the learners from ‘planning time’ or this or that, they are losing time from various things. We have a music school operating within the school and some kids go to those lessons. So we are competing for the kids. (Ci12ItR, 12)

Limited time reduces flexibility as Runa pointed out:

We had a very limited time for the seventh and eight-year groups, just one semester only eleven or twelve sessions. And then sometimes a lesson falls through because it falls on a public holiday, someone is sick or someone is taking swimming lessons. It needs to be much more massive somehow when you have such a short time. I had to organize it more strongly; we had much less freedom than in the third and fourth year groups. (Ci26It4, 29)

She found a way to manipulate the limited time by changing the designing tools and the outcome intended in the teaching materials from styrofoam models to making models in

computers only and changing the location from a crafts room to a room with computers. That arrangement turned out to be a success: “They thoroughly enjoyed it and thought it was a ‘fierce’ program” (Ci261t4, 28).

6.3.6 Criteria – evaluation

The criteria for acceptable work in the IEE lessons were not clearly visible and seemed to be developing along the way. This is in line with Bernstein’s description of the competence model where the emphasis is on what is present in the acquirer’s product and criteria of evaluation are implicit and diffuse (Bernstein, 2000, p. 47). Teachers made comments about work when asked and guided learners towards acceptable quality of work, usually one on one but not to the whole class. Criteria were therefore weakly framed (F –). Formal evaluation at the end of each lesson consisted of criteria that teachers had been developing for the quality of work in arts and manual projects. The factors that were evaluated in the IEE lesson were: work on ideas, working skills, diligence and orderliness and were known to learners through other manual work. These would fall closer to the RD conduct and manner in the school. This part of the evaluation but was not clarified or visible during IEE lessons. Formal evaluation would fall under strong framing (F + +) where the teacher controls evaluation.

6.4 Learners in IEE

6.4.1 Learners’ roles

One of the things I noticed first in learners in IEE lessons in City School was learner ‘thirst’ for doing things with their hands, for making things in different materials. The IEE lessons were located in a room that indicated ‘crafts/woodwork’ and the learners seemed to expect mainly that, but not discussions, writing and drawing that is the prerequisite groundwork in IEE. They often complained about having to do ‘paperwork’ (e.g. describing ideas with words and drawings) in IEE lessons; nevertheless they often got absorbed in such work and carried it out as demanded. But the general impression was that they loved the hands-on tasks and I saw several episodes of such work where learners were engaged and occupied, sometimes deeply immersed in their work and in a state of flow (Figure 6.9).

IEE requires a active and creative learner role and needs a process where learners are free but responsible and have self-discipline. I expected City School’s learners to be used to this kind of independent work from the policy of individual learning. However I saw that

learners were very dependent on teachers asking for permission for the smallest things and expecting teachers to lead and control. But the IEE thinking was coming across gradually as one teacher pointed out:

It seemed that in the beginning they were constantly asking, ‘can I do it like this’ and I would answer ‘yes if you like’ and it took them a while to realize that they were in control and gradually they started to say ‘I am going to do this?’ instead of ‘can I do this or that?’; it seemed to have developed quite a bit. (Ci26It4, 19)

The recognition rules of the learners were more in line with the traditional rules of conduct and manner than the flexible rules of IEE and the ones I expected to find in City School. The RD that dominated appeared for example in the use of PBS system (C – –) which controlled recognition rules. Learners were receiving contradicting messages of freedom and compliance.

Observation notes show that boys were more disruptive in lessons than girls and teachers responded more to boys’ misbehaviour with scolding though there were many exceptions. Utterances from teachers like: “John stop this noise” (Ci2, 5) or “Siggi close your mouth” (Ci6, 14) or “Johan, Aron are you ready” (Ci7, 6) or “Boys, what are you doing?” (Ci7, 7) were heard when working processes were about to start or ending. Even though the majority of time the learners were actively working on their projects there were incidents when learners were not behaving as the teacher expected and in most cases there were boys involved. The girls would be more patient when they needed help and had to wait for a bit. When some boys wanted her help they would more often pick on each other, run around the room or experiment with the styrofoam cutter. However it was not only boys that were playful and noisy, sometimes girls would also run around (Ci19o, 10) and get reprimanded.

One of the features that teachers mentioned as a struggle was discussions about issues with general participation of learners. In some lessons with the third and fourth years some learners’ “lacked vocabulary to describe their ideas and struggled with arguing” (Ci24ItA, 11). The teachers considered these discussions an important part of the innovation process but it took some time to get discussions started and when it got going they could be very constructive. In a lesson with 7th and 8th year (12 and 13 years old) the discussions were fruitful:

Learners were dealing with the project of designing housing for families and we started with discussions. We took a bit of needs analysis and discussed the foundational needs of man and such. It was so much fun. These kids have reached this philosophical age when they are pondering so many things. There are so many things going on with them and they were just amazing in these

discussions. For example one said ‘if we just were living for fulfilling the foundational needs life wouldn’t be worth living’. There were so many good things that came out of this. (Ci26It4, 28)

6.4.2 *IEE as seen by learners*

Learners from fifth and sixth year (10 and 11 years old), expressed their ideas and views about their experience of IEE in a group interview (Ci28Ist). The girls were asked to describe IEE to someone that doesn’t know anything about it: “It’s about constructing, making new things, designing, make new looks for things that exist and make models.” The boys said: “discover cool things”, “invent new things” and “invent things and that’s why it is called ‘ný-sköpun’ (Icelandic meaning: new-creation)”. A girl added: “In IEE you try to teach a person first the main issue, that is using your imagination a lot and just to invent something new”.

One boy said: “We sometimes visit other places than the school. We went to Rafheimar (the Electricity-World) and did all kinds of stuff, we learned heaps about electricity and innovation and such”. A girl added: “Our group went to the plastic bag factory. And we learned about rubber and how plastic bags are made, for example, the Bonus bags”.

They were not hung up about whether IEE was a subject or not: “It’s just an innovation lesson” said one girl and another went on “it’s much more fun than doing your learning plan. It’s more fun because you are doing stuff, instead of hanging over books.”

A boy said it was a subject but still ‘different’: “It’s a bit like a combination of arts and crafts. And it is more fun than the learning plan because you get to carry out your ideas” and another added: “And also about inventing, learning how inventors invent things.” IEE was very much about technology and science. Another boy said that you have to use technology and science to make a car such as they were doing, though it is not as elaborate as a big car. Here there are indications of IEE crossing boundaries and location with weak classification (C –).

The learners agreed that they learned best when they were to do something themselves. “I find it best to do everything myself but sometimes I get a little bit of help from someone” claimed one boy. A girl felt she had learned a lot in IEE and that she learned best when she was doing something herself: “I learn more when I try to do something myself”. The learners all agreed that they had done too much ‘paperwork’ in IEE lessons and they wanted to make more and have more control over what they do. They are describing tasks, materials and methods in which teachers lean towards strong framing although as I saw in observations teachers usually offered a measure of weak framing where the learners were

able to choose within these limits and develop their own ideas. Learners wanted to have a mixture of individual projects in IEE and larger projects where they have to work together.

The learners claimed that they were not allowed to do experiments in IEE and they were not familiar with brainstorming and also that they were not allowed to ‘gibber’ as a way to encourage ideas. Still they thought that they had trained their imagination a lot. One boy said: “You have to train your mind as you do in IEE, make your mind better. I will use my imagination later in life and in my dreams. Then I will have learned something and for example be able to make a flying car or something.” A girl agreed that she learned to use her imagination more in IEE and that it is important “because you just feel much better if you use your imagination.”

6.5 Location and classification of IEE – integration with other subjects

As IEE was taught as a timetabled ‘subject’ in City School it was mainly seen as a subject with its own merit. Some links to other school subjects and understandings built on them were also identified.

When asked to identify which subjects or areas of knowledge IEE was related to, the teachers often mentioned mathematics (Ci23IB, 12). “They are certainly practicing mathematics in IEE; they have to measure quite a lot” (Ci26I4t, 23). IEE was mainly seen by teachers as an area that was related to many things. One said: “It’s really about all school subjects, all mixed together (Ci24IA, 6)” and another: “It could be a part of many subjects, it connects with so many things. It’s really about all the subjects if you think about it” (Ci23IB, 12). This indicates that they have a view of IEE as a subject with weak boundaries (C –) that can include and integrate different kinds of knowledge.

6.5.1 Is IEE crafts?

IEE was partially seen as replacing traditional crafts and lessons were held in the room called “the arts workshop” which was the substitute for the traditional crafts/woodwork room. In Icelandic there is a special word ‘smíði’ that has a meaning similar to the word ‘construction’ in English and is used for ‘crafts’ in the curriculum. This Icelandic word ‘smíði’ covers all kinds of materials and learners and teachers have preconceptions about the subject.

The less flexible teacher thought that IEE should not be in place of crafts but should be offered alongside traditional crafts lessons. She considered IEE as belonging to the “arts subjects’ packet” (Ci25ItH, 10) and that it was very much needed since the learners get no

typical crafts lessons. But she found textiles to be equally suitable as an element in IEE as crafts and also that skills in other subjects such as Icelandic were constantly developed and used, such as in discussions and writing descriptions of ideas.

Two teachers agreed that IEE included crafts but said that it was much more (Ci27It, 2). They mentioned that IEE was more in sync with the modern world than traditional crafts, as they knew it. One quoted a young teacher in the school who had said: “I wish I had got these kinds of lessons when I was in compulsory school, the only thing I did in crafts lessons was to sandpaper over and over again” (Ci27It, 25). Both teachers recognized the need for learners to make tangible things and saw IEE as one of the means to do that, through designing things that were important to them and to make them using various materials. The lead teacher saw IEE as a way to make crafts more “creative and more fun for the learners” (Ci12ItR, 20).

A broader view was held by a third teacher: “I think it is more related to life itself, what it’s like being a person in the modern world and about everything around us, what we throw away but could be used again” (Ci24IA, 9).

6.5.2 *Science in IEE*

In the interviews the teachers did not indicate any relationship of IEE with science but when asked they recognized the relationship to science and technology. One said: “IEE is certainly related to science and nature science, isn’t everything related to nature that is about our human existence?” (Ci23IB, 11). Another said she hadn’t thought about the relationship with science, except the part of technology, but that she can imagine science being a definite part of IEE (Ci12ItR, 15). A third felt that science was a part of the IEE content but said that it could be more visible (Ci25ItH, 11). Many of the issues of designing were related to how everything in the world is connected one way or the other, so IEE should include knowledge and thinking about biology and science in general and to sustainable development and learning to be a responsible person in the world (Ci24IA, 8).

6.5.3 *Education for sustainable development and IEE*

All the teachers mentioned that sustainability was a concept that came naturally into IEE in discussing how things are made and what consequence they have on the environment. They did not mention how IEE could contribute to understanding how economy and social connections are related to design and problem-solving although that is a recognized property in IEE (Thorsteinsson & Gunnarsdóttir, [1996]a; Jónsdóttir, 2004). The connections the teachers made to education for sustainability were mainly through the environmental issues:

We would discuss potential consequences of the things they were designing and consider how the materials chosen for the design could affect the environment. (Ci24IA, 9)

And about the benefits of IEE:

I think innovation is something we have to consider much more in the future because we have to reuse everything. We simply have to stop this endless production and use what we have. (Ci26It4, 23)

Several mentioned the relevance of using the innovation thinking for recycling and reusing of castoff materials:

... that's why I diverged into recycling projects; I just have to be more active in collecting all kinds of stuff... I just say to them 'can you make a lamp out of this? And just make ideas that there is the slightest possibility of doing and realizing'. (Ci27o, 20)

One project for the older learners was the design of a new kind of Christmas ornament using old materials (Ci27o, 10). Another said that there are links to technology and environmental issues in IEE lessons and that environmental awareness can be cultivated through this kind of thinking to realize how things are made and how they influence the environment (Ci25ItH, 11). A third said IEE is clearly linked to science and nature as she points out that everything in our human existence is related to nature one way or the other (Ci23ItB, 11). This view is closest to the holistic view of ESD, the connectedness of everything.

6.5.4 *Arts and IEE*

Even though three of the four teachers were educated as arts teachers they did not see IEE as arts education. One said that the arts curriculum is much more restrictive than the aims of IEE:

IEE it is similar to arts in the way we are working on creating and developing ideas but in IEE you are mixing everything together, it connects with home economics, science, with recycling and you connect to the work life. IEE is much about things that already exist and how you can use them, it is related to design but in arts you have to deliver some fundamental issues whereas in IEE you have much more freedom. (Ci24ItA, 7)

Another teacher trained in the arts does not link IEE much to arts. She finds it most like working in themes as they commonly do in City School where arts is integrated into the

themes: “IEE fits well with what we are already doing in City School, you don’t need just crafts or arts teachers to teach it, we could have all teachers work on this” (Ci23ItB, 12).

6.5.5 *Information technology in IEE*

The teachers repeatedly mentioned how relevant and suitable using information technology (IT) and computers were in IEE. One age group of learners used Photoshop, Movie Maker and SketchUp Google programs in various designing tasks in IEE lessons (Ci27It2). Older learners (14-15 years old) used the 3D program SketchUp Google in lessons for designing a house to answer the needs of a modern family of their own choice; it worked well and the learners were active and interested (Ci13o, 10; Ci19o, 2). Sometimes the teachers would show learners material on the Internet such as when introducing the annual innovation contest for compulsory schools (Ci7o, 9 picture 7). The teachers all mentioned the potential of using IT more in IEE such as in writing about ideas, looking for information, interesting designs, and drawing programs and in general using it as one of the tools in the lessons.

6.5.6 *The invisible subject*

The principal of City School thinks that the introduction of IEE in the official curriculum in 1999 was not well introduced to school professionals or parents. Many teachers and administrators do not realise that IEE is a part of the official curriculum and partly that is because “You just dive into reading your own subject and don’t have the whole overview” (Ci20Ip, 8).

IEE in City School was somewhat invisible the first year it was offered. It was not reported on the school’s website as a part of the curriculum of the school. The IEE teachers said that other teachers in the school did not show much interest in what they are doing in these lessons but they also pointed out that they themselves did not follow up on what others were doing in their work. They did however get reactions from other teachers after my introduction at a staff meeting about IEE as some came to the IEE teachers and said: “I didn’t know this is what you were doing in IEE” (Ci26It4, 12). One IEE teacher thought that the ‘products’ of the IEE lessons are not visible for others in the school (Ci23ItB, 9). She wanted IEE to be ‘opened up’ by having the outcomes presented more directly with a show of some kind “making it visible and being kind of pushy.” The location of the IEE lessons in the ‘arts workshop’ room also makes these lessons more isolated from other schoolwork as it is in a locked room with no windows into the room from the hall like the other general teaching spaces have. One said: “You are just stuck in your cage so to speak” (Ci24ItA, 5).

The introduction of this new subject to parents has been low-key. Two teachers said that they had had an ‘open classroom’ on parents’ night to introduce the IEE work and that “learners have been active in dragging the parents in to show them their work” (Ci12ItR, 12).

Since finishing my research City School has made IEE a visible part of the school’s education, introducing it on their home page as an integral part of their curriculum within the arts and manual subjects area.

6.6 The teacher’s role in IEE

Soon after I started to visit City School I noticed how busy the case teachers were and it seemed to be the same with other teachers in the school. I noticed how well teachers and other staff appreciated the breaks in the teachers’ lounge. It was a nice bright room with cupboards, refrigerator, an elaborate coffee maker, a bulletin board, a large sofa corner and three tables with six chairs around each. In the long free periods most of the teachers would gather there chatting about matters of the family, working hours and salary, how to get nursery allocation, where to shop for smart clothes of good price, travelling and tending of children, and the behaviour of children.

6.6.1 Busy lessons

A very distinctive feature in the IEE lessons was the busyness of the teachers after some preliminary setups or introductions. Learners were most often doing individual tasks and often needed support. One of my notes of an IEE lesson reads:

The IEE lesson was in full blast when I arrived. It was a group of ten learners from grades five and six (age 10 and 11) who were making the chassis of their own design of cars from wooden materials. Runa was teaching them in the arts workshop. When I entered Runa didn’t have time to greet me. Runa went between the learners and assisted. A dark haired girl asked for Runa’s help and Runa replied: “Ask someone to help you, you have to find the centre”. Soon Runa went over to the girl and helped her. A blonde girl yells out: “Runa, Runa” and Runa answers: “Did you saw your finger?” and right back to the girl she is helping: “You have to glue this”. Runa looks at a boy and says: “Ali you have to glue this” and right after quite harshly: “Don’t do this”. Runa goes right over to two boys working in another space in the room. A girl comes over to Runa and asks: “I need a stick of wood, very thin”, Runa points over across the room: “They are over there”. The learners are quite busy working and chatting; Runa goes between the learners and assists them one

after another. Runa usually talks to them in a low voice and answers patiently without raising her voice. (Ci10o, 3)

Runa said herself “I sometimes feel like a racehorse and that I’m running from one task to another” (Ci4o, 5).

6.6.2 *Obligations outside the classroom*

The four IEE teachers in City School were very busy and had obligations within and outside the school. A sign of the school’s ambition and willingness to follow the latest and best in education was a planned trip to the US to visit schools that were considered exemplary models. This was a collaborative task among administrators and staff, which teachers actively worked on to gain funding for the costs.

The lead IEE teacher was occupied with duties around her role as arts subjects’ administrator. She arranged teaching within the arts area, groups and teachers and saw to it that materials and tools were available. She was responsible for making arrangements for the visits in connection with the IEE lessons, contacting the firms, ordering a bus or checking if the daily bus could be used and that all children went on the trips. She was also called on sometimes to replace the principal or to fill in or find replacements for sick teachers. On top of that she had a heavy teaching load.

Three of the four IEE teachers had young children and they had to get them to school and back home and were involved in their learning and homework. One was expected to pick up her younger son at four but had leeway until a quarter past. She was not always able to finish preparing for the next day at school, because of staff meetings and team collaboration, so she sometimes prepared at home, often doing research on the Internet and planning for lessons (Ci21o, 13). She said that on Mondays she could leave the school at 14:30 and she found that helpful as she would use the time to run errands. She appreciated this flexibility but at the same time makes part of her job invisible to others.

6.6.3 *Development and collaboration – ‘we speak the same language’*

The substantial developmental work required several meetings for all staff as well as times for collaboration between smaller teams of co-workers. On top of other demands there was the unspoken discourse of continuing education: “If you are going to be a good professional you must continuously add to your education”. The lead teacher was an example of this ‘demand’ as she was taking a master’s degree in education alongside work. She took it slowly, taking one 10 ECT course each semester. Her children are fully grown and needed less or at least a different kind of attention than younger children.

The four IEE teachers were aware of the strength of their collaboration and were thankful for the leading role that Runa had. They appreciated the weekly meetings to discuss IEE lessons (although they often fell through) and found them supportive: “It was so helpful to go over what went well, what could have been better and what do we want to change” (Ci26It4, 21). And Runa said:

In the first semester I was teaching IEE with Asa and that was excellent, but then in the last two semesters I was alone with this age group and I really missed not having someone to turn to, to collaborate and rotate the tasks (Ci26It4, 22).

Asa said about the importance of their collaboration in the IEE teaching team:

The thing about IEE is this discussion between ourselves; we have something in common to talk about. We are located in the same situation and are experiencing the same things and I think it is so important that we can talk about exactly the same things and we speak the same language. (Ci26It4, 22)

Even though the IEE teachers appreciated the weekly IEE meetings they were often put off for other more important meetings or because they were needed to substitute for sick teachers. The teachers felt that IEE should be practiced with a wider participation, where more teachers in the school take part (e.g. Ci25ItH). Reflecting back after the experience of the first winter Asa said:

I see more potential of IEE for all teachers really. It would be very good to have a philosopher to teach this or someone that is very environmentally conscious. You can take in everything you know well yourself or point to that direction in IEE. It is open in all directions. (Ci26It4, 22)

Runa is appreciated as a supportive leader of the IEE teacher group but I wondered whether her leadership limited the agency of the others with them leaning on her because it is convenient for the busy teacher doing a hectic job.

The support the teachers and the school got from the collaboration with me as a researcher and specialist in IEE was appreciated. Asa felt that it was good to have someone show so much interest in one’s work, that it gave it a sense of importance (Ci26It4, 37). Runa was especially expressive about the support she found in my visits:

We had the luxury of having you here all last winter. We wouldn’t have survived otherwise. If you hadn’t been with us we would probably have given up several times. (Ci27It2, 22)

She also mentioned this to me in our informal talks and when preparing an introduction of our work together at developing IEE at City School.

6.7 The pedagogic discourse – conflicting traditions

To identify the regulative discourse (RD) of City School I looked for the discourse of order, relation and identity, the discourse that says: “These are our traditions, this is the kind of learners we want and this is how we want them to behave and this is how we evaluate them” (Geirsdóttir, 2008a). City School’s policy and its organization indicate an RD of independent learners and an ID that offers some flexibility. The policy implies trust and self-control of learners, an RD that says: “We want our learners to be creative and independent, choose their own routes in learning and we trust them to take responsibility for that freedom of self-control and behave accordingly – and we support this by offering flexibility to some extent.”

6.7.1 The regulative discourse of City School

The organization of City School work was surprising though logical when examined. The open school approach required a clear structure, allowing movement and flexibility that integrative approaches required. This indicates a regulative discourse of independent learners that have freedom to choose and responsibility to act accordingly. This was seen in City School in the organization of the timetable, i.e. the groups eating at the canteen at different times and special arrangements for group work. An example of such structure in the schedule for learners can be seen in Figure 6.10.

The open structure and team-teaching accommodates diversity in group arrangements weakening a strong classification of invariable class groups (C –). City School is developing assessment that includes evaluation of processes and hands-on projects. The strong emphasis on practical subjects and integration of subjects indicates divergence from the traditional RD in Icelandic schools.

The clear vision of the school that could be seen in the integration of subjects seems to suit innovation education well and works against a strong classification of subjects. The RD should foster creative, independent and versatile individuals whereas the traditional RD supports the formation of known identities that fit society through subject based and easily evaluated components.



Translation from Icelandic:

Tuesday 5. Dec.

1.session	life skills Sports Free period
2.session	Refreshment ? English
3.session	Free period Lunch Plan

Figure 6.10 The daily plan

The evaluation criteria the school are developing builds on an RD that emphasises tidy and diligent workers (see evaluation form Appendix VI). Contradictions were seen in the RD, for example the use of positive behaviour support (PBS), which gave the learners clear messages about acceptable behaviour and indicated a different kind of RD than the one of trusting learners to take responsibility for their freedom to self-control. This showed an RD of compliant learners more than the openness of City School suggests, and implies strong framing where teachers have explicit control. Therefore the regulative discourse in City School is ambiguous. The open vision and individualised approach encourages independent and self-controlling learners that are at odds with external control systems and strong boundaries between learners and teachers, where teachers control behaviour with external rewards.

It was somewhat of a surprise that City School had such a clear structure but the necessity of it was understandable. The school wants learners to be independent and creative in their learning and manual subjects are emphasized. The innovation education lessons were held in a special room and not related to other work in the learner groups, which is an indicator of more classification than the integrative policy indicates.

6.7.2 *The instructional discourse of innovation education lessons*

Analysing the innovation education lessons of the four teachers using Bernstein's concepts of framing – selection of knowledge, communication, sequencing, pacing and criteria and control over the social space – a mixed framing of the instructional discourse appeared. The teachers had to balance freedom for creative work in IEE lessons with structure that comes with arranging and planning within a given time and space. In typical lessons teachers were very busy, assisting and guiding, giving individual support to learners. They were warm yet steadfast and disciplinary matters dealt with according to PBS. What was characteristic for their approach was a good balance of freedom and structure, an *artistic approach* in teaching (Eisner, 2002). The teachers wanted teaching to be exciting and creative and expressed a willingness to try something new. They were generally positive towards learners' own ideas and were developing lessons towards increasing learner autonomy. They supported learners in taking risks and in doing unplanned experiments, though one of the four teachers tended to lean towards more control in the lessons leaving less room for creativity. The teachers mentioned that they realized the need to build on structure that allows freedom and creativity.

There were some differences in how they handled learners playing on the freedom being offered. Runa the IEE lead teacher was confident in balancing control and freedom:

Of course we need a frame and learners need to learn methods and how to use tools, they must know certain methods to make their work easier. For example if you are going to work on a computer you need to know how the program works to know what sort of possibilities you have. There is a kind of a whole line and a dotted line in-between. Does the technology take over or creativity? There must be a very good balance between the two in my opinion. I have a tendency to prefer the freedom and not worry too much about technology. (Ci26It4, 22)

6.7.3 *Framing and classification in IEE in City School*

The features of the RD and ID in the observed lessons were given values for framing (F) from – – very weak, – weak, + strong to ++ very strong according to criteria developed by me and presented in Chapter 4. The features of the regulative discourse (RD) were given the same values from very weak C – – to very strong C + +. Classification from C – – to C + + was also applied to the level of insulation which IEE had in the school.

The classification of IEE as an organized unity in the school was generally weakly classified (see table 6.1). Classification in lessons was also generally weak (see table 6.2).

Table 6.1 Classification of IEE in City School

Arrangements	Descriptions
Structure of timetable	Long slots of time. Some flexibility for out of school visits. Weak C (C -).
Group arrangements	Home groups of mixed ages. Individual work or work in smaller groups with different individuals. Weak C (C -).
Physical location of IEE work	Work is mainly in one location within the school. Some visits to locations of work life or museums. Mainly strong C (C +) sometimes weak C (C -).
IEE teacher, specialist – collaboration	A team of IEE teachers work together on implementing and developing the subject in the school. Weak C (C -).
IEE lessons, content/nature	Integration of knowledge and skills from some subjects and some connections with life and work life. Weak C (C -).

Table 6.2 Pedagogic features of the social base in City School IEE lessons

Boundaries – control	Generally	Exceptions
Social space – location of work	The location of learner work was set within a particular room in the school – within the room learners could choose between locations negotiated between teacher and learner. C – (weak)	
Social space – learner and teacher	Teachers and learners mainly occupy the same space and teacher moves between learners and groups. C – (weak)	One teacher was more often in her space in the classroom but with considerable movements between. C + (strong)
Communication F	Teacher and learners freely communicate (atmosphere of a workshop) learners speak together. F – (weak)	One teacher (and sometimes the other teachers) controls all communication and is mainly talking – learners ask permission to speak. F ++ (very strong)
Behaviour – conduct F	Learners are immersed in interesting work and mostly handle freedom and seldom need reminders of what good behaviour is like. F – (weak)	Teachers sometimes rely on learner internalization of behaviour system and use reminders of consequences or rewards for good behaviour. F + (strong)
Roles – identity C	Learners have agency in defined areas and are aspiring innovators, they practice being creative and act on their ideas i.e. publish them. C –	Learners had less agency with one teacher where the roles of learners as receivers and teacher as transmitter were more often seen. C +

One of the teachers leaned towards a stronger classification of space and role (Table 6.2). Although the other teachers mainly displayed weak classification of roles they sometimes showed tendencies towards stronger classification and all of them used the PBS system.

The ID emerged in framing of selection, pacing, sequencing and criteria (see Table 6.3).

Table 6.3 Framing: selection – in IEE lessons in City School

Control over selection	Generally	Exceptions – tendencies
Knowledge: content – themes	The focus of the content is greatly influenced by learner ideas and suggestions. F – (weak)	One teacher offers specific contents but allows learner ideas to influence the main focus. F +
Needs	The learners suggest several needs and select which they want to address conferring with teacher. F – (weak)	Three of the teachers sometimes let the learners select which need to address. F – – (very weak)
Tasks	The tasks framing varied from F – – to F + + . Commonly learners could suggest tasks themselves or teachers suggested several to choose from and the learner made the final selection. F – (weak)	The learners wanted to do more hands-on work but sometimes had to do paperwork first. F + One teacher tended to frame tasks strongly and decide which tasks were appropriate. F + +
Methods	Teachers and learners suggest different methods and learners select. F – (weak)	One teacher sometimes offered just one method or a limited range of methods. F + +, F+ (very strong, strong)
Materials	Most commonly the learners had a range of materials to choose from. F – (weak)	One teacher sometimes offered one sort of material to use in tasks. F + + (very strong)
Summary – direction of developing ideas	Most commonly the learners develop their ideas with teachers support, very weak and weak. F (F – and F – –)	One teacher tended to offer her opinion or offer her own ideas on developing learner ideas rather than elicit their ideas, strong F. (F + and F + +)

The instructional discourse in IEE lessons was somewhat mixed though most aspects emerged as weak framing with one teacher diverging towards strong framing (see table 6.4).

Table 6.4 Framing: pacing, sequencing and criteria – in IEE lessons in City School

Control	Generally	Exceptions – tendencies
Pacing	Most commonly the learners were able to set their pace within a set time frame that sometimes was possible to stretch. F – (weak)	The overall time frame for projects had limitations due to school timetable and organization. F + (strong)
Sequencing	Learners were able to do some alterations to sequencing of tasks or parts of processes. F – (weak)	One teacher tended to control the sequence of tasks within projects. F + (strong)
Criteria of on-going work	Criteria are developing in the process. Teachers make a few comments when asked – criteria not made explicit to all. F – (weak)	
Criteria as formal evaluation	Criteria builds on RD of hard-work and orderliness on one hand and on independence and work skills on the other. F + +	Evaluation not visible in the lessons

The freedom of the learners in lessons was somewhat limited but they had freedom to create with personal expressions (design), choice of materials, working at their own speed with some limits of finishing (pacing) and the space to work was somewhat flexible. Evaluation criteria were known to learners as they had been developed within the school in other areas for measuring the work in integrated subjects and manual work, but were not prominent in IEE. The formal criteria arose from the RD rather than the goals of IEE, such as creativity, although independence and competence were included (see evaluation form Appendix VI).

The regulative discourse linked to the instructional discourse of innovation education indicated that the school wants independent and creative learners. Three out of the four IEE teachers tackled well the balance between learners’ autonomous work and structure and control mostly identified as weak framing. The use of the PBS system was a part of the RD with teacher control of learner behaviour coming from a different regulative discourse of strong classification and also emerging in the formal evaluation sheets.

The learners loved and wanted to do more hands-on work and less of the paper assignments and were less enthusiastic about the discussions and written assignments: “We

want to do more actual things, not just to invent them and talk about them.” It seems that a balance between the written and hands-on work is necessary to achieve creative thinking and deliberations and the joy of seeing their ideas realized in substantial form, indicating that a weaker framing of selection might be beneficial.

6.7.4 *Recognition and realization rules*

Learners were starting to *recognize* what was expected in innovation education. They were getting to know and understand the ‘rules of the game’ of innovation education and gradually learning to behave accordingly. The teachers said they occasionally had difficulties in getting the learners to ‘fly’ in their creative process, they didn’t always know how to handle the freedom offered for creative work. Sometimes they misinterpreted the freedom as permission to “act out”. Even though the learners should have recognition rules of independence from other schoolwork that would fit well with the weak framing of IEE they sometimes did not make use of the freedom offered to “fly” and be creative, or they were not able to accept the responsibility of the freedom, in other words they did not have the *realization* rules for IEE. Another way to understand the ‘misuse’ of freedom might be to acknowledge that the learners might not yet have the capability to do independent and creative work but the assumption in IEE is that both creativity and responsible control of personal work can be enhanced.

A contradiction could be detected on the one hand of the RD of innovation education and City School that allowed an ID of weak classification and framing and on the other hand the RD coming from other sources pulling the school towards stronger classification and strong framing.

6.8 The social ecology of IEE in City School

By using Bronfenbrenner’s model the systems that interact and affect schools and the work of the schools can be located and by using Bernstein’s theories the different sources of power and control that influence our systems are detected. By making these visible we can consciously choose constructive responses in education.

The RD and the ID of City School are by and large supportive of innovation education as was reported above. Findings show that there are individual differences in the way in which innovation education is being taught and can be seen in different framing in lessons.

Table 6.5 The social ecology of IEE in City School

Systems	Systems characteristics	Observations – comments
Personal level	Teachers support taking risks, experiments and silliness. Balance control and freedom skilfully. Artistic approach, framing mixed or weak.	One teacher more controlling in her teaching, the other three are able to allow learners more freedom. F – to F + and F ++
Microsystem School leaders and colleagues	Actively familiar with IEE. Leaders mediate external support. Secure support of school community towards IEE. Colleagues support IEE. A team of teachers works collaboratively on IEE. The ethos of the school enables weaker framing. C –	School leaders intentionally weaken classification of subjects and framing towards more learners control and choice.
Mesosystem IEE as a curriculum area in school	School receptiveness to learning and change Emphasis on arts and manual subjects as tools for learning and on integrating subjects in creative projects. C – – Physical arrangement of IE C + Use of PBS system F ++. Lesson length supportive of project work C – Supportive evaluation procedures of IEE F – but tendencies to use formal criteria from a different RD towards F +. Builds on a historical system of strong classification and is a deviation from it.	Classification is weakened by integrating subjects and length of lessons give space for learners’ control of sequencing and pacing. Evaluation criteria being developed for project work.
Exosystem Parent and community aspirations towards IEE	Reliance on traditional measures of school quality. Traditional school subjects given priority C ++. Parents minimally involved in school activities. Indifference towards IEE C + (strong classification between home/society and school).	Parents (and society) do not oppose IEE but seem to pay most attention to the national tests that build on a strong classification of selected (respected) subjects.
Macrosystem	Law and policy expects innovation education. National curriculum includes innovation education. Official evaluation procedures focus on selected subjects. C +	The official discourse calls for creative and cooperative individuals but offer an evaluation system on an individual and strongly classified subjects basis.

The regulative discourse of City School includes contradicting notions of innovation and traditions, which in turn affects the nature of the instructional discourse. In City School the RD, guiding what kind of learners they want, deviates from the official RD that leans towards strong classification and strong framing. The official RD is evident in the official evaluation system that gives precedence to strongly classified subjects. The criteria of knowledge of IEE may need to be more visible in assessment giving learners and parents clear messages about what is expected of learners and how they will be assessed. Clearer messages about what is to be evaluated could enhance learners’ recognition and

consequently realization rules. I see the visibility as necessary platform for negotiating individual criteria for evaluation giving learners more control over their learning.

6.9 First findings

In this chapter I have described in detail the work of four teachers in City School with IEE. I described the main content and characteristics of lessons and teacher and learner views. The teachers find IEE to be constructive offering opportunities for learners to gain self-confidence and grow as independent persons by exercising “creative powers” and understanding how things are connected in the world.

I described how classification of roles and framing in lessons varies. The instructional discourse of three teachers in IEE lessons was characterised by mixed framing but mainly weak and one teacher leaned towards strong framing. The general regulative discourse of City School wants creative and independent learners but also quiet and compliant learners.

In describing the characteristics of City School I began to understand what affects the location of IEE and the role of school context. The inclusion of IEE in the school’s activities was in line with the stated policy of the school and its introduction was at the initiation of the school administration. The social ecology of City School is fairly supportive towards IEE with engaged teachers and a supportive school structure and informed leadership. Other colleagues have some knowledge of IEE. It seems that structure and organisation that supports integration of knowledge, subject areas and collaboration of teachers could be crucial in implementing and developing IEE and this will be explored further in Chapter 7 and 8. I want to investigate how the elements of these findings appear in other conditions, with different structures, agents and social circumstances.

In the next chapter I will describe my findings from two more cases of IEE in practice.

CHAPTER 7: IEE in two rural schools – agents and conditions

More can be said about the nature of IEE and requirements by investigating how it is tackled in different circumstances. In this chapter I consider two rural schools in Iceland operating in different conditions but both offering IEE as a subject area in the timetable.

7.1 Country School – the work of one teacher

7.1.1 Country School

Country School is a small rural school with learners from age six to twelve (1-7th year) located in an agricultural area, forming a community of around 500 inhabitants. Two municipalities merged in 2002 and two compulsory schools Graysheet School and Mount School were consolidated in one institution in the same year, being united in 2006 in one location. Both the mergers caused conflict and disagreements that were still evident at the time of my research. I was and still am resident in that community and a former teacher and instigator of IEE in the Graysheet School.

In the year of my research (2006-2007) the focus of the school activities seemed to be one of avoiding changes, building rather on the work that had been done previously. The Graysheet School (my former school) had before the merger been active in environmental education focusing on conservation of nature and sustainable living and had earned a name for its work on IEE for about ten years. The merged school, now called Country School, also implements a policy towards individualised teaching and an understanding of teaching and learning built on Gardner's theories of multiple intelligences.

Surroundings – architecture and space

Country School was designed with an 'open school' in mind but also with the potential to close off spaces as traditional classrooms. The building is modern with an octagonal centre and many of the classrooms are pentagons indicating a non-traditional space. Some areas are large and can be divided by low mobile walls and other areas are smaller with large openings that can be closed with sliding doors. The experience has been that most teachers choose closed classrooms.

Schedules – arrangements – organisation

Most lessons were scheduled as 40 minutes slots and usually the manual subjects (arts, textiles, crafts, IEE and home economics) were arranged as two consecutive lessons in one day and one ordinary 40 minute lesson another day. As mentioned most teachers taught solo, one per classroom teaching their subject, sometimes with an assistant if there was a learner in the group with special needs. As this is a small school with around 50-60 learners, teachers teach many subjects, know each learner and are familiar with their circumstances at home.

Administration

The principal, Ragna, a woman in her sixties had considerable school experience, first as a teacher and later as a principal of Mount School for a few years before the merger. She is a firm administrator and had to deal with the aggravation of teachers and parents that were displeased with the municipality merger and unhappy over school merger. She said about the school's policy that its aim was: "... that the children are well equipped for the future and that they show initiative" (Co10Ip, 6). She thought that IEE suited school policy and the aim of school activities. IEE had already "put us on the map" she said and she believed it to be useful for the learners:

I think perhaps mainly that it is this generative thinking that they have to rack their brains about things, invent things and consequently understand better the environment that surrounds them and see problems and try to look for solutions. I think that that gives good 'provisions for the road'. I think it is very important and constructive. (Co10Ip, 4)

She thinks that the school needs to integrate IEE better with other school subjects and that this will be so in the future. Ragna considers the lessons assigned by the official curriculum to be one lesson for computers and one for crafts and therefore they take one of the unassigned lessons under IEE. She mentions that there are only a few who know about IEE as a part of the curriculum and that the annual reports that schools have to send to the ministry do not ask if IEE is offered to learners. "So we don't have as much flexibility" and if a school wants to offer IEE they have to "take it off the elective lessons" (Co10Ih, 5).

Time and flexibility

In Country School one hour per week for grade 5-7 is dedicated to IEE. The teacher can arrange the lessons against lessons for information technology and crafts so there are three lessons over the school year to be divided between three subjects. This allows some

flexibility for the teacher to weaken classification between subjects (content C –). Sunny the teacher is responsible for the arrangement of lessons and organizes a period of three hours per week for the IEE lessons. She also teaches the same groups arts, Icelandic and maths and has the leeway to move lessons between weeks depending on where the most work is needed. She said that she had good flexibility so she can try out some ideas and diverge from the plan but she also complains over this freedom and finds it reflects indifference on the part of administration. The school uses a manually steered electric bell to start lessons allowing flexibility to adjust free periods to good weather and shortening or lengthening of lessons when the need or opportunity arises. These conditions in the school offer weak classification in the structure of the timetable (C –) although the main structure in the timetable is one of strong classification (traditional arrangement of 40 minutes lessons).

The atmosphere in the IEE lessons was usually relaxed. When working in the crafts room the teacher would allow the radio in the background. The learners experienced mixed framing often starting with strong framing and later on weaker. Sunny would tell them what to do and what they had to finish, such as drawing an object showing the front, top and side (knowledge), and then they could choose ideas to send to an invention competition (Co2o,8). Learners were partially free to choose what they wanted to do with weak framing (F –) over selection of knowledge, tasks, needs, design, materials and methods in some lessons.

There was flexibility in the location of IEE lessons. Sometimes the groups in Sunny's class work in two locations in the same lesson with her approval (location of work C –). Sometimes learners worked in the arts room, sometimes in the crafts room, sometimes outside, sometimes in the classroom and sometimes in the computer room, but always with the teacher's approval. The tasks were variegated and touched on different knowledge and skills. Learners sometimes used computers to develop ideas in words and drawings and sent ideas to the yearly innovation competition. They could be filling out cost estimates on paper, drawing, making models in polystyrene, working on a light board, making things of plastic, doing textiles or crafts, writing on flipcharts, experimenting and competing with their cars, selling products and handling money, discussing, explaining or having a conversation with the teacher or their peers (see figures 7.6, 7.8, 7.10, 7.11 and 7.12).

7.1.2 Learning the inventor's ways of working and thinking

In Country School looking for needs and working on solutions was well covered in IEE and was seen as fundamental components that were practiced over and over again. Notebook use was introduced to learners and formed a steadfast part of the training. Sunny

would often start an IEE lesson by asking the learners about needs they had come across and what they had written in their notebooks. Some learners had lost their notebooks in the washing machine and some forgot but Sunny persisted and let them have new or make new notebooks if they were lost or ruined (Co2o, 3). They spent some time in the beginning writing needs on a flip chart to access later, brainstorm and discuss solutions and needs. Sunny would help them rephrase their needs if they came with solutions that blocked further development and she would write them on the flip chart or the learners would do it themselves.

The learners were trained in making models according to the project and got the opportunity to make them out of styrofoam, cut with a heater, polished and painted with water based paint.

Creativity – experiments and immersion

Sunny emphasised creativity and was surprised to find how creative teaching could be. She found that she is able to try out things in teaching, has flexibility and space and isn't stressed over whether her experiments are a success or not. She said that she is very much against copying and she found that when she is creative it is rewarding: "It fills me up, it makes me happy. It makes you somehow so whole" (Co11It, 6). She thought it is important that learners get this opportunity to be creative: "And it's not about being good at drawing, that is beside the point, you can be bad at drawing but still very skilful in making things, creating and inventing" (Co11It, 5). She found the learners still closed minded and not able to communicate well, nor did they applaud themselves when they deserve it (Ci11It, 5). Sunny described the potential influence of IEE: "... they just believe in themselves, that they can do everything they can think of, first and foremost" (Ci11It, 6).

I witnessed learners taking part in lessons and being creative. The brainstorming sessions and discussions were an arena where they got to air ideas. When discussing and brainstorming solutions for the problem "birds crap everywhere" they came up with solutions like "exterminate them", "have a head umbrella" and "put a diaper on them" and to the problem "impatient children" they would suggest "leave them in the woods", "scold them" and "take them to the psychologist" (Co8o, 17-18). They came up with practical and realistic ideas, such as the boy working on the problem of "children can't get on a horse by themselves" and developing an idea he called "the elastic stirrup". I witnessed learners immersed in manual work (e.g. Figure 7.1, 7.2 and 7.4) and on paper (Figure 7.3). Perhaps the best example of engagement and visible enjoyment was the preparation and execution of the completion of the movable cars where they competed in three categories: A.

Running down a ramp – longest distance B. Elastic driven – longest distance, and C. The most fanciful (Co3o, pi6 and pi14). Before the competition they did experiments, trying out cars and making adjustments to get them to work better (Co3o, pi5).



I often saw learners immersed in creative work, either in manual work or working on paper, either working by themselves or in small groups.

This boy was whittling a piece of twig to make a small cup he had designed.

Figure 7.1 Whittling a piece of wood (Co4o, pi3)



These three learners were working together as a firm creating items to sell on the upcoming market. They had decided between them what to sell and designed artefacts and were making those in wool and plastic.

Figure 7.2 Preparing for the market (Co6o, pi12)



Figure 7.3 Learners active in paperwork – different tasks (own pacing) (Co8o, pi 13)



One of the joyful lessons I observed in Country School, where all learners were actively involved was the Car Race and the Car Design Competition. The whole class group was engaged in preparing, experimenting and taking part in the race.

Figure 7.4 A. Happy learners (Co3o, pi6) and **B.** Engaging car competition (Co3o, pi14)



Figure 7.5 Adjusting and experimenting (Co30, pi5)

Learner agency

Sunny had chosen to use the published teaching materials (see Chapter 5) at first, as this was the first time she was working with IEE. She found them restricting and as time went on started to diverge from them. Learners had to follow a plan that included several training elements and specific projects (selection of knowledge F++) though quite broad, such as technology or marketing (F-). The tasks were either constrained such as drawing a 3-D picture of a house (task F++), open such as designing and making a car (developing idea F-) or with the most freedom (task F--) preparing for the market by forming your own firm and designing and making artefacts to sell. However the market tasks had set guidelines and requirements (knowledge F+) such as to make a cost estimate and to calculate a percentage of earnings to pay to the school. Sunny showed the girls more trust and did not remind them as often of behaviour as the boys. The learners did get many opportunities to choose, decide what to do or how to do things or could choose what to do next (sequence, pacing and task F-). Sunny said she always emphasised independent work and she deliberately tried to step back (developing idea F--) when learners were creating something on their own (Co80, 8). She also tried to get learners to take responsibility for their learning, such as in using the notebook, looking for needs and taking part in the innovation contest and figuring out how to make IEE learning more fun and interesting (Co11It, 7).

As Sunny was quite active in using the needs collection, analysis, brainstorming and discussions there were ample opportunities to scrutinize her approach. She would most often be supportive or neutral to learners' suggestions but sometimes the 'black hat' would pop up in her reactions. For example, in one lesson when discussing the problem of sending a letter in a bottle from a location far inland one boy suggested "tie it to a bird" and Sunny replied "is that a nice thing to do?" Another learner suggested "throw it in a ditch" and she replied in a doubtful tone "does that water move?" (Co7o, 3). This would indicate strong framing (F +) as the teacher influences possible solutions. Sometimes the learners fell into the role of the 'devil's advocate' reacting to other suggestions with scorn or finding a flaw such as when a learner suggested that the solution to 'forgetting your PE clothes at home' could be to put them in the bag the night before and another learner replied "you just forget the bag" (Co8, 15).



In this task Sunny (on the left) would let the students write needs on the flip chart thus the learner is both choosing the need to address, very weak framing and also very weak framing of roles and space.

Figure 7.6 Learner writing needs on the flip chart (Co4o, pi2)



Figure 7.9 Production for market – textiles (Co6o, pi13)



Figure 7.10 Searching for raw material prices on the internet (Co6, pi6)

7.1.3 Characteristics of IEE in Country School

The ‘chat’ – the relaxed conversation – teacher levels with learners

Sunny would often sit down and talk with learners about their ideas and progress in their work (Figure 7.11 and 7.13). She was warm towards the learners, calm yet encouraging and lively, giving advice, asking for explanations and giving suggestions when needed (Co8o, 13). An example of her thoughtfulness was when she asked the learners to be considerate to one boy that had just lost his cat asking them to give him space and time: “Let’s leave him alone and not ask. He will talk to us if he chooses. Since you are all friends you will show him friendship and support. When we feel bad we show it in various ways. We are all different” (Co8o, 3). Here the RD of consideration and compassion emerges in Sunny’s advice.

Sunny would get the whole learner group going in a relaxed discussion about needs and ways to solve them (Figure 7.12). The most relaxed conversations I saw were when Sunny would sit down at learner level, one on one or with two learners, and discuss their ideas, progress and continuance (Figure 7.13). These episodes have weak classification (C – –) with the teacher and learners in similar roles developing ideas through conversations and with weak framing (F – –) of design and pace.



Figure 7.11 Teacher Sunny discussing with learners (Co7o, pi7)



Figure 7.12 Teacher and learners discuss needs in a group (Co8o, pi10)



Figure 7.13 Relaxed conversation: teacher – two learners (Co6o, pi9)

Connection to the world outside the school

The strongest connection of IEE to the world outside the school was through finding needs and solutions identified by learners, a sign of very weak framing (F – –). Examples of needs detected by the learners were: “People cut their fingers on paper”, “sisters and brothers behave badly when guests arrive”, “sisters and brothers fight”, “it’s difficult to move heavy buckets between places in the cow-shed”, “the milking robot doesn’t accept all cows” and “learners fiddle with tables” (Co4o, 3).

Learners got to know work life, for example, through running a market. They learned to form small firms, divide labour, choose products to make, use advertising, take on leadership and responsibility and understand how ideas and realising them can be a source of income. The market was a way to connect parents and families as they were invited to take part in it. In this way the classification of school and homes is weakened (C –). Sunny said that the market was a great way to connect with parents and that she wanted more school activities to make parents more interested and positive (Co11It, 11). Sunny decided to drop some of the visits that IEE learners in the school had taken part in before her time such as visits to the glutam factory, factories in Selfoss and handicraft workshop in neighbouring communities as she considered them too much work and time was limited. This depicts a move from very weak classification (C – –) of IEE in connection to the work life, towards weak classification (C –)

When I was visiting the school the learners had started to think about sending their ideas to the annual innovation contest for compulsory learners in Iceland. The following year Country School received a prize for the best participation of ideas sent through the internet. Learners from the school also received prizes and some ideas were among the best 30 ideas in the competition that year.

Sunny described an enjoyable IEE lesson that took place when the learners were setting their letter afloat in a bottle in the river nearby the school

They walked all the way to where the small river meets the main river and observed their bottles floating down. They completely kept track ‘YES the current took it’. And the boys said: ‘This was totally awesome’. And it makes them so positive towards school so I think we need to reproduce these moments, that they think positively and that it isn’t just about boredom, sitting still and such. ... I think what was positive about it was the movement and to see what they had created become a reality. It wasn’t just an idea, that is just an idea something artificial, but something connected to reality. It happened for real, we executed this. I think it is a bit this accomplishment.

They just loved it, they ran around the bank, threw the bottle in again, fished it out, they were just totally occupied. There is too much immobility in schools and in general in society. And allowing them to run around is just awesome for the kids. You know its the movement, it is experiencing nature, its endless, it's to see the device they designed and developed do something in reality It's the realness of it (Co11It, 9).

So in her opinion this experience was one of learners seeing their own thoughts and learning become a reality, experiencing on the way a connection to nature, a bit of science and technology, reality outside school and the pleasure of moving freely about.

Sunny – the IEE teacher, the artist, the mother, the Icelander

Sunny found getting to know a new area like IEE to be a considerable task on top of other duties. She does not want to work much more than she is obliged to and is often exhausted after teaching. She is first and foremost an arts and crafts teacher working full time. She tried to make IEE manageable by cutting off some activities. She is an educated artist with teaching credentials to have a secure income. She was thirty-four years old at the time of my research, married with two young children. In one lesson I observed her take the phone to confirm a doctor's appointment for her son and later that week she had to take time off teaching for the appointment. Sunny and her husband had just finished building a house that they moved into in December that year, the house only partially ready. Building the house and moving took a lot of their energy and time and added to their workload. In Iceland it is quite common for ordinary people to more and less build their own houses or take considerable part in it alongside the artisans.

Sunny's rationale for IEE

Sunny finds that IEE offers opportunities different from other subjects and that it could be used more with other school subjects. She thinks IEE connects so many subjects, for example, the field trip connected to the project Letter in a Bottle could be used in Icelandic to write about the learners' experience that would be "much a better and realistic exercise than reading up from some books and filling in gap-exercises" (Co11It, 9). She hopes that IEE will make a contribution to strengthening learner self-esteem and that they will come to believe that they can do anything they think of (Co11It, 6). She expects IEE to give them the feeling that they are not passive receivers in their learning and that they carry responsibility for their learning. She thinks IEE offers opportunities for connecting school activities with life outside school.

Learners' voices

One of the things I soon noticed in the lessons was a difference in boys' and girls' behaviour and in the teacher's reaction. The boys would be restless and noisy, especially when the lessons were approaching the end. Sunny was conscious of this and sometimes sent the boys outside to run round the school house to release some of their energy. It seemed to me that Sunny more often criticized ideas from the boys that sometimes were more 'silly' than the ones from the girls. The boys were also more active in producing 'silly' ideas that seemed impracticable. In a brainstorming session I observed the boys to be active in suggesting and giving answers without raising their hands, and the girls were also active but always raised their hand first and Sunny would ask the girls more often for their opinion even though there were more boys (Co7o, 2). Sunny pointed out that she knew that the girls sometimes did things behind the teacher's back but they were better at hiding it and had more control over their behaviour in front of the teacher. She says that the girls are sometimes rude but they take care to not be caught (Co8o, 15).

In most of the lessons I observed the learners would be working steadily and doing as they were asked or what they had decided to do within the frame of the lessons. A snapshot of part of a lesson in March 2007 where Sunny was teaching a group of grade 5 (9-10 years old) learners, seven girls and five boys is as follows:

The learners gather in the arts room and sit down at a row of 14 tables turning towards each other and with a flip chart at the end of the tables near the door. Sunny says to the learners: we are going to start by doing a bit of need analysis. A boy asks: What about the letter in a bottle? Sunny: this won't take long, then you'll finish the poster advertisement and if there is time then we will continue. Sunny turns to one of the boys and asks: 'Haraldur do you remember what we discussed about the location on the paper?' Haraldur looks surprised and then answers: "yes, yes." Sunny reads a need from the flip chart: "One is afraid of nights" – and then adds: "Brynjar had found a solution 'acrophobia glasses'." Haraldur stands up from the chair and takes things from his school bag that is hanging from the back of the chair. Sunny asks: "other needs? " One boy suggests: "grocery bag handles rupture. " Sunny asks: can you find a solution? A girl suggests: "a grocery cart that can be used on stairs." Sunny: "but what about when you want to take the groceries into your car?" The girl: "fold the wheels under the cart" – then she demonstrates with her hands what she means. Another girl has her hand up and suggests: "make a grocery bag out of strong materials".

They go on for some time and are active in suggesting needs and solutions and discussing the needs. One boy offers the need: "a heavy school bag" and Sunny asks for solutions. All the girls raise their hands when they want to

talk, but the boys chat amongst themselves, Sunny walks towards them and asks: Haraldur do you have a solution?’ He answers: “yes, do weight lifting” and Sunny answers: “ah, get strong” and then she adds: “if you never tidy up in your school bag, that is another problem, what do you think Berta?” Berta answers: “too much stuff”. They discuss this briefly and then Sunny says: “let’s go and work on the poster now”.

They all start working on A4 sized papers, sitting at the long table each doing their own poster. Every now and then a learner stands up, shows Sunny his/her work or asks for advice. Sometimes Sunny sits down beside a learner or across from her/him to discuss their work, literally levelling with them (Figure 7.11). A dark haired girl comes to Sunny and asks: “is there a y- in deodorant (í.l yktareyðir)?” Sunny gives her the correct answer. Off and on you can hear a man’s voice from the adjacent room and sometimes children’s voices talking. The learners in Sunny’s room work quietly. Numi, a brown haired boy, stands up and shows Sunny his poster. She responds: ‘this is fine, maybe add a little bit of colour’ and he sits down and carries on. A girl shows Sunny her poster and she gives her a bit of blue tack and tells her to hang it up in the corridor.

The boys are getting loud, are chatting happily in a high voice, one stands up, another walks to the cabinet and gets some colours. A girl asks Sunny for help, Sunny is busy most of the time and responds and advises one on one, she has a pile of A4 projects that she has photocopied from the teaching materials, ready on the teacher’s desk. The boys have raised their voices, laugh loudly and seem restless. Haraldur laughs out loud. Sunny leans down to him and says something to him in a low voice. The boys whisper and laugh out loud, continue talking but carry on working. Sunny declares: “Haraldur and Numi, you have now got two points”. They complain and say that the girls never get anything. Sunny answers: “I wonder why that is?”

By the end of the lesson Sunny tells the learners to start tidying up. When they are finished they line up by the door, Sunny reminds one boy about behaviour and lets him move to the back of the row, she opens the door and thanks them for today and wishes them a good weekend.

This episode shows a mode of pedagogy that is strongly framed (F +) with some indications of weak framing such as in the suggestions of needs and the teacher sitting with learners (F -). Sunny does not think that IEE offers more opportunities for different learners to shine than other school subjects. Learners that are strong “in the book” are similarly strong in IEE and in arts (Co11It, 20). However I couldn’t help wondering about the boys in IEE. I saw them improving their cars through experimentation and then competing in the car race. I noticed that some of them that were not generally highly rated

in the school as learners looked very happy, taking part and learning about technology, friction, energy and design. In that project the framing was strong (F +) in selection of knowledge and ongoing evaluation, but the sequencing, pacing, tasks, design, materials and methods were weakly framed (F -).

Researcher's dilemma – different roles

When I was observing lessons and discussing them with Sunny I was very much aware of my role as the teacher that had initiated IEE in the school and a specialist in the area. Sunny was doing it for the first time and had not much knowledge of it apart from the two-day course she took in the summer of 2006. I thought that she did remarkably well but thought that some of the things I found important in IEE were left out or done differently and I struggled with keeping these views to myself or putting them forward in a constructive way. I also worried that when I was giving advice I would come across as a “know-it-all” and that could have the opposite effect.

I also experienced tensions between being a researcher and a community resident and former teacher at the school. On one occasion in the teachers' lounge I stepped into my former role and took a part in a heated discussion about the mergers of the communities and the effects it had.

7.1.4 *Locating IEE in Country School*

Location/classification of IEE and connection with other subjects

The principal considers IEE a subject in the “arts and crafts area” and also related to science, where there could be more connection. She adds, “it really fits into most subjects” (Co10Ih, 5). She found IEE to “...have opened up since I started teaching it, it has grown. It offers so many things and it really connects to all subjects” (Co11, 2). She took an example of the Letter in a Bottle project quoted above, where learners could connect with nature, move about freely, experience forces of nature and practise Icelandic and English. In the project they had to decide what kind of vehicle they wanted to use for their letter, think about what qualities would make it float and run best, what would influence its travel from the small river to the sea, write a letter in Icelandic and English and give basic information for the finder to contact them and tell about themselves. Thus they were practicing and learning about physics, technology, nature, and doing physical exercise, using Icelandic and English and enjoying being together in a different setting. That project was an example of very weak classification (C - -) of content, group arrangements, location and weak in classification of content (C -). In terms of framing the project offered

weak framing (F –) of selection, and very weak of tasks, methods and materials and design (F – –).

Sunny found IEE to be in some ways similar to crafts and to arts but still quite different “It’s more like those lessons you have with your own group as a class teacher. It’s these group discussions, they are more in the lines of life skills” (Co11, 15). She considers the part about producing and making things similar to arts learning. Sunny classifies IEE as a special subject rather than an approach but still stresses that it relates to all subjects (Co11, 12) and wants other teachers in the school to take part and use it to connect subjects more deliberately.

Framing, and the RD in Country School

The framing of IEE lessons in Country School was somewhat mixed as in City School, but in a different way. The features of the instructional discourse (ID) seen in the observed lessons were identified with the same values for framing and classification as before from very strong to very weak (Table 7.1).

Table 7.1 Classification of IEE in Country School

Arrangements	Descriptions
Structure of timetable	Mainly traditional arrangements of lessons. Some flexibility for out of school visits. Strong C (C +) Flexibility within the small school structure. Weak C (C –)
Group arrangements	Set class groups of mixed ages. Individual work or work in smaller groups with different individuals within the class. Weak C (C –)
Physical location of IEE work	Work is at several locations within the school. Some visits/fieldtrips outside school. Weak C (C –)
IEE teacher, specialist – collaboration	One IEE teacher specialist in the school, who wants more integration. Strong C (C +)
IEE lessons, content/nature	Deliberate integration of knowledge and skills from many subjects and connections with life and work life. Weak C (C –)

The classification of IEE as organized in the school was mixed with the teacher as a solo player of IEE and main arrangements of lessons strongly classified but with the flexibility of the small school. Sunny taught several groups other subjects so she could take time from other schedules for IEE if needed. She mixed different knowledge areas with IEE, from life, arts, crafts, information technology, science and technology (weak classification C –).

In the social base of IEE in Country School (Table 7.2) there is a mixture of strong and weak classification and framing but tends towards stronger framing (F +). The ID of IEE in Country School is summarised in Table 7.3 and 7.4, first for the different elements of selection then for pacing, sequencing and criteria.

Table 7.2 Pedagogic features of the social base of IEE Country School

Role- control	Generally	Exceptions – tendencies
Social space – location of work C	The location of learner work was set within different rooms in the school – within a room learners could choose between locations negotiated between teacher and learner. C – (weak classification)	
Social space – learner and teacher C	Teacher and learners occupy their own space but frequent moves between these. C – to C + (strong)	When Sunny occupied learner spaces she would sit, bend down or kneel so she would be on their ‘level’ indicating weak classification. (C –)
Communication F	Learners ask permission to speak to teacher. F + (strong)	On occasions such as when creative conversations were going on C was very weak offering a basis for weak framing. (F – –)
Behaviour – conduct F	Learners work quietly and do as they are asked to. Teacher reminds learners of what good behaviour is like when needed – gives ‘points’ for inappropriate behaviour. F + (strong)	In projects like the Car Race and the Letter in a Bottle the learners were immersed in their work and were not reminded of good behaviour. C – (weak)
Roles – identities C	Although learner have agency in defined areas and are aspiring innovators, and learner and teacher communication is often on equal footing there was a tendency towards roles of authoritative teacher versus obedient learners C +	

Table 7.3 Framing: selection – in IEE lessons in Country School

Control over selection	Generally	Exceptions – tendencies
Knowledge	The focus of the content is offered by the teacher but allows learner ideas to influence their development. F + (strong)	In some projects the focus and content is greatly influenced by learners. F – (weak)
Needs	The learners suggest several needs and select which they want to address conferring with teacher. F – (weak)	
Tasks	The teacher offers a limited range of tasks to choose from and the learner makes the final selection. F + (strong)	Sometimes Sunny framed tasks strongly and decided which tasks were appropriate. F + +
Methods	Teacher and learners suggest different methods and learners select. F – (weak)	Sometimes Sunny offered just one method or a limited range of methods. F + +, F+ (very strong, strong)
Materials	Most commonly the learners had a range of materials to choose from. F – (weak)	Sunny sometimes offered one sort of material to use in tasks. F + + (very strong)
Summary – Direction of developing ideas	Most commonly learners developed their ideas with teacher support. Weak to very weak. F – to F – –	Sometimes Sunny would influence the direction of ideas in brain storming sessions. F +

Table 7.4 Framing: pacing, sequencing and criteria – in IEE lessons

Control over	Generally	Exceptions – tendencies
Pacing	Most commonly the learners were able to set their pace within a set time frame that sometimes was possible to stretch. F – (weak)	
Sequencing	Sunny tended to control the sequence of tasks within projects. F + (strong)	Learners were able to do some alterations to sequencing of some tasks or parts of processes. F – (weak)
Criteria of ongoing work	Criteria is visible in the process. Teacher makes comments about learner work, corrects and guides – criteria often made explicit to all. F + (strong)	
Criteria as formal evaluation	Evaluation not discussed	

The instructional discourse in Sunny’s lessons was somewhat mixed leaning to strong framing and sometimes very strong. It was though sometimes weak and on occasions very weak such as in creative conversations and the Letter in a Bottle project, which was an example of very weak classification (C – –) of content, group arrangements, location and very weak of selection of tasks, methods, materials and design (F – –).

The overall impression I got was that the teacher was in control and the most mixture between weak and strong framing was in the parts constituting selection of knowledge (content, tasks, needs, materials, methods and design). The instructional discourse of innovation education in Sunny’s lessons emphasizes independent and creative learner work but an RD of quiet, efficient and obedient learners also emerges in her mode of teaching. In balancing learners’ autonomous work versus structure and control Sunny seemed more on the control side though she allowed personal creativity and elaboration. She used strong classification of roles and thus status and power, though she often ‘levelled’ with learners in lessons.

There was some integration of subjects under the heading of IEE and by Sunny’s crossing boundaries of time allocation when needed. The different location of learners’ work in IEE also indicates a loosening of boundaries within the structure of the school’s timetable. Sunny’s work is quite isolated as hardly any other teachers take part in it except for a short collaboration with the English teacher on writing the Letter in a Bottle. She has limited the connections to the local community as she excluded visits to work places and introductions to parents of the IEE work had also decreased.

Learners' recognition and realization rules

Learners' recognition and realization rules appeared to be developed and they knew what was expected of them in IEE. They seemed to understand the "rules of the game" and in some respects could behave accordingly. They didn't always know how to handle the freedom offered in creative work and the teacher stepped in to correct their behaviour. It may be that recognition rules from other schoolwork were regulating their behaviour in an RD of traditional schooling that is different from the relative autonomy and freedom of IEE work. Their realisation rules were still developing.

7.1.5 The social ecology of IEE in Country School

The RD of Country School and the ID of IEE are in some conflict with each other. The design of the building offers flexibility and boundary crossing but these properties are not present in the general use of time and space. It is more 'one teacher – one classroom', a manifestation of a more traditional RD that wants quiet and obedient learners with a single teacher. Thus Sunny's preferred IEE aligns with the RD but she has some leeway in control of space and agency.

Although Sunny's personal and professional values fitted well with the ethos of IEE she leans towards strong framing. She acknowledged learners' ideas and allowed some autonomy and choice but limited risk taking and held chaos at bay. She had reservations about the extra work required such as planning and preparing field visits. These factors can be seen as related to teachers' contracts and to the demands of being a family person. The administrator supports flexibility but Sunny sees it as an attitude of indifference that the principal does not visibly show interest or look closely into her planning of lessons. The principal and other teachers in the school were familiar with IEE but did not take part in it as it was a 'one-teacher task' in this school.

The regulative discourse of schools that include conflicting notions of character and manner, of innovation and traditions also affect the nature of the instructional discourse in Country School. The social ecology of IEE Country School is depicted in Table 7.5.

Table 7.5 The social ecology of IEE in Country School

Systems	Systems characteristics	Observations – comments
Personal level	Balances control and freedom, leaning towards strong framing. Artistic approach. F – to F ++	Allows learners freedom to choose and create within her set frame.
Microsystem School leaders and colleagues	Leader and colleagues are familiar with IEE. Principal allows expert’s support. The ethos of the school is generally in the form of strong or very strong classification. C ++ to C ++ But the smallness of the school offers flexibility for crossing boundaries C –	School leader sees IEE as a part of the school’s image. IEE the work and responsibility of one teacher.
Mesosystem IEE as a curriculum area by school	School works on developmental project, emphasis on individual learning. Physical arrangement of IEE flexible within the school but does not reach to the community C – to C + Evaluation procedures mostly traditional – not clear in IEE C + Builds on a system of strong classification but IEE deviates from it in some respects.	Integrating subjects within IEE weakens classification. Time-table lessons gives some space for learners’ control of sequencing and pacing. Evaluation criteria for project work not developed, could be more explicit both for learners and parents.
Exosystem Parent and community aspirations towards IEE	Reliance on traditional measures of school quality. Traditional school subjects given priority. C ++ Parents minimally involved in school activities, introduction of IEE work less than the preceding years. Indifference towards IEE or interest not expressed. C ++ (strong classification between home/society and school)	Parents (and society) do not oppose IEE but seem to pay attention to the subjects of the national tests that build on a strong classification of selected (respected) subjects. Parents meetings with teachers are usually about the “core” subjects.
Macrosystem	Law and policy expects innovation education. National curriculum includes innovation education. Official evaluation procedures focus on selected subjects. C – to C+	The official discourse calls for creative and cooperative individuals but offers an evaluation system on an individual and strongly classified subjects basis.

In Country School there is a system of organizing teaching and learning that builds on strong classification and strong framing, a historical legacy of teachers reigning over the learners. IEE within Country School is a deviation from the RD that appears in the meso and macrosystems of classified subjects and roles of learners and teachers. The official RD is indicated through the official evaluation system that values the strongly classified subjects. Those values in turn influence what is considered quality education in society, which is particularly important for parents that have limited opportunities to official

measures of school quality. Evaluation of IEE could be more visible, to give learners and society (parents) clear messages about what is expected of learners and how it is to be assessed, thus gaining more respect and interest for the subject. Explicit evaluation criteria can also give learners the opportunity to set their own learning goals and meeting the claim for individualized learning.

In the next section of this chapter I will describe my findings in Trio School and draw up a picture of the setting and the characteristics of IEE practice in that school.

7.2 Trio School – developing collective experiences

Trio School is a compulsory school in a rural area spread across three locations, after a merger of three formerly independent small schools in 2007, Mare School located in the small Mare village by the seaside, Northbound School in an agricultural area and Angelica School in an agricultural area where there is an agricultural university. There were 97 learners in Trio School in 2009-2010, 11 in Northbound, 36 in Angelica and 47 at Mare. All schools offer classes from grade 1 to 7, but all grade 8-10 learners attend Mare School.

7.2.1 Trio School

IEE in Trio School is led by Sif a teacher who attended the same IEE course as the teachers in the other case schools in the summer of 2006. Sif had asked me to come to Trio School and give a course to the other teachers of the school. I recommended that all teachers attend and also requested that the administrators attend as I knew that IEE is not well known to school personnel. I gave a basic course on IEE for Trio School staff in Mare School in August 2007. The majority of teachers attended but not the administrators. In November 2007 I had a follow-up course for the group of IEE teachers and started my collaboration and research with them at the same time. The last course was in February 2009 at my third and last visit to the school.

Policy of Trio School

The policy of Trio School is guided by the educational vision of the municipality and the vision of the compulsory school law which aims at preparing learners for the future with a solid academic, vocational and social foundation so they can become active participants in society. Trio School also emphasizes good collaboration with homes, the local community and its environment and wants to create a unique position through powerful innovation and entrepreneurial education. Another emphasis of the school is to cultivate in learners a sense of community so they can be proud of their school and its environment.

The school has on its agenda several projects and developmental issues that are seen as enhancing each other. It follows the Olweus agenda on eliminating bullying and discrimination, and promotes outdoor teaching, connection with the community, innovation and entrepreneurial education and the development of teaching, learning, assessment and evaluation procedures. Sif the lead teacher of IEE wanted to integrate elements of the developmental agendas, for example, outdoor teaching and innovation education (TS2, 8).

Acting principal Karl says that an innovation in the national curriculum requires the initiative of an individual to implement and that it is the first time they have formally provided IEE (TS11Iad, 3). He thought it necessary to have IEE as a special subject to get things going but later on it will be like with the computers and IT, it will be a part of every subject "... but it will not get into school work until there is general knowledge and acknowledgement of it" (TS11Iad, 3). They only started doing IEE at Mare School as a collaborative project of a group of teachers with Sif as the leader.

The IEE work is led by Sif who gets some time allocated for her work as Karl acknowledged: "This kind of work needs someone to lead and boost" (TS11Iad, 3). The administration allowed my research visits and courses for the teachers in IEE, which was in a way an acknowledgement of and support for IEE.

Administration

The main administration and the principal of the merged schools is located in Mare School, the vice principal at Angelica and department head at Northbound. The main principal Sigmund took paternity leave in the winter of 2008-2009 and Karl the vice principal from Angelica was his substitute and two department heads served at the same time at Mare School.

Karl the acting principal finds that there is a lot of flexibility in Angelica School as they commonly teach multi-age groups and that traditional class-by-class teaching is too rigid. He wants to loosen the classification of schoolwork finding it to be bound by subjects and structures so that feasible options for change are limited. He wants stronger connections with the preschool. He sees the new official curriculum from 2007 as offering flexibility in schoolwork creating possibilities but he wants to introduce this flexibility, step by step.

People need to experience it ...that they have advance notice before being ready to work in that manner and we have the best conditions in the small school to try things out. (TS11IAd, 9)

Sif found the head principal to be half-hearted in his support of the development of IEE in the school. He did not attend the courses offered or take an active part in discussions and preparations for IEE. Sif felt that she needed the full support of her principal when she was dealing with problems of disinterest and doubt. It must be remembered that the head principal took leave for the school year of 2008-2009, which was the time span of my main data collection. Sif had been acting under his administration before and after this research period, and made her judgements from a longer time span than my research covered. She says that Sigmund has never been “onboard and involved” in the IEE project or supported her directly in the development of IEE: “I may be the manager of this project but I don’t set the course and I don’t steer the ship” (TS16ItSi, 12). Karl was supportive of her work but did not take a stand in work with the Mare teachers and did not attend the courses.

Sigmund the head principal got an opportunity to read over the chapter about Trio School and expressed views that contradicted Sif’s interpretation. He said that it was his proposal to have Sif as leader for IEE in the three schools. The work she had started in Angelica was implemented in all three schools on his initiation when the schools merged in 2007. “So this project I fully supported even if I did not attend your course” (principal’s comments on the Trio School chapter). Sigmund claims that the problems that arose in the collaboration in Mare School were mainly because of Sif’s lack of collaboration skills. According to him, most of the teachers really liked the ideology of IEE and its activities and what it gave the learners and the local society but they had some issues in working with Sif.

Arrangement of IEE lessons in Trio School

In Angelica School IEE was offered for the first time as a special subject in 2006-2007 for learners in grades 5-7, working with basic methods and elements of IEE, developing into participation in a competition about work safety and ending with preparing and hosting a conference about ‘sustainable innovation’ in late March.

From 2007 Trio School has worked according to the following arrangements for IEE:

In grades 5-7, the foundations of IEE are built, learners learn methods to create and develop ideas and introduce them in written and pictorial form. The main focus is on creativity as they learn to scrutinize their environment with a critical eye and to be sensitive to its needs and problems. Learners look for solutions and design something from the beginning or redesign things that already exist (TS27Curr4, 1).

Grade 8 in IEE is called ‘Smoke Free Class’ and is considered as a continuation of the three-year training in IEE methods and thinking from the previous years. Learners use the IEE methods to implement into their work at

finding ideas for preventing young people from smoking and taking part in an international competition. The project combines the practical use of Icelandic, Information Technology, Life Skills, Science, Mathematics and Textiles. The period ends with a conference the learners prepare and host to introduce their ideas and the importance of being smoke free. The learners from Angelica School have landed one of the first three prizes in the last three years (2005-2008). The teacher has had collaboration with firms in the community to support the project financially. (TS27Curr4, 2)

In grade 9, running of a coffee shop, is used as a practice in running a small firm for eight weeks. Emphasis is put on educating and training learners partially through having guest teachers from the community that have a specialisation that is relevant to the running of the coffee shop. The main focus is on training in service as professionalism in the service sector which is a growing source of wealth in different regions in Iceland through growing tourism. The cultural aspect is highlighted as well as learners are encouraged to look for entertainment and local lore as well as themselves entertaining with music, reading or performance of other kinds. In the project learners use and practice Icelandic, diction, Life Skills, Home Economics, Arts, Mathematics and some Business Administration (TS27Curr4, 2-3).

Grade 10, the project Creating Local Valuables (CLV) is about design and product development in collaboration with local businesses and runs for six weeks. The project was in the first year about designing a food product from local meat in collaboration with the local meat factory. The intention is to introduce to learners the potentials of their local work life environment and to enhance their agency as prospective enhancers of local work life and society. Other teachers in the school are expected to take part in the project, the foreign language teacher, mathematics teacher, Icelandic and science teacher, home economics and arts teacher, crafts teacher and textiles teacher. Guest teachers, specialists in their area of work, that live in the community also come and teach the learner group about: how to ignite ideas, nutrition, advertising psychology, packaging and logos, the meat factory, the local food project and a professional chef oversees an experimental kitchen (TS27Curr4, 3) The guest teachers neither take fees for their teaching nor travelling costs (with a few exceptions guests got paid travel costs). (TS23Add1)

In the school year 2010-2011 the CLV project was not run and according to Sigmund it was not possible because of a very small cohort in grade 10 and a huge range in capability in the group.

IEE teachers in Trio School

A group of Trio School teachers formed an IEE team for older learners (grade 8-10) coming from all three locations to Mare School, lead by Sif the teacher who had the longest experience in the area and had attended the in-service summer course in 2006. This group attended the course I gave in the school.

Sif is a vibrant and enthusiastic woman who is passionate about her work. She is creative and resourceful and doesn't hesitate to do things if she thinks they are fun, helpful or constructive. She is quite talkative and freely gives her opinion on any subject. Sif is educated in Iceland, Norway, Austria and Germany and took her teacher education in Iceland. She was originally educated for another profession that she pursued for a few years but after a divorce she moved to the rural area in Iceland and started teaching and found it to be a great profession (TS33Add4). She was soon attracted to teaching projects with IEE approaches and methods as she said and quotes her own learners "It makes so much sense" (TS29Add4). She started those approaches by integrating various elements into her Danish teaching by making links between the language, the culture and the country. When Sif attended the IEE summer course for in-service teachers in 2006 she had already started a few IEE type projects in her school Angelica and later in Mare School. After the course she constructed continuity for IEE in the school curriculum for learners from the age of ten to sixteen (see above).

The teachers in the IEE group expressed appreciation for having Sif's lead in the implementation and development of IEE: "We have totally depended on Sif for the first round" (TS2Itgr, 2). Fanny said that she had to lean a lot on Sif for support in the beginning: "I was so insecure in the beginning; I think Sif had to take on a lot of the responsibility" (TS10ItF, 3).

I observed in IEE lessons that the teachers had a lot to do and how they were very busy as learners called for their assistance as several different jobs were going on. The teachers also mentioned that in the IEE lessons they were "drowning in demands" (TS6o, 2). At their collaboration meetings they brainstormed solutions to diminish the pressure of too many demand. Teachers have better control of demands when classification and framing are strong and this may help to keep *chaos angst* away and it is an understandable and often easier choice than the risk of potential chaos with looser framing and less clear classification.

Sif explains the reluctance of teachers to take on demands of IEE outside their zone of comfort where they are secure and risk free:

Teachers are very tenacious about their territory. They are used to controlling and teaching and that is one of the things they partially have to get rid of when they take on IEE, to no longer control but rather guide, be there and help out. Not to give their own opinion but rather elicit the learners' opinion. It is a bit difficult to get the teachers into this particular channel. Some of them have taught for many years and they are deep in their rut, they have a fixed mindset. (TS16ItSi, 3)

7.2.2 *Ownership and agency of teachers*

It was clear from some of the teachers in Mare School that they were somewhat reluctant and even hostile towards taking on IEE. The two department heads Ben and Lisa that took part in the evaluation discussion meeting at the end of the CLV project and were meant to have taken part and supported it were both disinterested at first. Neither of them had attended the first two IEE courses offered for the teachers. Lisa was critical and complained about the things that she thought had gone wrong such as how the project dragged on and lack of communication from the lead teacher to the other teachers. At the meeting Ben declared: "I was not interested in the beginning" but he had changed his view and admired the success of the project, expressed praise and said that he had seen the strengths of the project: "It's a great project and it was good to get acquainted with it. It's positive that learners find that they can do things themselves, the project was a success, just splendid." (TS7o, 2).

From the very beginning of Fanny's involvement in IEE she spoke of her insecurity and reservations towards it (TS2Itgr, 2) and that she felt that it was a demand from the top (TSItF, 3). Fanny has taught at the school for 13 years and though she does not have a teacher education certificate, she has attended many courses for teachers through the years. She took the initial IEE course I offered for Trio School, but she was still uneasy about teaching it, as she felt she was not able to put herself in the learner's shoes and assist them as needed. Fanny felt that her early IEE work was a bit of a fumble and she relied a lot on Sif's lead. She felt that she didn't understand the basic thinking of IEE so she wasn't able to explain it to learners. She said that she liked to have clear rules and boundaries, to know exactly what is expected of her. She wished that she could have taken smaller steps in her development such as having the opportunity to observe IEE with an experienced teacher: "I felt that I was a bit lost and didn't know a thing" (TSItF, 3). She noticed that it was easier to work with IEE the second time around as learners had gotten to know the subject and were more ready and more positive. She too had attained some experience of IEE that helped her. The second time I observed Fanny I could see that she had gained security in

her approach and was growing as a professional in IEE and in teaching (see narrative below, pg 177-179).

Fanny said that the IEE approach was starting to influence her teaching in other subjects such as in nature science and social studies: "... so that the learners have to find their own solutions to problems, I have started doing that a little bit" (TS10ItF, 6). Even though she has matured in her IEE development she feels that she has a long way to go yet: "I would like to have lots of courses in IEE but most of all I would like to sit in lessons with teachers that are used to teaching IEE not just one but several different teachers" (TS10ItF, 3).

Some IEE lessons

Sif decided to use IEE to support the policy and main goals of the school and enhance projects that already were going on thus easing the transition of IEE into the school. The school emphasises a 'sense of community' and making learners active participants in their communities. This was clearly visible in the IEE curriculum and lessons when learners were given agency to react creatively to their environment, try real roles and operate in collaboration with local agents. Examples of these were: a boy designing and making a camouflage cloak for hunting wild animals (Figure 7.14), running the coffee shop (Figure 7.15) and visiting the coffee factory or the meat factory and communicating with visiting specialist teachers from the community.



Figure 7.14 Making a camouflage cloak for hunting (TS5o, 7)



Figure 7.15 Running a real coffee shop as a school project (TS3o, 3)

Creativity in IEE

Learner creativity was evident in observations and teachers needed to deal with similar restrictions that are known to hold creativity back i.e. teacher control, time restrictions and lack of flexibility. The teachers were deliberately trying to give learners creative freedom and holding back their own control. Fanny a teacher at Mare School found it difficult: “One thing I found particularly difficult was to step back and not interfere with the learners’ ideas” (TS10ItFa, 8). Learners also seemed to deal with their own known patterns of ‘correct’ school behaviour, as the rules in IEE are different from traditional rules of schooling. Design and crafts teacher Finn in Mare School said that the learners from Angelica School that had been experiencing IEE for some time were quicker to adapt to the freedom and agency that they were offered in IEE and crafts, than the learners from the other locations “... they completely realized what they were getting into” (TS9ItFi, 3). In other words they had acquired both the recognition and realization rules of IEE.

Framing was sometimes deliberately loosened to give space for learner creativity. Learners in the coffee shop project were offered a time-frame and overall content (running a coffee shop) but had the freedom to decide the theme of each evening, the entertainment, the decorations and catering treatments (TSo1, 2). The following description and sequence of pictures depicts the framing and creativity in an IEE lesson with grade 7, with collaboration of five teachers: Sif, Finn, Julia, Fanny and Jon:

In the beginning of the lesson Sif addressed the whole group of learners and explained to them what they would be doing in the three consecutive lessons

comprising one IEE session and wrote the main issues on the blackboard: A key chain for many keys – looking for needs – the notebook – introduction of inventions – what happens to ideas – why learn innovation? Sif praises the learners for their work in the last IEE lesson and says they were hard working and very creative. She tells them that they will watch a short video about innovation education and then revise the required contents of a poster that they are going to do for their design. Sif also introduces the yearly innovation contest for compulsory schools, tells them about the prizes and that the president of Iceland gives the prizes to the learners that win. She also mentioned that they will have their own ‘invention day’ in Trio School to show learners’ ideas. Sif then introduces the main elements of the poster: description, target market, need, solution, materials, logo, producer and name of product (tasks F +). Learners can then decide and elaborate on the look of the poster and control details in the contents of the elements (design F –). Sif tells them to continue working on their posters (sequence F +) and one learner declares that he has finished that part and is allowed to continue to the next step (pacing F –).

Most of the learners take down from a shelf plastic containers in which they keep their IEE things, and start working individually or two and two together as they choose (social relationship C –). Teachers start to assist and help learners to get going, often lowering themselves physically to learner level and also trying to be on their level when it comes to the learners’ own ideas, respecting that they are the experts in their own ideas (C –). At the end of the first part of the lesson the learners are allowed to go on different locations within the school if they need to work on producing their ideas either as models or prototypes (social/physical space C –). Some learners go to the crafts room, others to the textiles room and others stay put.

In the textile room Julia is starting off with the learners, they are impatient and need her help to get started. Julia has collected some old items in “treasure bags” as she calls them to use to ignite learners’ ideas or to give them a push and stimulation in the design process (Figure 7.16). There is a lot going on and Julia is busy, assisting learners to get going. One learner is with her, one is on the floor cutting material for his hunting cloak, one is looking in books to prepare for the development of her idea and two girls are waiting to get Julia’s assistance and glance at the boy working on the floor. In the crafts room teacher Finn and a few learners are working hard, Finn goes between learners and assists them, models how to apply tools and answers questions about materials and work methods (criteria F +). The learners are making things they have invented and or designed that are related to their lives and interests (F – and C –). One boy is making a case for hunting guns and a girl is making a ping-pong racket with a watch in the handle.



Figure 7.16 Treasure bags for stimulating creativity (TS5o, 5)

In the classroom where the IEE lesson base is, several learners are working on developing their ideas. One girl is designing a mirror for herself and Sif has sat down beside her and they are discussing some details in the practical functioning of the design. It is an example of ‘a creative chat’ as was also seen in City and Country School. Sif asks how the girl has imagined doing those details and Sif suggests some solutions in a questioning form. In the picture (Figure 7.17) the teacher is writing a potential solution for the learner’s problem. This seems to be a sensitive moment where the danger is that the teacher and her creativity take over the learner’s idea thus limiting learner agency and creativity.



Figure 7.17 A sensitive moment – the creative chat (TS5o, 11)

By the end of the IEE lesson it became evident that Fanny one of the IEE teachers had dealt with a certain problem in a creative way. One girl had tried to make herself 'invisible' by skipping the lesson when they were allowed to choose a location for work. Fanny had spotted her and started a discussion with her about what she wanted to do as an invention. She suggested to the girl that they would brainstorm any words they could think of and note them on paper. After doing this for a while they stopped and Fanny asked the girl if she could possibly find a problem linked to any of the words that she wanted to try and solve. The girl soon chose the problem: "you lose the teabag into the water and it's difficult to fish it up." The girl then designed a solution to this problem. Teacher Fanny had found a creative and constructive solution to the problem of 'disinterested learner' and became the agent for the solution and thus expanded her professionalism. (TS5o)

Time issues relating to IEE

Lack of time is usually the explanation for why areas like IEE are not offered in schools. In Trio School they arrange a six week continuum with three consecutive lessons for IEE with the rationale that the time is used to teach and train several subjects at once. In the beginning Fanny came to me in my first visit to Trio School and told me that she had reservations about these IEE lessons and felt that it was taking away valuable time from what she had to cover with learners (TS2Itgr, 2).

Sif reflects on IEE and says: "What characterizes the IEE process is the limited time that I can spare for the subject" (TS22Ref5, 1), so even though she sees the importance of IEE she thinks there are other important issues: "I'm constantly worrying if the learners get the correct division of time for design, computer, arts and crafts lessons."

In the project *Creating Local Valuables* the teachers experienced a lack of time for collaboration and had to deal with stress and conflicts. In the evaluation meeting discussing pros and cons they concluded that the structure of the project needed to be stricter to enhance its effectiveness and make better use of time (TS7o, 2).

7.2.3 *What is IEE in Trio School to participants?*

As an educational offer for the younger learners IEE is classified within the manual subjects and is called on the timetable 'Innovation and Arts'. At the older levels it is set up as special projects that are introduced with names: *Smoke Free*, *The Coffee Shop (CS)* and *Creating Local Valuables (CLV)*, without assigning particular subjects to them. The area of IEE has open boundaries in Trio School and has been getting more clarity as a special phenomenon with the developmental work they have done since 2006.

Sif has a view on what IEE is for her: “I have always looked at IEE from an integrative point of view, as a subject that weaves into all subjects and has no boundaries” (TS22Ref4, 1). Thus she has a very broad view of IEE that I see as very weakly classified (C – –). Sometimes the learners are taking on real roles as participants in society, for example, when they serve as waiters in the coffee shop and they get opportunities to create and act on their own ideas when they develop, make and introduce their ideas either at a conference for the general society or as a feast and dinner party at the end of the CLV project. Sif looks at IEE in the Coffee Shop project as covering life skills, bookkeeping, mathematics, Icelandic and advertising literacy in addition to enhancing creativity and agency of learners (TS22Ref4, 1). At Angelica School IEE is seen as an ‘arts and crafts’ subject partially as a substitute for crafts that has meagre facilities and no skilled teacher. Technology education is seen as the crafts teacher’s responsibility (TS11Iad, 6). IEE has not been used in or with science teaching in general in Trio School. However Rakel from Northbound mentioned that they had used the IEE approaches when learners were designing and choosing a place and items from nature for the outdoor classroom that they were making in the neighbourhood of the schoolhouse. The teachers deliberately held back their ideas and listened to learners’ suggestions and acted more as assistants and workers than as teachers in the traditional sense. Also as reported above, Fanny had started to use the IEE approaches in her science teaching.

Finn the crafts teacher at Mare School considers IEE to be primarily a method or an approach that should not get more attention in the curriculum than other methods of teaching and therefore should not have a special time on the timetable. This view of IEE can be seen as weakly classified, as a method, rather than an all-encompassing learning area. However he thinks that as it has been introduced in courses for teachers it can be seen as a special subject (TSItF, 3-4) which is a more classified view. Fanny has a similar view and thinks IEE is a technology of learning, an approach and ideology that more teachers should utilize in all teaching (TS11ItF, 6-7). Sif says she looks at IEE in general as a broad spectrum and that she uses ‘innovation education’ freely:

[IEE is] All design work and creation of something, either tangible or the idea on a paper that is innovation (‘new-creation’ is a direct translation of the Icelandic word). Something that originates in learners’ thinking and goes through a process of formation and maturation. These projects, Smoke Free and the conference fall under IEE. Learners are creating, making, designing and showing their work. (TS22Ref4, 2)

Karl acting principal thinks that the location of IEE is a question of a short and long-term view:

In the beginning it needs to be a subject or a support in integrative work as we are experimenting with in Mare School (the older years). Then it is home economics, arts, textiles and design and crafts, and done through these teachers collaborating as a special subject all working from these perspectives of ideation using creativity in these areas. (TDS16Iad, 7)

He is arguing that in order to gain a status it needs to be introduced as a subject (C +) and then it can be developed as a tool for learning in any subject.

The rationale – benefits

The teachers see many potentials and benefits of IEE for learners and society regardless of whether they see it as a method or a subject. Gunna who teaches home economics and arts finds IEE important as it requires learners to create themselves: “It is important that they just don’t get everything handed to them, rather that it comes from themselves. It enhances their instinct for self-preservation, they are not being spoon fed” (TS13ItG, 3). Finn the crafts teacher thinks it is important both in IEE lessons and in design and crafts that learners: “... think from their point of view about all things they handle every day and contemplate how little needs to be changed to make it better” (TS9ItF, 5). He also thinks it is important to enhance innovation in work processes not just in inventing and making things. Fanny is convinced that IEE thinking is helpful for learners in life and work if they can master it: “If they become aware of their own thinking powers and are able to tap into it” (TS10ItF, 6).

Sif sees much potential in IEE, materializing for example at the conference (Smoke Free Project) in Angelica School when she saw how proud the learners were and that they felt important and had a lot of fun (TS23Ref5, 2). She says IEE offers learners the opportunity and setting to do the things they are interested in and that they have thought of themselves. She thinks IEE benefits learners and offers a good way to show what they have learned in compulsory school. “I think the IEE approach, with running a business, organizing a conference and taking part in competitions, is a good option for learners and keeps them ‘on their toes’” (TS22Ref4, 2). Sif also thinks that it is important that learners are consciously aware of the value of their education and that they connect differently and more constructively with their education if they sense its importance and usefulness. IEE approaches help them to connect on that level (TS33Add4, 1).

The teachers experienced pleasure in IEE lessons as they observed learners being creative. Gunna said: “It is immensely enjoyable to see when they are inventing something. It’s so much fun to see what is emerging in their heads, ideas and such. I just think it is stunning

to be there and notice when they are ‘lighting up’. To see how inventive they are, making such cool things” (TD13ItG. 6).

Sif finds IEE appealing: “It’s just so much fun. I think it is because in IEE you get these rare moments when learners work, and it should be like that more often, but its when learners really work hard and teachers are more like guiding, observing, watching and looking at the activity somehow” (TS16ItSi, 2). Finn enjoys IEE and teaching crafts when the process has started with the learners, when they have developed an idea and have started to work on making it (TS9ItF, 9). Fanny says that it is most rewarding “... to see the incredibly creative imagination that the learners possess and how they are able to produce so many excellent ideas” (TS10ItF, 10).

Collaboration – developing collective IEE teaching efficacy

Sif had arranged short teacher meetings after each IEE session to discuss what had gone well, what not and if materials were lacking. She also arranged a meeting for reflection on the CLV project of teachers and managers that were or should have been involved in the project to evaluate it. Even though the collaboration of the IEE team in Trio School at Mare School was not without tensions and conflicts it was a source of strength and potential development of IEE in the school. Fanny declared her gratitude for having Sif to rely on in the IEE teaching but it was also clear in the beginning that she felt that the collaborative work that was partially in “her” classroom was uncomfortable and it was a step on her “turf” (TS2Igr, 2). In a group discussion about IEE some of the teachers acknowledged the gains of their collaboration.

Sif who had been working in IEE for some time saw the gains of collaboration:

It is so interesting to see how the other teachers think of this, they teach me a lot. It is so useful because we are quite different each of us and I sometimes learn a lot about something I hadn’t thought about, something the others point out to me. (TS2Igr, 2)

She points out that: “It’s important to do this collaboratively and let the thinking sieve into other subjects, especially because it takes time to change so it must happen gradually” (TS2Igr, 2). They rely on the strengths and specialization of each in the team and find Sif’s lead to be a major support. Rakel from Northbound commented:

To work here with them has been simply great. Also because I find this very exciting, but we have completely relied on Sif to tell us what to do next and after that and so on. This is good at least for the first time around, she is actually teaching the learners and us at the same time, then when you go the second time around you become more secure and more self-reliant. It has

been very valuable and you have seen that it is the best way at least for some to learn this in collaboration and then later you can take part in other teamwork. (TS2Igr, 10)

Rakel also noticed the strength of teamwork with her colleague at Northbound when they were assisting learners in designing and creating the outdoor classroom "... and we stopped each other when we started to try and control the direction of the work and started to say: ... this is not going to work, you should rather do it like this..." but then the teachers deliberately stopped and stepped back and let the learners decide (TS2Igr, 11).

Sif expressed appreciation for the collaboration with me in developing IEE in the school curriculum. She found my input highly valuable and supportive both with the courses and as a consultant between visits when she contacted me and asked for advice (TS17ItSi1, 3).

It was very good to be able to clear teaching plans with you and get your comments. I found that to be very supportive. (TS17ItSi1, 3)

She also found my input valuable for the other teachers as:

It made a huge difference to have you come in with your courses, many of the teachers mentioned that and that they had a lot of fun, it made them understand what IEE is. (TS17ItSi1, 2)

Abba teacher at Angelica who attended the first course said that it had been great fun and given her creativity a "push" (TS12, 7) and that she thought: "your work with us is very important and is excellent for lighting the embers" (TS12, 7).

Learners' voices

Most of the learners are taking on a new role when they start in IEE, they are given real roles, pride and agency to be creative and put their ideas into action, they are specialists in their own ideas and sometimes take on the role of teachers (TS3o, 15). They have to learn new rules of schooling, new thinking and new ways of working. The teachers say that they learn this relatively quickly. Teacher Rakel says that her learners caught on to the new rules quickly but were a bit insecure in the beginning (TS2Igr, 10). Sif says learners need supervision and steering in IEE.

Learners in Trio School were generally positive towards IEE having their own opinion about what it is about. Explanations from learners and their interpretation of IEE (TS1Ist; TS14Ist; TS15Ist) fall roughly into two categories, one related to subjects and the other to an integrating view, depicting a process (Table 7.6)

Table 7.6 Learner views of IEE in Trio School

Integrating view – a process	Subject view
<p>We are learning to solve problems and just to invent something.</p> <p>It is general education. I think it is new-creation (the Icelandic word) it is something new and then creating. We are creating something new that has never been before.</p> <p>We are basically learning to make the world a better place and make new things.</p> <p>There is always a need, an idea and then action.</p>	<p>It is certainly a special subject.</p> <p>Science and technology are related to innovation education as we are trying to create something new that may become scientific.</p> <p>I think it is a subject, because it includes so much, every subject can be included.</p> <p>It is both a school subject and a hobby, you know like having fun.</p> <p>It is Icelandic as we are talking a lot and writing down our ideas and descriptions.</p> <p>I think it is similar to arts and crafts.</p>

Some learners say that they want more IEE than they get:

I want more innovation education. I so want to learn how to improve things, I want to make clothes, and I want to do innovations at home, learn it more thoroughly. I think innovation education is the most enjoyable subject in school (TS11st, 17).

Others have similar views and want more lessons in IEE: “I think we should have more IEE lessons because it can teach us kids so much. It can be useful in many ways and we could invent so many things” (TS15Ist, 5). Others just like it: “It’s nice because you are doing things differently (TS14Ist, 2)... I like IEE best of the subjects because I get to invent new things and make them (TS15Ist, 5)... I like IEE because I like changing emphasis and do something I have never done before” (TS18Ist, 4).

Learners find IEE useful and fun, they get to be creative and do stuff and do different things than usual. They see several benefits of learning what they learn in IEE in addition to the relief of doing new things and in new ways:

We learn how to present ourselves and not be rude, and we remember these things much better than political history because it is much more fun ... It is somehow not lessons, we are preparing the event and then when everyone is there, everyone is good.... It is good when you have to get a job to know the foundation of serving customers, to be able to conduct yourself properly and serve... It will be quite useful later for when I have a problem that I would like to solve, I could solve it (TS15, 5).

7.2.4 *Step by step development of IEE in Trio School*

The development of IEE in Trio School during the time of my research shows a process that takes time and that progress is gradual and mostly happens in small steps.

Results, assessment and evaluation

One of the issues that Sif needed advice on, from me, was on how to evaluate the work of the learners. IEE is not suitable for traditional evaluation like testing knowledge. It is about using knowledge rather than attaining it. Sif reflects in January 2007:

The hardest part is, not knowing whether the IEE teaching has got to learners, if I really am building learners to become actors and creators for themselves rather than receivers, or if there is maybe too much steering on my behalf and that learners just tag along and find it fun for as long as it lasts (TS23Ref5, 1).

Sif had set up the CLV project evaluation procedures which included: Learners' reflection, guest teacher reflection, learner portfolio, learner self-evaluation on lesson performance and portfolio and guest teachers' evaluation on learner performance in lessons. Learners' reflections were guided with open questions about an overall view, what it taught them, strengths, weaknesses, what he/she could have done better, how to improve the project, what else to include, and open comments. The evaluation was partially of the project itself and partially for learners' assessment of their work. Sif introduced the assessment scheme to learners and parents at a meeting before the project:

The following will be evaluated built on the aims of the project: Behaviour, performance and interest in lessons, conduct towards fellow learners and collaboration in lessons. (TS32.Intr.)

These points refer to the RD perhaps more than the main goal of IEE to enhance creativity and innovation. However, performance as activeness and collaboration are relevant aims for evaluation. The description of Sif's evaluation includes various elements:

- A. Portfolio, that learners work on and take care of while the project is ongoing. The portfolio is to include information among others from guest teachers, learner's ideation work, cuttings from newspapers and magazines and various fun things that the learner collects in her/his portfolio during the working process. The learner is encouraged to collect and not throw out, sketches, mind maps, and all kinds of scribbles related to the work process. Thus the development of the project can be followed in text and pictures.

- B. Learner self-evaluation on his/her performance in lessons and on her/his portfolio.
- C. Guest teachers assess the participation of learners at the end of each lesson. (TS32.Intr.)

In the coffee house project a contract between learners and a teacher was signed by both that included rules on communication for both parties and expectations on content. The rules of communication were about being positive, fair, understanding, courteous and using careful choices of words. Again this reflects an RD but nothing in the contract is about the work itself or about exercising creativity or agency (entrepreneurship, action).

Sif wrote to me and asked for advice as she thought the assessment procedures were not working well enough for years nine and ten:

I have been having trouble with giving learners grades for their projects in year nine the coffee house and year ten the CLV project. As teacher feedback and learner self-evaluation in grade 9 has been very slack and with no follow up as intended in life skills lessons, I was wondering about using a general reference statement that describes the participation of each learner in the project. ... Can you help me with getting on track with this? (TS35Add6, 1).

My advice to her was that she create a rubric with three or four main categories with a scale according to performance and the categories would be built on her main emphasis in the project. My suggestions of categories were: A. Creative work – solutions. B. Collaboration. C. Independence – action/activity. D. Attention to detail and responsible work.

The development of evaluation of learning in IEE in Trio School is thus in a cycle of reconstruction and needs time and attention to reach an acceptable level. The evolving evaluation procedures are an example of developmental work in schools that is taken step by step according to the available level of mastery. One step is making the procedures visible in the beginning such as she did with the Creating Local Valuables (CLV) project and to make the main goals of creativity and innovation a prominent part.

Teacher development

Teacher Rakel described the cycle of experiencing and developing IEE quite well as she pointed out that in the beginning the teachers learned a lot from Sif's lead and then gained experience and confidence to take on IEE the next time around (TS2Igr, 10). Sif also realized the importance of reflection and discussion about issues in IEE as she arranged the short meetings for the teacher group working at Mare School each IEE session and the

evaluation meeting at the end of the CLV project. Those meetings also were a part of the steps that were taken and gave the foundation for further steps to be taken to strengthen and sustain IEE in the school.

The development of individual teachers was also noted. Some teachers were already far along (Sif), others seemed unchanged but the clearest example of noticeable development was Fanny's case. Fanny developed from being defensive and territorial to being interested and capable of transferring the IEE approach to her general teaching, but still admitted to have some way to go in mastering IEE. Ben the department head at Mare School was another example of development from being disinterested and unsympathetic to coming to understand the strengths of IEE and being positive forwards it and that it was the responsibility of all the teachers in the school to make it work.

The connection to the local community in IEE seemed to be quite strong and relied on Sif's active introduction to parents and having them and the local work-life take part in the projects of older learners.

Framing and classification in Trio School

The classification and framing of IEE lessons in Trio School was mixed, as in Country and City School, with its own characteristics towards a looser framing than in traditional school work.

The school had mixed features of classification (Table 7.7) as it operates a traditional system but contributes to IEE with considerable weakening of lesson content (integration of knowledge), flexible group arrangements and location of work and with collaboration of a team of teachers. This organization is supportive to IEE with administrators willing to arrange IEE according to its needs within a traditional structure.

Table 7.7 Classification of IEE in Trio School

Arrangements	Descriptions
Structure of timetable	Mainly traditional arrangements of lessons. Long periods arranged for IEE projects and lessons. Considerable flexibility for out of school visits. Weak C (C +)
Group arrangements	Set class groups of mixed ages. Individual work or work in smaller groups with different individuals within the class. Strong C (C +) – also weak C (C-)
Physical location of IEE work	Work is on several locations within the school. Frequent visits/fieldtrips outside school. Weak C (C –) to very weak (C – –)
IEE teacher, specialist – collaboration	One IEE teacher specialist in the school leading a team of teachers gaining knowledge and skills to develop the subject within the school. Weak C (C –)
IEE lessons, content/nature	Deliberate integration of knowledge and skills from many subjects and connections with life and work life. Weak C (C –)

There is a mixture of strong and weak classification and framing of the social base in IEE in Trio School, though often weaker in the older classes (C –) (Table 7.8).

Table 7.8 Pedagogic features of the social base in Trio School IEE lessons

Role – control	Generally	Exceptions – tendencies
Social space – location of work	The location of learner work was set within different rooms in the school – within the room and the school, learners could choose between locations negotiated between teacher and learner. C – (weak classification)	
Social space – learner and teacher	Teacher and learners occupy their own space but frequent moves between these in the younger classes. C + (strong).	In the older classes there was more freedom and learners and teachers occupied the same locations and teacher moved between learners. C – (weak).
Communication	Teacher controls some of the communication, learners ask permission to speak to teacher. F + (strong)	In the older classes and after input from teacher, learners and teachers freely communicated, learners speak together (atmosphere of workshop).
Behaviour – conduct	Learners work quietly and do as they are asked, often immersed in interesting work. Mostly handle freedom responsibly and seldom need reminders of accepted behaviour. F – (weak)	
Roles – identities	Learner have agency in defined areas and are aspiring innovators. C mixed C + towards C –	In older classes learners are aspiring innovators moving towards ample agency and to be innovative i.e. creative and active. C –

The instructional discourse in IEE lessons in Trio School was also mixed as in the other two schools, though here more towards weak but seldom very weak. The ID that emerged from teacher framing is summarised in Table 7.9 first for the different elements of selection then for pacing, sequencing and criteria in Table 7.10.

Table 7.9 Framing: selection – in IEE lessons in Trio School

Control over selection	Generally	Exceptions – tendencies
Knowledge	The focus of the content is offered by the teacher but allows learner ideas to influence their development. F + (strong)	In many projects the focus and content is greatly influenced by learners. F – (weak)
Needs	The learners suggest several needs and select which they want to address conferring with teacher. F – (weak)	
Tasks	The teacher offers a limited range of tasks to choose from and the learner makes the final selection. F + (strong)	Sometimes Sif framed tasks more weakly and learners had considerable choice. F – (weak)
Methods	Teacher and learners suggest different methods and learners select. F – (weak)	Sometimes learners could freely choose methods or with teachers permission F – –, F- (very weak, weak)
Materials	Most commonly the learners had a range of materials to choose from. F – (weak)	
Direction of developing ideas	Most commonly the learners develop their ideas with teachers support. F very weak and weak (F – and F – –)	Instances were seen where teacher creativity might have been taking over in the design process with strong framing (F +).

Table 7.10 Framing: pacing, sequencing and criteria – in Trio School’s IEE lessons

Control over	Generally	Exceptions – tendencies
Pacing	Most commonly the learners were able to set their pace within a set time frame that sometimes was possible to stretch. F – (weak)	
Sequencing	Learners were able to do alterations to sequencing of some tasks or parts of processes. F – (weak)	Sif sometimes controlled the sequence of tasks within projects. F + (strong)
Criteria of on-going work	Criteria are visible in the process. Teacher makes comments about learner work, corrects and guides – criteria usually just given individually. F – (weak).	
Criteria as formal evaluation	In some projects the criteria for evaluation were visible through a contract and at an introductory meeting for parents and learners in the CLV project. These were largely built on the RD. F + (for older learners).	

The strength of Sif's framing is mainly weak (mixed) in her lessons though sometimes strong but usually not very strong. It was interesting to see that Sif in the social studies lesson I observed (TS04) showed framing that was very different from her mode in IEE. In the social studies lesson she was much more in the role of the traditional teacher where her framing was strong to very strong in most aspects and the classification of social roles as well. In this lesson she stood by the blackboard and used the 'read-question-answer-chat' method that is common in Icelandic schools (Sigurgeirsson, 1992) except that it was even more teacher controlled so it was 'teacher chat-question-learner answer- teacher corrects or answers'. There she was the teacher with the correct answers and was leading the way to learning more distinctively than in IEE although she used different media to introduce diversity in the lesson. It was clearly an ID and RD of strong framing and of strong classification.

The framing in IEE lessons in Trio School was generally mixed, with the freedom of the learners limited to some extent, for example, framing of pacing within the frame of time and project (Coffee Shop, six weeks). Learners had some choices of tasks, materials and methods and they had freedom to create and develop their idea. They could work at their own speed with some limits of finishing (pacing) and the space to work in was inside and outside school in the older classes but more located within the school for the younger. Evaluation criteria were not visible to the younger learners but were introduced to the older and their parents and these were developing and being scrutinized.

The weak framing inherent in IEE was offered by the Trio School teachers although some of them felt uneasy as Fanny expressed honestly. Trio School is coming from a strong RD but IEE tends towards a weakly framed ID and is developing. Fanny's case shows how the IEE approaches are influencing her teaching of other subjects thus potentially changing the RD of the school if other teachers develop on that same path.

Learners' autonomous work versus structure and control in the IEE lessons seemed to be balanced by the teachers as they allowed flexibility for learners' creativity, but the learners seemed to lean a lot on teacher control especially in the beginning of lessons.

Classification was blurred in the IEE lessons in Trio school as teachers were mixing subject knowledge together; subject teachers were collaborating under the heading of IEE and were also crossing boundaries in the 'one teacher-one classroom' pattern. The different location of learners' work within the school in IEE and also in the older classes going out of the school indicates a loosening of boundaries of location of school learning. Sif's collaboration with parents and work-life in the local community also indicates a loosening of classification among schools, home and society.

Recognition rules in Trio School regulate learner conduct and manner. These recognition rules originate in a RD of traditional schooling and learner ideas of ‘real’ schooling and ‘correct’ school behaviour. As mentioned above recognition and realization rules seemed to have taken their form from a strong RD expecting teacher control and appropriate behaviour. However as Finn mentioned the learners from Angelica School had acquired both the recognition and realization rules of IEE and he said that they were quicker to adapt to weak framing and classification in IEE than those from the other two parts of Trio School.

7.2.5 The social ecology of IEE in Trio School

The RD of Trio School and the ID of IEE are in conflict with each other as in the other two case schools. The RD that the teachers build on and the majority of learners expect is one of traditional strong classification and strong framing. Fanny is an example of how the IEE framing is seeping into her other teaching and changing her ID in general. Sif’s example in the social studies lesson is an example of the persistence of the traditional RD and it is not certain that the changes that are inherent in IEE will expand to the whole school and be sustained in its ecology.

Sif’s personal and professional values fit well with the innovation education ethos but even she leans towards strong framing when she is operating in a different subject frame, social studies. Sif acknowledged learners’ ideas and allowed them considerable autonomy and choice within the frame of the overall projects. As she was allocated time from the school to steer the IEE work she did not find the extra work burdensome. She had been doing this kind of work before she got the post of the IEE project manager and that was due to her enthusiasm and interest in the importance of such work.

There were some differences detected in the ecology of the three sites of Trio School. In Mare School there seemed to be less interest and more resistance to IEE even though it was supported by arranging time for learners and for collaboration of the IEE group. The main principal Sigmund, located at Mare School, showed limited interest in IEE according to Sif and the two department heads acting in his absence were also reluctant and defiant although one of them later took a more positive position by the time of the end of my research. Sigmund contested this view and said he had supported the implementation, and that the problems in the teamwork were because of Sif’s lack of collaboration skills. This indicates that the leaders of the school and IEE were not supporting each other and unresolved tensions existed.

The atmosphere at Angelica school was more open to IEE and they had been doing work on this kind for a longer time than the other schools. Similarly the small division at

Northbound seemed more open to this kind of work than Mare School. Both Northbound and Angelica are small schools that are used to working across age levels and Angelica has been known for progressive work for several decades and among other things emphasized collaboration and contact with parents (A. Macdonald, personal communication 20.10.2010). The work that Sif has been doing with parents and work life in the nearby community (the exosystem) is likely to change the atmosphere towards IEE and its importance and the development of the assessment of IEE in the school also has the potential to work in the same direction.

Trio School's micro and meso ecology (Table 7.11) seems to be a bit more complicated than in City and Country School, that is, the school and its surroundings (micro, meso and exosystems). Several tensions were detected that can either stifle further development of IEE or can be a foundation for further development and progression such as Fanny's and Ben's examples illustrate.

In Trio School as in Country School there is an RD that builds on strong classification and strong framing, a historical legacy of what schools should be like. IEE within Trio School is a deviation from the RD that appears in the meso and macrosystems of the school, a discourse of classified subjects and roles of learners and teachers. The official RD exerts its influence from the macrosystem through law and policy and through the official evaluation system that offers evaluation of the strongly classified subjects. The values may influence parents in particular who have limited opportunities to official measures of school quality. The school is working on evaluation procedures that may be in time considered credible by parents and learners. The evaluation of IEE needs to give learners and society (parents) clear messages about what is expected of learners and thus strengthening the development and respect of the subject.

Table 7.11 The social ecology of IEE in Trio School

Systems	Systems characteristics	Observations – comments
Personal	Sif's profile: supports learner independent work, agency and responsibility. Skillful and secure in teaching IEE; knowledgeable about content and pedagogy of IE; initiates connection with parents and local society. Will and skill in crossing various boundaries. Framing in most elements weak, weaker with older learners. (F –)	Alongside the IEE role is the ID of a traditional RD – teacher control and receptive learners.
Microsystem School leaders and colleagues	Somewhat familiar with IEE. Leaders allow IEE to take place and it is included in school curriculum. Leaders allow external support. Some colleagues have some knowledge and skill in IEE and take part in it as obligation. The ethos of Angelica School supports weaker framing F – but Mare School builds more on stronger framing and classification F + C +	School leaders allow and support IEE.
Mesosystem IEE as a curriculum area by school	IEE is organized within a traditional timetable but allocated a succession of lessons this opens up the necessary flexibility. The school organizes collaboration of teachers in the area and supports the leadership of one teacher. Both weaken classification of time and teachers' work C – Evaluation procedures are being developed to fit the open characteristics of IEE. Framing of formal evaluation is guided by the RD and is visible for older learners thus very strong (F + +). School practice builds on a system of strong classification and IEE is a deviation from it.	Classification is weakened by this particular slot of time, integrating subjects and consecutive lessons give space for learners' control of sequencing and pacing. Evaluation criteria for project work are being developed and may need to be more in line with main emphasis and aims (creativity and agency).
Exosystem Parent and community aspirations towards IEE	Efforts to measure IEE quality differently than by traditional measures – but traditional school subjects have priority. Parents and work life in local society involved in IEE school activities. C – (weaker classification between home/society and school)	
Macrosystem	Law and policy expects innovation education. National curriculum includes innovation education. Official evaluation procedures focus on selected subjects. C – to C +	The official discourses call for creative and cooperative individuals but offer an evaluation system on an individual and strongly classified subjects basis.

CHAPTER 8: Modes of IEE at the micro and meso level

In this chapter I will look more closely at the micro- and meso-levels to look for ways in which the school as an organisation influences possibilities teachers have for working with IEE. I will also have a closer look at part of the micro-system, that being the core of school activities, at the classroom level itself, and tease out the ways in which teachers understand IEE and new roles for learners.

I draw on some of my data from the case studies and analyse data from 13 teachers working in 10 schools in all, some not in the case studies. From six teachers I have both interview and observation data (the cases) and from the other seven I have only interview data. In this chapter I am nearing the end of my quest to locate IEE in Icelandic compulsory school practice.

To understand the effects of the school and its staff on the fate of IEE I have designed a two-dimensional tool building on Bronfenbrenner's systems approach. With this tool I can place schools in the resulting 'organisation-support rubric' according to the extent to which other teachers and school leaders support the introduction and practice of IEE and the leeway provided for IEE in the school organisation. This gives rise to four different settings in which IEE can find itself: *dormant, enclosed, developing* and *feasible*.

At the micro-level of the classroom I have constructed another two-dimensional analytical tool based on Bernstein's notions of classification and framing. I can place teachers in the 'roles in IEE rubric' according to the strength of classification of IEE with regard to the roles of teachers and learners and the strength of framing as they work with learners. This gives rise to four different modes of integrative pedagogy: *transmissive, controlling, progressive* and *emancipatory*.

I conclude the chapter by returning to the model of integration introduced at the end of Chapter 5, i.e. the 'content-learner role' rubric which provided a way to describe the range of teacher decisions concerning content and learners when they say they are working with IEE. The use of this rubric has a practical value for working with teachers in that it displays examples of IEE, from its fully 'integrated' or purest form to other forms in which elements of IEE appear. In the next and final chapter I will show that IEE in Icelandic schools exists in an ecological web of systems, and in order for a school to work toward preferred levels of IEE, it can determine its location in the web and plan action at several points of the web. The findings in this chapter help me construct the web. In the discussion

of the results I draw in part on knowledge from my participation in the Intentions and Reality project on science and technology.

8.1 Analysis of school conditions for IEE

The case studies show that the characteristics of the macro and meso systems within which teachers function give an idea of the ‘constraints and contributors’ to the implementation of IEE in schools (Lewthwaite, 2006). Two school level factors were frequently mentioned or observed, the level of indifference or support of colleagues and leaders and the flexibility or otherwise of the school organisation for finding a niche for IEE in an often traditional structure. I plot a model of the interaction of these two factors: on the horizontal axis, from indifference or neutrality of colleagues and leaders to support which enables teachers to work with IEE and on the vertical axis, from rigid to receptive organisation in each school (Figure 8.1). Four settings emerge: *dormant*, *enclosed*, *developing* and *feasible*. I then take each school, seen through the eyes of the teachers, apply indicators which I developed for working with the model (Table 8.1) to determine the type of setting in each school studied (Table 8.2).

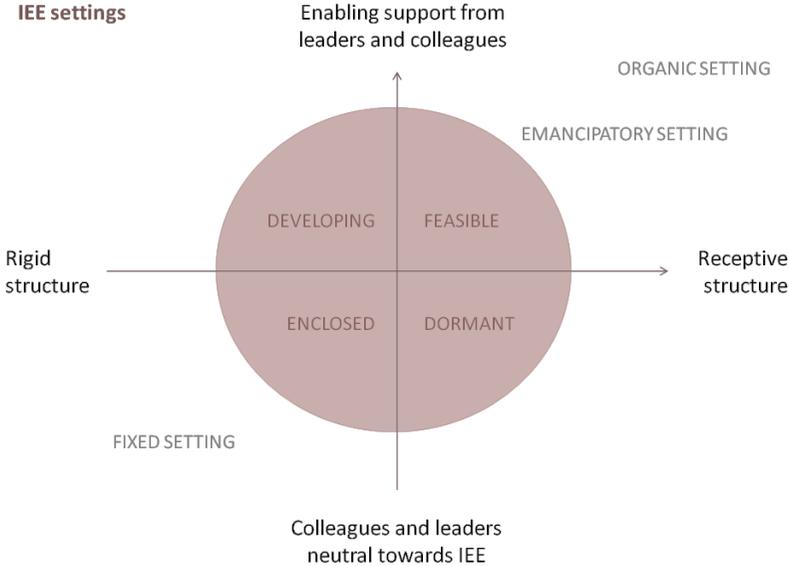


Figure 8.1 Tool to analyse school settings through level of collegial support for IEE and flexibility of school structure

In order to locate the settings of the 10 schools in the model I extracted from the data short descriptions that indicated characteristics of each school with regard to structure and support (Table 8.1). In the former column I gathered indicators of the structure and organization of each school and in the latter the views and support of leaders and colleagues towards IEE. The data come from interviews with teachers and administrators, where those were available.

Table 8.1 Conditions for IEE in 10 schools

School	Meso-level – structure and organization Organization – openness of structure connections of IEE with other subjects-isolated subject.	Micro-level – views and support School ethos and views towards IEE – support of leaders and colleagues.
Kolbrún's school	Flexibility of the small school, within flexible boundaries of the timetable.	Kolbrún is the IEE specialist in the school but gets participation of other colleagues.
Rósa's school	Traditional timetable, large school, some flexibility arranged.	Support of leaders to flex boundaries of timetable and get grants. Teamwork on IEE.
Trio School	Traditional timetable but with special arrangements flexibility is arranged.	Support of headmaster to include IEE A group of teachers take part in developing IEE.
City School	Location of IEE lessons isolated but the organization of the timetable with large slots of time to create flexibility. PBS system calls for strong framing.	Leaders are familiar with IEE and allow it as a part of school curriculum. Colleagues are familiar with IEE. A team of IEE teachers works on the subject within the school.
Country School	Traditional timetable. One teacher specialist in IEE. Flexibility of the small school to change contents of lessons.	Leader familiar with IEE and allows as a part of school curriculum. Colleagues are familiar with IEE but do not take direct part.
Hanna's school	Traditional timetable but two consecutive lessons arranged for IEE. IEE is one teacher's task.	Leaders are familiar with IEE and allow as an isolated part of school curriculum.
Sigurd's school	Traditional timetable. IEE is one teacher's task. Flexibility for visits and field trips.	Leaders allow IEE as the undertaking of one teacher within his subject (crafts).
Gunnar's school	Traditional timetable. Set time for one age group. One teacher's task.	Leaders allow IEE as the undertaking of one teacher within one age group.
Paul's school	Traditional timetable. IEE is one teachers task.	Leaders interested in IEE and allow IEE as the undertaking of one teacher.
Sedna's school	Traditional timetable. IEE is one teacher's task. IEE teacher is acknowledged as the specialist.	Leaders interested in IEE and allow IEE as the undertaking of one teacher but are interested in expanding it within the school.

The results of Table 8.1 are mapped into Figure 8.2 in order to explore the interaction between support and structure. Four indicators were developed for the microsystem factor of support: *neutral*, *accepting*, *encouraging* and *enabling* and four indicators for the mesosystem factors of organisation: *rigid*, *firm*, *flexible* and *receptive*. It seems that in schools where traditional timetables set the basis for their practice, the views and actions of leaders can soften their rigidity to create some flexibility for IEE. I concluded that if the timetable was *rigid* it could be softened towards more flexibility with positive views from leaders that would arrange for some leeway when needed, moving into a *firm* organisation. Such flexibility is needed for work with holistic arrangements of time conducive for IEE.

The *dormant setting* supposes a *flexible* or *receptive* organization and views that are *neutral* or *accepting*. Although this setting was not found in ten schools I studied the setting is however not unthinkable as there might be flexible or receptive organization that allows a single teacher to use some aspects of IEE on his or her own, perhaps within a subject area, without direct participation of others in the school. The *enclosed setting* is one building on a *rigid* or *firm* organization and *neutral* or *accepting* views of IEE. The basic order of the school is intact (Thomson, 2010) and IEE has no impact on infrastructure or other staff than the IEE teachers. This was the case in Sedna's and Paul's school where the day-to-day organization of the school seemed to be unchanged although IEE was offered on a limited scale. Sedna's, Paul's and Gunnar's schools are all examples of this view as the leaders know about IEE and allow it as a part of the curriculum and the colleagues know about IEE but do not work on further dissemination within the school. Country School, Sigurd's and Hanna's school had also the support of administrators in allowing IEE as a part of the curriculum, including crossing boundaries of school and work life, integrating knowledge areas and organizing suitable time slots, but still no lasting changes to the basic order.

The *developing setting* is one that even though the structure is *firm*, administrators and colleagues *accept* teachers working with IEE, are willing to make adjustments to the day-to-day operations, permit collaboration for developing IEE in the school and external support is mediated. The progressive setting could support agents of IEE within the school that may leave lasting changes such as in expertise and skills that will not disappear even if one IEE teacher leaves the school. This could be seen in Rósa's and Trio School as administrators had organized longer time slots for IEE than traditionally, for collaboration of teachers on IEE and flexibility to work outside the school when needed as well as supporting the input of specialists.

<i>Participatory:</i> Positive views of IEE and creative work – enhancing learner agency as a collective responsibility						ORGANIC SETTING
<i>Enabling:</i> Leaders and colleagues acknowledge the importance of IEE and support it, are actively engaged in it.	DEVELOPING SETTING		Kolbrún's school			EMANCIPATORY SETTING
<i>Encouraging:</i> Leaders are actively familiar with IEE and may mediate external support. Colleagues and community support IEE	Rósa's school Trio School		City School			
<i>Accepting:</i> Leaders are familiar with the IEE pedagogy and allow it as a part of the curriculum and colleagues know what IEE is about.	Paul Gunnar Sedna		Sigurd Hanna Country School			
<i>Neutral:</i> School leaders are neutral but may allow IEE as a teacher initiative and colleagues are indifferent.	ENCLOSED SETTING		DORMANT SETTING			
<p>↑</p> <p>Level of support from leaders and colleagues</p> <p>Flexibility of organisation →</p>	<i>Rigid:</i> Traditional organization of timetable and division of work between teachers and knowledge is organized as independent subjects. IEE may be accepted, no changes in the organization are facilitated.	<i>Firm:</i> Traditional organization of timetable and division of work between individual teachers but administrators see to certain flexibility for projects and work such as IEE and cater for its special requirements.	<i>Flexible:</i> The organization of the school is planned to include project work, long periods of time for lessons, emphasis on creativity and arts and manual subjects, open spaces and flexible locations for work.	<i>Receptive:</i> School is organized around main needs according to the curriculum, supporting creative work with good connections between knowledge areas, school and life outside school. The organization can easily be flexed according to day-to-day needs.	<i>Organic:</i> The school is as a living organism in organic conditions that responds exactly to the needs of the learners and the school community	

Figure 8.2 Settings for IEE in 10 schools

The *rigid* organization might include *enabling* and *encouraging* views towards IEE although it is an unlikely combination. However schools with a firm or less rigid structure were able to facilitate IEE, as was the case with Trio School and the school in which one of the pioneers of IEE, Rósa, had worked. The social surroundings of the three different sites of Trio School offered more flexibility at Angelica and Northbound and less at Mare school.

The *feasible setting* is one where IEE as intended by the curriculum becomes possible, a kind of exemplary setting. The infrastructure is *flexible* with regard to planning, time and space, and there is some measure of *encouragement* from other teachers, even collaboration, and support from leaders. This setting offers realistic and feasible arrangements which facilitate IEE. It is a setting where administrators know IEE and what it needs, the school has a group of teachers working on developing IEE and other members of staff know what it is about. This was the case in City School that had a deliberate plan for opening up longer time slots than traditionally and an emphasis on blurring boundaries of subjects by integrating arts and crafts into lessons and learning.

A promising version of the feasible setting is what I choose to call an *emancipatory setting* where organisation is at its most *receptive* and *enabling* views are in place. This interaction creates conditions that emphasize learner agency and creativity by offering IEE in different forms. Leaders acknowledge the importance of IEE, highlighting it in school curricula, taking part in introducing it to society and supporting autonomous learning related to IEE inside and outside the school. Colleagues take active part in IEE. The emancipatory setting is receptive to learner needs and society and can vary time and location from day to day. This was seen in Kolbrún's case where she was both the leading IEE teacher and the principal of a small rural school with possibilities for easy contact with natural and social environment. The curriculum in her school emphasizes creativity and innovation and connections with natural environment and local society.

A tantalising fifth setting was glimpsed in Kolbrún's perhaps unique setting, the *organic setting*. The conditions were *organic* and *participatory*. Kolbrún was the principal and main IEE teacher so had a perfect position to pursue her holistic view of education such that the school sometimes functioned as a 'living' organism in organic conditions that could respond in a timely and appropriate way to the interest and needs of the learners, allowing them to be creative and innovative. This school community reminded me sometimes of the settings described in Summerhill (Neill, 1960) and in the English primary school Prestolee as it operated in 1918-1953 (Burke, 2005).

It can be seen that school structure influences the range of learning opportunities through the curriculum and the timetable and if it is too rigidly organized IEE will find it hard to

thrive. However it can also be seen that the views of leaders and colleagues can soften the edges of the setting allowing it more flexibility and thus supporting a version of IEE practice in which some curriculum aims can be met.

8.2 Different modes of pedagogy in IEE

Time for IEE in schools in my study is found mainly in the three forms that the curriculum suggested: time dedicated to IEE from the elective hours, time allocated to IEE as a part of other subjects, and a mixture of electives and time from other subjects. It is possible that in the first form we expect to find ‘pure’ IEE, where all conditions are met. But the difference in pedagogy of teachers might be influenced in other ways in the different schools and to study this I analysed some features of the pedagogy of IEE.

8.2.1 *The analytical tool*

To analyse what kind of pedagogy can be seen in IEE I assessed the values of framing and of classification for each of the 13 teachers building on the tables of indicators introduced in Chapter 5.

I plot a model of the interaction of these two factors: on the horizontal axis, from strong classification of roles of teachers and learners (well-insulated, teacher has power) to weak and on the vertical axis, from strong framing of communication between teachers and learners (teacher control) to weak (Figure 8.3). Four indicators were developed for each axis on a scale of C ++ to C -- and F ++ to F -- (Table 8.2). By doing this I produced descriptions of four modes of IEE pedagogy. These modes are characterized by how teachers classify their roles and learner roles and the strength of their framing in IEE lessons (Figure 8.4). I call these modes: *emancipatory*, *progressive*, *controlled* and *transmissive*. The last mode is virtually not possible in practice as the contradictions between weak classification of roles and strong framing of communication are difficult to reconcile.

Modes of IEE pedagogy

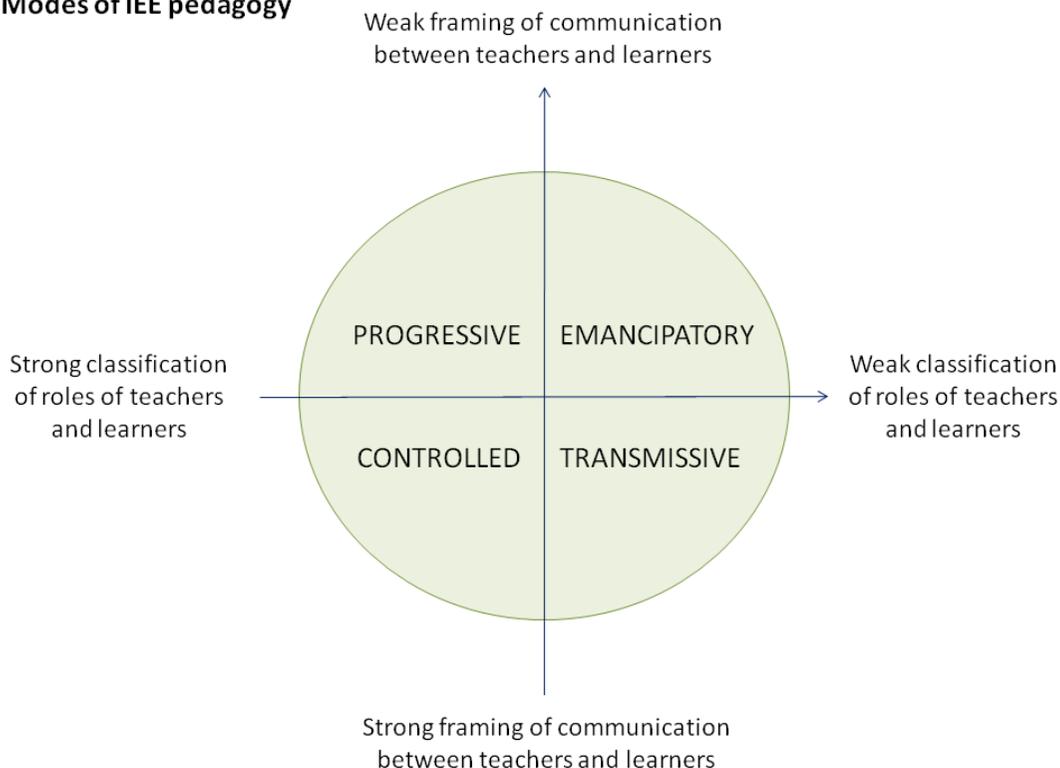


Figure 8.3 Tool to analyse and describe modes of IEE pedagogy

An analysis of the data from interviews of 13 teachers using Bernstein's pedagogical conceptions shows levels of classification and framing in their pedagogy (Table 8.2). Interviews with four teachers from City School, two with the lead teacher in Trio School, one interview in Country School and with seven teachers in seven other schools, were analysed as well as observations from the case schools.

A range of framing was found within IEE lessons but on the whole there was a tendency towards weaker framing (Table 8.2). The classification of roles (Table 8.2) also started to open up. When I mapped these values on dimensions proposed in Figure 8.3 I found a distribution of the teachers depending on the strength of C and F (Figure 8.4). These indicators were drawn from the codes that emerged in the data analysis and sometimes raw data was consulted as well. As can be seen in Table 8.2 classification and framing varied quite a lot within the repertoire of each teacher but distinct tendencies could still be drawn out.

Table 8.2 Classification and framing of IEE in the classroom

Teacher	Classification – power (Discourse, agency)	Framing – control (Selection, sequence, pace)
Kolbrún	IEE is a very open area sometimes a subject, sometimes an approach C- – Teacher supports learner agency i.e. learners become explorers and creators of knowledge C- –	Framing is weak to very weak F – to F – – Learners have control over selection and pace and some control over sequence. Learners often have control over communications
Rósa	IEE is a special subject that integrates different knowledge and appears in different forms* Teacher supports learner agency learners become explorers and creators of knowledge C- to C – –	Framing is mainly weak to very weak within the boundaries of the timetable F – to F – – and sometimes F +
Sif	IEE is a special subject that integrates different knowledge and appears in different forms C-. Learner have agency in defined areas and are aspiring innovators. C mixed C + towards C –	Mixed framing: weak to strong, seldom very strong or very weak. F – to F +. Weaker framing in projects of older learners. Often the learners develop their ideas with teachers support weak F, sometimes very weak (F – and F – –)
Runa	IEE is a special subject that integrates different knowledge and appears in different forms C-. Considerable learner agency C –	Framing mixed: F – to F – – sometimes F+ (tasks and themes) PBS system F +
Bryndis	IEE is a special subject that integrates different knowledge and appears in different forms C-. Considerable learner agency C –	Framing mixed: F – to F – – sometimes F+ (tasks and themes) PBS system F +
Asa	IEE is a special subject that integrates different knowledge and appears in different forms C. Considerable learner agency C – –	Framing mixed: F – to F – – sometimes F+ (tasks and themes) PBS system F +
Heidi	IEE is a special subject that integrates different knowledge and appears in different forms C-. Teacher limits learner agency i.e. learners often become receivers C+ to C ++	Framing mixed: F – to F + sometimes F+ + PBS system F +
Sunny	IEE is a special subject that integrates different knowledge and appears in different forms C- Learner agency somewhat limited C +	Framing mixed: F + to F –, a tendency towards strong framing.
Hanna	IEE is a special subject for one age group, integrating different knowledge and appears in different forms C- Learners are aspiring innovators C –	Framing is mixed F – to F + and sometimes F – –
Sigurd	IEE is a special project within craft that integrates different knowledge and crosses boundaries of school and world of work C- Learners are aspiring innovators C –	Framing mixed: F – to F – – and sometimes F +
Gunnar	IEE is a special subject for one age group linking common knowledge and innovation. C+ Learner agency is somewhat limited but learners are aspiring innovators C –	Mixed framing towards strong: F – to F+ and sometimes F + +
Paul	IEE is a distinct element within craft C + + Learner agency is limited C + to C + +	IEE within craft with strong to very strong framing F + – F + +
Sedna	IEE a special subject for one age group with a design focus. C++ Learner agency is limited C + to C + +	Framing strong to very strong F + to F + + Framing weak in design parts F –

*Different forms: design projects, paperwork, field visits, drawing, writing, craft, model making, computer work, discussions and/or introductions.

Learner controls the development of his or her ideas and teacher supports. F – –	PROGRESSIVE MODE		EMANCIPATORY MODE	
Learner with teacher's support develops his or her idea and learner makes final choices. F –			Runa Asa Bryndis	Sif
Teacher suggests choices in development of ideas or influences learner choice. F +	CONTROLLED MODE		TRANSMISSIVE MODE	
Teacher takes/ makes decisions in developing solutions. F + +				
 Framing –communication Classification – teacher-learner roles 	Learners have very limited agency and are receivers. The teacher is the specialist and sets criteria of roles. The control in lessons is with the teacher. C + +	Teacher controls most aspects of lessons and is the specialist. Learners have agency within certain well-defined areas. C +	Learner have agency in defined areas and are aspiring innovators. Learner and teacher communication is often on equal footing though the teacher has the power to decree. C –	Learners have ample agency and are innovative i.e. creative and active. Learner and teacher roles are often interchanged; learners are experts and teachers learners. C – –

Figure 8.4 Modes of IEE pedagogy – classification of roles and framing of communication

8.2.2 Modes of IEE pedagogy

Although the main advice in teaching materials and IEE courses is to be aware of the agency of the learner in developing ideas and that the teacher should often “step back” it could be seen in the different data that teachers exerted this in different ways, in different degrees and for different elements. Bernstein’s concepts of classification and framing supported the identification of four different modes of pedagogy three of them displayed by teachers in this research and none the fourth. These modes were *emancipatory*, *progressive*, *controlled* and *transmissive* and will now be described and supported by examples from the data.

Transmitting mode – the impossible?

The content of IEE is wide ranging and typically is influenced by learner choice (see the next section). In a *transmissive* pedagogy, a teacher selects themes, tasks, methods and materials and influences the development of student ideas with predetermined directions. Learners learn the ‘right’ way to work from the teacher. The teacher controls activities with strong curriculum framing (selection, sequence, pacing). Weak classification of roles (teachers-learners) seems difficult with strong framing of communication, unless the learners are willing to concede authority to the teacher on the base of his or her specialist knowledge which is not part of this analysis. Possibly the teacher is a ‘capable peer’.

Controlled mode – the expert

The control of learner behaviour is distinctly in the hands of the teacher. The controlling teacher has authority over students in *controlled* lessons and uses strong framing in the selection of content and approach. The teacher uses reminders, rewards or consequences, to control communication and behaviour. The teacher is probably the ‘expert’ and makes decisions accordingly, who controls most aspects of lessons and provision of learning opportunities. He/she chooses the content, tasks, needs to address, methods and materials to use. Some freedom for creativity and agency may be given to students in the development of ideas and some in pacing. Learners get prescribed and controlled opportunities to be creative. The macro and micro elements of learning are more and less designed and controlled by the teacher. Examples of a controlled pedagogy are found in the practice of Sedna, Paul, Sunny and Heidi.

Sedna and Paul are both craft teachers in compulsory schools in the Reykjavík capital area. Paul, a male craft teacher about 60 years old, taught when he was younger but recently returned to teaching after working outside schools for 20 years. He is very secure in his knowledge and skills in IEE, craft and technology, which are his areas of teaching. Paul’s craft lessons are on the restrictive side with strong framing. In addition to time-tabled lessons he offers an out-of-school course on technology where students can come and design and make different things like an electric car and similar technological things.

Sedna is educated as a designer from a technology college and later added craft through teacher education. Sedna is very creative, is resourceful in finding different materials to use in her teaching and comes up with creative ideas and enjoys it when students are creative. Sedna restricts student agency although she allows personal variations. She controls what is designed (selection of knowledge and tasks F + to F + +) in the IEE lessons, for example, when she organizes “her own” school wide competition and decides the theme each time – such as “The Lamp Competition”. She also decides the materials (F

+ +) to be used for the ideas that students are to design for in IEE lessons. “In the next course for year seven I am going to use one bulb. I have decided what is going to be done there.... And it will be a lamp competition as well.” (VT15IRISe, 6). She is very secure as an IEE teacher and considers herself to be the specialist in the school thus eliciting a very strong classification of the IEE teacher’s role within the school (C + +). She is not very open to the idea of collaborating with other teachers in the school but has experience of working with the textile teacher (weaker classification). In general her approach is very strongly classified and strongly framed: “I let them make a ruler that they use in mathematics “ and she decides the material for that task as well (VT15IRISe, 8).

Heidi in City School and Sunny in Country School showed a tendency to take control and decide for students and limit what was allowed, possibly displaying their fear of losing control over the classroom activities. Sunny was however closer to the progressive mode as she often supported learner ideas and “levelled” with them. Sunny’s mode also diverged in different projects where she displayed weaker framing such as in the car competition and preparing for the market.

Progressive mode – supporting learning agency

Within the frame of the lesson learners have considerable freedom and agency though the *progressive* teacher is undoubtedly the designer of the learning opportunities and leader of the lesson. The overall frame of time and content is controlled by the teacher but learner agency is supported within lessons and learners can decide and control different tasks and elements especially in the development of ideas. Where learner agency is allowed, teachers are supporters rather than experts. Learners are aspiring innovators; they are creators of knowledge as inventors and can sometimes be explorers and experimenters. Examples of the progressive mode are Hanna’s, Sigurd’s and Gunnar’s teaching.

Hanna taught in a rural school by the seaside in east Iceland and teaches work with IEE as a separate subject within a traditional timetable without collaboration with other teachers (C +) but she had rather weak framing in her lessons. She decided the overall content of lessons (F +), but allowed the students to choose the ideas (selection of needs and tasks F –) they wanted to work on and they could partially control the pacing and sequence (F+ to F –) of their activities but were obliged to introduce their idea in a poster (task F +). At the end of the IEE project a formal introduction of ideas was meant to be for parents but the students wanted to do it just for each other and not the parents and Hanna allowed them to decide this (task F –) after consulting with the principal (VT3IRItHa, 8).

Sigurd taught in a small town in the south of Iceland, operated within a classified school curriculum and timetable but he is open to students’ suggestions and ideas of tasks and

design (F -). He decided the timing for the projects (pacing F - to F +) and partially the content (F +) though students choose what to do (tasks F -). He took the students on field trips in the neighbourhood and thus weakening insulation between school and community (C -). His lessons in IEE were time-tabled as craft lessons but he finds the emphasis of IEE to fit well with the modern design and craft (handicraft: í handmennt). The relevance of an IEE pedagogy emerges through the needs analysis, and so he is weakening the classification of craft a bit (C -). However he worked on this project alone in the school, most of his other work is within his own specialty (geography) and he teaches alone in his classroom (teacher role C + +).

Gunnar is a craft teacher, who taught in a large compulsory school in Reykjavik. He had the support of the principal for teaching IEE and got one hour per week for one third of the winter for year five as a special subject on the timetable. He taught IEE as a separate subject (C +) for one year within a classified curriculum and timetable and without collaboration with other teachers in the school (C + +). He allowed students to choose what to work on (tasks F -) and how to make their ideas (design F-) within a narrow time frame so the sequencing and pacing is more and less decided for the students (F + to F + +). His framing is mixed but in the development of ideas he allows learners to direct their ideas and supports their decisions (F -). Gunnar controlled the overall frame of the lessons with a focus on taking part in the innovation contest (F +) that has defined areas to work with. And he decided what learners were going to do with their ideas as he offered them the process of finding needs to solve and to choose one or more need to design for and send to the innovation competition. In the development of learners' ideas they controlled the direction with the teachers support (F -).

Emancipatory mode – creative learners

The *emancipatory* setting is like a workshop or a place of work with a democratic and creative atmosphere. Learners experience these lessons as a lifting of restrictions and have opportunities to have an influence on their environments. Learners select the location of their work, and learners and teacher freely communicate and take on each other's roles; learners talk together, help each other and teachers learn about student ideas. Learners are explorers and creators of knowledge as inventors and they work autonomously and responsibly alone and with others.

The focus and content of themes and projects develops around learner interests and ideas and learners select needs, tasks, methods and materials. Learners control the progress of their idea development and teachers support them. Learners set goals and criteria for

evaluation, set the time frame and control pacing and sequence that fit their goals. Learners are leading agents in the lessons and often learn through experimentation and exploration.

I experienced this kind of atmosphere several times in City School for example in the lesson described in Chapter 6 and depicted for example in Figure 6.9. In Trio School I also saw this workshop setting in which where learners could move freely about and work on their ideas independently or with their mates. The descriptions of Rósa and Kolbrún also indicated learner choice of locations, experiments and research as well as a flow of creativity (see in more detail in Jónsdóttir, 2009).

Sif's framing varied with overall framing tighter in the preset projects such as the Coffee House but weaker within, and stronger in some aspects in IEE with younger classes. In general she acknowledged students' ideas and allowed them considerable autonomy and choice within the frame of the overall projects. Sif's mode of teaching is mainly located at the weaker end of framing. She has an integrative approach and thinks about the educational value for students. She pointed out the rational fit of integrating outdoors teaching and learning and IEE and also saw how the projects already in place like the Smoke Free Project were ideal as IEE projects with both a creative and entrepreneurial emphasis. In Trio School IEE Sif looks at IEE from an integrative point of view, she sees it as something that can be woven into other subjects (TS22Ref4, 1) with very weak classification.

Rósa and Kolbrún were both pioneers in IEE in Iceland and both took part in instigating and developing the subject in Icelandic compulsory schools. The IEE approaches and pedagogy are in line with their professional values and personal attributes. Kolbrún was in a position of principal and with flexibility and support that a small school allowed her, she could change the course if the opportunity rose. These conditions allow weak to very weak classification of structure of timetable, lesson content, group arrangements and physical location (C – to C – –). Kolbrún described her situation:

I was able to work in the best of conditions to work with students and freedom to do whatever I've wanted to do. ... In our school we mix it all together a bit... I don't make a clear distinction between what exactly this innovation education is... we have IEE on the timetable for the third and fourth year, the fifth and sixth and for year eight. We have of course integrated age groups, we have 70 students in all and in these lessons we are working systematically on IEE so to speak. (VTSc1IK, 3 and 6)

Kolbrún as a principal and leader of IEE in the school would work closely with the crafts and design teacher on IEE and with other teachers in the school as she was also considered the specialist in IEE in her school.

In Rósa's teaching the students had the opportunity to control the selection of needs, tasks, methods, materials and direction of developing ideas (F – to F – –), within an overall theme (F + to F –). Learners also could control sequence but had less influence on pace. However Rósa offered them the opportunity to come out of school hours to finish their projects and she was there to help them, and thus extended the flexibility otherwise offered by the school weakening the control of pace (F –). Rósa worked with the crafts teacher in the school on IEE and later a larger team of teachers that worked on IEE as a collaborative developmental project. Rósa complemented the principal for his support to the IEE development in the school as he was open to its special requirements and was resourceful in finding grants to support the extra work needed and to pay for additional student time.

Both Kolbrún and Rósa cross the boundaries of classroom work easily, indoors/outdoors, between teachers, boundaries of subjects and time. Both included other teachers in the IEE work, class teachers, science and crafts teachers (collaboration C- or C – –). Kolbrún would often take the students outside to the seaside or to local factories and Rósa would allow students to work in the library or in the classroom or she would allow them to go to the beach near the school to investigate its ecology. Both emphasized the use of real problems and materials and topics that the students were interested in and found important (knowledge C – or C – –).

8.3 Learning experiences and IEE

So far I have considered characteristics of the settings in which IEE is offered and the modes of pedagogy which teachers employ. To what extent do these settings and pedagogical options affect the way in which learners experience IEE? Do these experiences reflect the aims of the intended curriculum in 'innovation and the practical use of knowledge'? To begin with I return to the integration model introduced in Chapter 2 (Figure 2.1) which offers four levels of integration of IEE (Figure 8.5) from which I build a 'content-roles' figure (Figure 8.6). The four levels are:

Separate disciplines – essentially no integration of IEE and subject areas, teachers work independently and learners experience a relatively passive role.

Discipline-based integration – a sequence of topics from separate subjects (disciplines) linked through a theme, and offered in a sequence decided by the teachers who do not otherwise collaborate, though learners may be required to show some level of creativity in producing an 'integrated' product. An approach similar to that advocated by IEE might be used but are likely to reflect one of the school subjects involved. For example, the science

curriculum calls for particular methods and skills (defining a problem, planning and organising how to tackle it, trying it out, interpreting and evaluating results, concluded by a presentation) which has some similarities to a ‘design and technology’ approach. The arts curriculum includes a section on laws and methods and the ‘design and crafts’ curriculum includes sections on industrial design and innovation.

Interdisciplinary integration – a broader theme is offered crossing subject boundaries perhaps moving into non-subject areas (issues in the local community), teachers work together in pairs or teams, the choice of theme reflects the interests or needs of the student but the work is not necessarily creative as teachers may feel challenged by moving into ‘imaginary’ or ‘unthinkable’ areas. Some teachers may call on IEE as the approach to be used with learners being required to make some of the decisions.

Full integration – in this experience the learner’s needs and interests determine the content to be offered and the solutions, and the learner is expected to be creative and an independent investigator, making decisions. The solutions do not necessarily originate from a disciplinary base. The learning experience is managed by teamed facilitators and the outcome is probably open-ended. Much of the recommended IEE approach is used.

In Figure 8.6 I have entered examples of learning experiences from my data, that occur at the four levels of integration are presented and the table includes criteria for the roles of learners from passive to independent and the choice of content from subjects to the interests of learners.

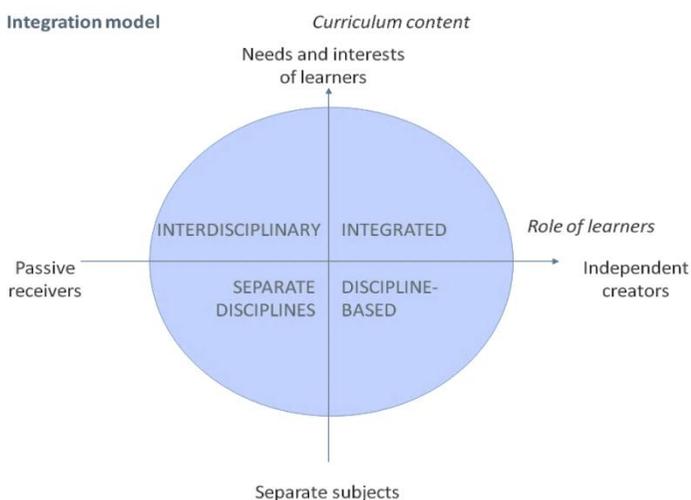


Figure 8.5 Integration model, based on Nsubuga (2008) and Kysilka (1999)

	INTERDISCIPLINARY		INTEGRATED	
Needs and interests of learners	Learners are obliged to use a small notebook – they are to use it to collect their ideas.	Learners make presentation on their innovation (product, process) they are planning. They make a poster with categories decided by the teacher. Learners send their ideas to the annual national competition if their interests and ideas fit their criteria.	Learner chooses a need to solve and makes a definition in text and a model and sometimes a prototype – i.e. “the tidy hen-feeder”.	Learners identify needs to respond to, investigate, experiment (models) and create new knowledge (artifact) and present to the world – i.e. “hand-ee”.
Broad themes/ interests of learners		Learners are asked to work on prevention of smoking and find ways to promote a smoke-free way of life.	Learners work within The Coffee House theme, choose ‘the theme of the evening’, invent and create products.	Learner works within the theme of technology – i.e. a learner chooses to invent a device or a process to mount a horse.
	SEPARATE DISCIPLINES		DISCIPLINE-BASED	
Sequenced ideas, focused themes	Learners are required to draw three-dimensional pictures in order to simulate the work habits of inventors.	Learners make three-dimensional cubes from paper through a sequence of steps decided by the teacher and/or the learning materials.	Learners prepare and hold a market: visit industry, form a firm, make a market survey, design and make products etc.	Learners are asked to find a solution to the problem of “attacking terms”– they investigate and experiment – and make their ideas visible in text, drawings, models and/or prototypes.
Separate subjects		Learners design lamps for the in-school Lamp Competition and make their own version. Towards ⇒	Learners in crafts lessons design a living room and furniture and create small models of furniture in wood and cardboard. ⇐ Just a cry from	In science learners collect objects from the local beach, investigate the ecology and present their findings.
Curriculum content Role of learners	Receivers	Receivers/doers	Doers/creators	Independent investigators, creators of knowledge, decision-makers

Figure 8.6 Examples of integration of IEE into learning experiences in some Icelandic schools

As can be seen from this representation of curriculum integration, the form and features of IEE can vary greatly. To summarise, IEE can be offered in a controlled and *discipline-based* form if learner agency for creativity is given space. As the role of learner as receiver is a small part and sometimes unwanted in IEE it is not a prominent part of the examples. IEE as a *separate discipline* or within a classified subject, with a single teacher, can only ever be a weak version, offering limited learner agency and creativity. *Interdisciplinary* approaches with some learner agency offer more space for learner interests. Examples of IEE in an *integrated* form often include some elements of the neighbouring units that offer the most learner agency and space for creativity.

8.5 Summary and discussion

The role of the teacher in IEE requires a delicate balancing act of structure versus freedom and choice. This freedom is varied through different levels of framing of selection, pacing, sequencing and criteria of work. Fully integrated IEE experiences occur when teachers override the strong classification of knowledge embodied in school subjects and work with framing values which enables all learners to integrate, mix and co-construct (new) knowledge, sought after in ‘innovation and entrepreneurial education’. Classification and framing values can vary considerably among teachers, as was seen in Table 8.2.

Sedna and Paul worked from a base of separate subjects and are examples of how teachers can offer learners a weak version of IEE with strong framing, within a strongly classified system which does not disrupt the existing system. Kolbrún is an example of a teacher who overrode strong classification of knowledge and Rósa found some leeway for IEE within a disciplinary framework. Kolbrún and Rósa felt able to work with weak framing in classroom communication and had the support of flexible or receptive school organization (often possible in small schools or smaller units) and/or the support of an administrator (needed in both large and small schools). However Sif was situated in a traditional though small organization and had to deal with prejudice from some of her co-workers, and a lack of interest and reluctance to work with changes in the spirit of IEE although there were indicators of development and change in attitude towards the end of the period under study.

It is difficult for teachers to move away from strong classification and strong framing, from separate subjects. This is what they know, what they are used to and what they have been trained for. If they are required to move towards the discourse of innovation and knowledge use and to work in a fundamentally different way they need opportunities to understand these new demands and require support to reduce *chaos angst*. To be or

become a professional IEE teacher is demanding, mastering not just the “artistry of teaching” as Eisner (2002) put it, but also to support learner agency in creative ways without losing precious time to apparently chaotic experiences. Knowing when to frame teaching weakly or very weakly or even sometimes strongly is a sensitive skill that most teachers take time to acquire, not least the IEE teacher. Knowing when to support learner agency, offering meaningful activities where learners get to explore, experiment and create from their existing knowledge base and when they need additional knowledge, are all issues of control. How do teachers realize and recognize what needs to be controlled? Do situations differ depending on the age of learners and their recognition and realization rules? How can they be supported in taking on more control and experiencing agency and creativity in their own learning and how does the teacher relinquish control accordingly? These are questions that the professional IEE teacher must answer and the answers are a part of her or his professionalism in the area.

It can be seen that the conditions in the schools offer different structures of time and space that either are limiting for IEE or conducive. In Kolbrún’s school the flexibility of time was extensive with her as the principal and with the openness of the small school. Her conditions of space were also unusually flexible as they could easily be stretched to the nature and the society they were located in. City School had a measure of inherent flexibility so to speak, as they organized the timetable to include longer stretches of time that suit better for creative work and projects than rigid 40-minute organization. The schools with traditional timetables could however be flexed to some extent with the support and understanding of administrators.

The relocation of the innovation discourse in Icelandic school practice is not common with or within science or other subjects. In science at the compulsory level the discourse of innovation education is vague or non-existent. The regulative discourse towards innovation education seems on the surface to be supportive, expects innovation in society and praises it as a valuable source of wealth and improvement in science and living. The translation of the regulative discourse into schools, detected in the innovation discourse, does not manage to support an integrative IEE instructional discourse in action. It seems that regulative discourse at the school level has the better of the external supportive discourse of innovation. The external discourse shows what is wanted but this does not help schools in bringing innovation education into lessons.

The general system of schools is built up through strong classification and framing and thus works against subjects like IEE, but can be influenced as was seen in some of the schools. Some of the schools with traditional arrangements were willing to stretch and change parts of the organization to give some flexibility. The role of the principal is vital to

make the necessary flexibility in the timetable and the understanding and support of other colleagues can also help with considering and accommodating to the need of IEE to override boundaries. Schools, that deliberately work to loosen the constraints of classification, have a supporting culture for IEE a culture that offers conditions for weak framing. This culture can be seen as inviting for progressive and emancipatory modes of IEE.

A part of the leadership in schools that want to implement and sustain IEE must be to support further development according to the situation in each school. Such development needs the interaction of the macro and meso systems in the schools where school leaders supply the necessary flexibility and encourage collaboration within the school and the local surroundings. IEE needs to be cultivated and nurtured if – as seems to be present in all of the schools – there is interest to strengthen this area, but it is not very easy or simple. What makes it difficult is that the system that schools build on is strong and tends to be inflexible. A part of this tendency to rigidity is the regulative discourse that is underlying and influences the instructional discourse that schools offer. It is a regulative discourse of compliant and quiet students that is in opposition with an instructional discourse of independent and creative learners. By locating the teachers' modes I am analysing their ID and at the same time it can be interpreted that they are influenced by an RD that appears as order and organization that sometimes takes over and is the ID in practice. In Kolbrún's case she had the RD more or less in her own hands and therefore it was not at odds with the ID she practiced. Sedna and Paul also practise an ID that is not far from the RD of strict and controlled organization, but that is an ID that is not conducive to IEE and far from an emancipatory mode.

The strength of classification regulates the recognition rules, the rules governing in the pedagogic context and influences whether teachers or learners are aware of the rules. When teachers and learners do not recognise the rules and consequently the power relationships this influences the feasibility of methods of instruction (Macdonald & Jóhannsdóttir, 2006). As the recognition rules and realization rules of IEE may be new to some learners it is necessary to make them visible and provide support at different levels. To change the 'rules of the game' acquirers must know what it entails (recognition rules), they also need help to acquire an understanding and skills to act accordingly (realization rules), this applies to learners, teachers and administrators. The curriculum was changed in a fundamental way in the new ITE curriculum in Iceland in 1999. Earlier research on the ICT curriculum (Macdonald, Hjartarson, Th., & Jóhannsdóttir, 2005) indicated that the managers of the curriculum revision in the late 1990s had underestimated the momentum in the system and the effort needed in order to make changes. Both top-down and bottom-

up actions were needed in order for systemic change to occur (Macdonald, 2008) as this case of innovation education in Iceland demonstrates.

The modes of IEE pedagogy can be seen as different levels of development where the *transmissive* mode is the least developed and probably unlikely. Some examples of a *controlled* pedagogy exist that could be enhanced to the *progressive* mode with weaker framing of communication between teachers and learners. To move from the progressive to the *emanicipatory* mode requires a change towards weaker insulation of roles, where teachers can also be learners and vice versa.

In the next chapter I will pull the findings from these chapters into an ecological web of systems and levels of development which can be used when a new and challenging idea such as IEE is introduced into schools.

CHAPTER 9: Summary and discussion

9.1 Introduction

In this research I wanted to find out how IEE could be enhanced in Icelandic compulsory schools by investigating what supports teachers and schools in implementing this curricular area. The formal aim of the study was to examine examples of innovation and entrepreneurial education (IEE) in compulsory schools in Icelandic and locate them within the pedagogic discourse, thereby extracting an understanding of the nature of IEE and the conditions in which it thrives. The main focus was on the work of teachers in order to find out what supports them in offering and developing IEE and to identify the kind of pedagogy and curriculum used in IEE. Curricular frameworks were explored and intrinsic tendencies in social structures identified and analysed for the influences they have on the relocation of the innovation discourse in schools as innovation education. My goal was to construct a way to show the location and nature of the phenomenon of IEE.

I was guided by my key research question: *Where and how is innovation education located in compulsory school practice in Iceland?* In order to seek answers to that question I found it necessary to answer the following questions:

1. What is the rationale for innovation education?
2. What affects the location of innovation education (IEE) in three Icelandic schools?
3. What characterizes the pedagogy of teachers that embrace IEE?
4. What characterizes the social ecology of IEE?

I developed sub-questions for these four questions to guide me in answering the questions. Bernstein's theories influenced my search for answers to the first three questions and Rogan and Grayson's theory and Bronfenbrenner's concepts guided my answer to the fourth question.

My findings are reported in the preceding chapters and will now be summarized and discussed with the help of the research questions and put in the context of the *ecology of feasible development*.

9.2 Summary

The official rationale for innovation and indeed for innovation education depicts a spirit of economy and competitiveness. However in the schools where IEE is found the rationale is more in line with educating ‘the whole child’ and the general aims of education to make learners competent participants in the modern society such as teacher Bryndis said: “... to gain the confidence to carry out what they intend to do ... and to acquire a belief in their own power” (Ci23ItB, 5) and principal Ragna: “... that the children are well equipped for the future and that they show initiative” (Co10Ip, 6). This is in line with the findings of recent research on the views of teachers on ‘enterprise education’ in Scotland that shows that teachers were more comfortable with using a values approach and social entrepreneurship than with business enterprise (Paterson, 2009). The economic rationale appeared in the Icelandic cases, such as two of the projects for the older learners in Trio School: The Coffee Shop and Creating Local Valuables. However the strongest rationale in the schools was the one of strengthening the learners’ ability to be creative and act in the world, as one Trio School learner said: “We are basically learning to make the world a better place and make new things.” Such a rationale could be emphasised more in the IEE curriculum. IEE has the potential to strengthen life skills that people need in a sustainable world, the life skills to be creative, confident and responsible, to be able to solve all kinds of problems and to work and live with others. A life skill’s perspective as the main focus does not exclude understanding and doing business. It should make it easier to build on learners’ creative capacities, develop skills for doing business and understand the relationship to the environment and social elements if the experience is meaningful to individual learners.

From my data and analysis of IEE as experienced by learners, teachers and administrators an image is emerging of IEE. It has weak boundaries and is an elastic phenomenon offering freedom and flexibility. The issue is whether opportunities introduced through the aims of IEE enhance learner creativity and innovativeness and strengthen their capacity for action in their lives and societies. The weak framing of IEE did not reflect the instructional discourse generally found in Country or Trio School and therefore the learners had to recognize the different messages and act accordingly. In City School the instructional discourse could have been similar to IEE but seemed influenced by a regulative discourse of schooling with strong classification of learners and the roles of teachers. The instructional discourse of IEE could be made more visible, perhaps through the assessment, to help learners figure out what kind of rules exist in IEE and whether those are the same as the general rules in their school or different.

The forms and features enacted in IEE are varied different and depend in part on their curriculum organization. The purest form of IEE is found as *integrated IEE* where the needs and interests of learners and learner agency guide the choice of curriculum content and teachers worked collaboratively as facilitators. An *interdisciplinary* approach towards IEE can also align itself with learner interests. Other curriculum approaches build directly on school subjects both in *separate discipline* and *discipline-based* integration but offer more limited opportunities for learner agency and creativity.

The weak framing advocated in IEE and its weak classification as an area of knowledge makes special demands on teachers and schools that traditionally build on strongly classified subjects and roles and on strong framing. When IEE practices of 13 teachers in Chapter 8 were scrutinized in the light of classification and framing, four modes of IEE pedagogy are found: *emancipatory*, *progressive*, *controlled* and *transmissive* (Figure 8.3 and Figure 8.4). The emancipatory mode is the one most in line with the ideology of IEE but teachers working in progressive mode could adapt or move into the emancipatory mode perhaps with school level support. The controlled mode allows least learner agency and limited creativity but may be a starting point for some teachers that could move to the progressive mode and towards the emancipatory mode. It would be difficult for teachers to adopt the transmissive mode of strong framing of communication and weak classification of roles, though it is an interesting alternative in the light of an emphasis on individualised learning. No examples of this mode were identified in this research.

Rósa and Kolbrún could easily change other subjects into IEE by using its thinking and approaches and they have a frame of mind that is characterized by their holistic thinking of education and schooling (see Chapter 8 and Jónsdóttir, 2009). This is not surprising as they were two of the instigators of IEE in Iceland. Sif in Trio School and three of City School's teachers also showed a disposition that was conducive to IEE. Sif, Kolbrún and Rósa see IEE as a way of thinking, an approach and as a 'special subject'. The other ten of the 13 teachers see IEE as a 'special subject' although they understand it as integrating in its use of different knowledge and subjects. Two of the thirteen teachers offer IEE as an element or project within crafts.

Individual differences among the teachers are found in different strengths of framing in lessons. Two teachers (Paul and Sedna) classify IEE most strongly as a 'special subject' and with regard to teacher-learner roles see themselves as the ultimate specialists. The teachers in Trio School have different understandings of IEE. One teacher sees it mainly as a method and others as an integrating 'subject'. They offer it through collaboration by crossing boundaries of solo teachers as different projects for older learners and as a 'special subject' for the younger.

The three principals of the case schools saw IEE in different lights. Linda in City School has a holistic view of education and the structure and work in the school focuses on such aims. The organization of the school reflects her views on education and the work in City School is meant to encourage and support an individual pace of learning, group work and flexible instruction, integration of year groups and subjects, and teacher teamwork. For Linda IEE fulfils the aims for ‘arts and crafts’ and supports theme work in the school where arts and crafts are integrated with other subjects. So IEE is in her view one of the forms through which learners can achieve the main goals of their education.

Ragna in Country School sees IEE as a ‘special subject’ that enhances initiative and creativity (generative thinking) but she acknowledges the need to integrate it with other subjects in the school. Karl acting principal in Trio School sees IEE as a ‘special subject’, as integrative projects and as a tool to be used in other subjects. All administrators locate IEE in some relation to arts and crafts (í list- og verkgreinar), either by using time from those subjects, by location of lessons or as seeing them as fulfilling aims from those subjects.

I noticed that the settings for IEE varied and receptivity to the ideas of IEE depended much on the structure and organisation of the school and the views of school leaders and other teachers. I identified four settings: *dormant*, *enclosed*, *developing* and *feasible*. The most extreme version of an enclosed setting would be *fixed* with no leeway for change. On the other hand more extreme versions of a feasible setting would be an *emancipatory* setting where there is full support and sufficient flexibility or perhaps even an *organic* setting where boundaries dissolve, learners are teachers and teachers are learners.

9.3 Location of IEE and interactive systems

9.3.1 The ecology of feasible development of IEE

Social influences from different systems were evident throughout data generation and the analysis process and levels of development began to emerge. Visions in the curricula, in IEE teaching materials from the pioneers and initial findings were used to construct an *ecology of feasible development* of IEE introduced as a rubric in Table 9.1 (see also Chapter 2, section 2.3). I built up the rubric for IEE with indicators (descriptive text) emerging from the data and analysis and at the same time I could begin to locate the implementation levels of IEE for the case schools.

Factors from the personal setting to the macrosystem were mapped against four levels of development from basic to ideal for analysing the development of IEE. When reaching a

level of current implementation, the next and adjacent levels are thus identified and the levels of a feasible ecology emerge. There may be schools and systems that do not display any of the practices or attitudes of the IEE rubric. For these the *Ecology of feasible development* must be extended downwards or upwards. There could be a level above Level 4 of which I got glimpses when I considered the ‘organic’ practice of Kolbrún. The setting in Kolbrún’s school, which was not one of my case schools, combined with the pedagogy she adopted, could require Level 5.

I then use the EFD in Table 9.1 to create a profile for each of the three case schools, starting with City School in Table 9.2.

Feasible curricular futures for the case schools can be enhanced by looking for support and interaction of the neighbouring systems (Tables 9.1, 9.2, 9.3 and 9.4). In this way I could locate and analyse the nature of classroom activity, the the level of outside support and the capacity within the schools for change and then map a profile of implementation of IEE in each of the three schools.

Table 9.1 The ecology of feasible development: A social ecology of IEE

4 Ideal	Teacher supports autonomous work, learner initiative, learner activity –and learner responsibility. Confident teaching efficacy; skilful IEE pedagogical content and curriculum knowledge. Creates links and connection to parents and society.	Leaders acknowledge importance of IEE. Support with timetabling; highlight IEE in school curricula, support fiscal needs. School supports autonomous work and learners responsibility. Active participation of colleagues in IEE. Actively introducing IEE work to society.	A priority placed on IEE as a curriculum area by school. Location and space for IEE lessons supportive. Good, rational connections with other school work. Ample space, tools and materials.	The community expects and supports innovation education. Parents acknowledge importance of IEE as an integral part of schoolwork. Different methods of quality assessment equally important in the public eye.	Developmental agendas include support for IEE development. Evaluation and assessment procedures acknowledge process and creativity. Official discourse about innovation and creativity is directed towards education on all levels.
3	Teacher supports taking risks, experiments and folly. Shared responsibility with learners. Balances control and freedom skilfully. Pedagogical IEE knowledge.	Leaders actively familiar with IEE. Support of school community towards IEE. Colleagues support IEE. Leaders mediate external support.	Evaluation procedures in school include process and creativity. Timetable supportive of project work. School positively receptive to learning and change. School emphasis on arts and manual subjects.	Parents interested and supportive towards IEE. Creativity and innovation seen as essential elements of learning. Process measures of school quality acknowledged.	Teacher education includes IEE – harmony between teacher education and official innovation discourse. Official mandates acknowledge the complexity of deep changes and pay scale structures promote professional development.
2	Teacher acknowledges learners ideas, supports initiative. Constructivist views. Artistic orientation towards teaching; supports learners creativity. Creates a relaxed atmosphere.	Leaders familiar with IEE pedagogy. Allow IEE as a part of school practice (curriculum). Allow external support. Colleagues know about IEE.	An emphasis on or opening spaces for integrating subjects in creative projects. IEE lessons within main building. IEE a part of the developmental agenda.	Parents are informed and take part in IEE. IEE seen to support traditional subjects.	Law and policy expects innovation education. National curriculum includes innovation education.
1 Basic	Teacher interested in IEE. Learners have partial choice. Limited flexibility and chaos angst.	School leaders neutral but allow teacher initiative. IEE as ‘attachment’. Colleagues indifferent.	IEE lessons an isolated undertaking within school.	General views in the local society neutral towards IEE. Parents’ involvement minimal. Traditional subjects main reference for school quality.	Law and policy allows innovation education. Official discourses expect innovation in society.
Setting	Personal factors	Microsystem factors	Mesosystem factors	Exosystem factors	Macrosystem factors

Table 9.2 Location of IEE in City School and interacting systems

4 Ideal					
3	Runa, Bryndis and Anna		City school		
2	Heidi	City school			Icelandic society
1 Basic	All teachers			Aspirations of the local society	Icelandic society
Levels Settings	Personal factors	Microsystem	Mesosystem	Exosystem	Macrosystem

I have described IEE in City School for four teachers (Chapter 6). The setting for IEE in City School is *feasible*, the main mode of pedagogy is *emancipatory* and the curriculum model is mainly *interdisciplinary* with a tendency sometimes towards an integrated curriculum. The school and its teachers meet many of the demands of IEE, having reached the third level in the mesosystem and with several competent teachers in the area of IEE. Although the teachers and the school could reach Level 4 this task would be made easier if they were able to influence the local community to achieve a higher level of development.

The macro and meso systems of City School were found to be constructive for IEE as they support IEE with fairly positive views of the innovation and have in-built flexibility within in the school. Evaluation procedures are being developed to meet requirements of learning across subjects and integration of arts and crafts. The influence of and interaction with the exosystem, the local community, is limited. Some IEE work life visits were arranged but there is not much other contact with the local community in IEE, including parents.

The four teachers tackle working with IEE in different ways. They meet all the basic requirements for working with IEE (personal, Level 1) and three have moved on to Level 3, mainly because they are more flexible. The characteristics of the teachers' work differed with regard to classification of roles and framing in lessons, and in dealing with freedom and control (Chapter 8). Three of the teachers displayed mixed framing towards weak and one leans towards strong framing in lessons. It seems that City School and the team of IEE teachers can develop a more emancipatory IEE with participation of other teachers and by supporting individual teachers in balancing the art of suitable framing in lessons.

Table 9.3 Location of IEE in Country School and interacting systems

4 Ideal					
3					
2	Sunny	Country school			Icelandic society
1 Basic	Sunny	Country school	Country School	Aspirations of the local society	Icelandic society
Levels Settings	Personal factors	Microsystem	Mesosystem	Exosystem	Macrosystem

In Chapter 7.1 I described the work of one teacher, Sunny, with IEE in Country School.

The setting for IEE is (still) *enclosed* with a firm structure but accepting the views of IEE. The pedagogy is mainly in the *controlled* mode but sometimes shows the characteristics of the *progressive* mode. The curriculum is sometimes *integrated* through project work and is otherwise *interdisciplinary*. Country School has a good foundation for working with IEE but needs more strength in the meso- and exosystems in order to move to Level 3 and to work in a more flexible way with IEE.

IEE within Country School deviates from the RD that appears in the meso and macrosystems, a discourse of strongly classified subjects and fixed roles of learners and teachers. However the macro and mesosystems of Country School are somewhat supportive towards IEE with colleagues knowing about the area and the principal facilitating time arrangements in longer time slots than in the ordinary timetable. One IEE field trip was arranged for the Letter in a Bottle Project, and learners held a market where parents and people from the neighbourhood were invited. Otherwise there was little contact with the local community in IEE and parents did not take part in IEE.

Sunny's characteristics in working with IEE showed that she displayed mixed framing in lessons but leaned towards strong framing (Chapter 8). She often acknowledged learner ideas and supported their initiatives. Sunny is somewhat isolated in her work on IEE in her school. Developing the area further within the school needs more contact with the local society (exosystem), direct participation of other teachers and leaders and a progression in Sunny's development towards weaker framing in lessons.

Table 9.4 Location of IEE in Trio School and interacting systems

4 Ideal	Sif lead teacher				
3	Sif lead teacher		TS starting this level		
2	Helen and Rakel	Trio School	Trio School	Parents are informed and take part in IEE	Icelandic society
1 Basic	Fanny, Gunna and Finn			Aspirations of the local society	Icelandic society
Levels Settings	Personal factors	Microsystem	Mesosystem	Exosystem	Macrosystem

In Chapter 7.2 I described the work of a group of teachers with IEE in Trio School with a main focus on the lead teacher Sif. The setting for IEE is *developing* towards one which makes IEE *feasible*. The pedagogy varies among teachers with the lead teacher working in the *emancipatory* mode, some others have reached the progressive model and a few have yet to move beyond the *controlled* mode of pedagogy. The curriculum is often *integrated* but is also found in all the other forms, *interdisciplinary*, *separate disciplines* or *discipline-based*.

The macro and mesosystems of Trio School are supportive of IEE as leaders are interested and some flexibility of time is arranged within an otherwise fixed timetable. Arrangements for team teaching in IEE were made. However, IEE within Trio School deviates from the RD that appears in the meso and macrosystems of the school, a discourse of classified subjects and roles of learners and teachers.

The characteristics of IEE lessons with regard to classification of roles and framing in lessons showed mixed framing with some teachers leaning towards strong framing (Chapter 8). Sif was skilful and confident in working with IEE and instigated various connections with the local community. Different views of colleagues were detected, some antagonistic but others supportive and some changed during the period of the research. As one teacher gained experience of IEE her agency increased and her skills in tackling the demands IEE. Collective teacher efficacy was seen to be developing with the collaboration of a team of IEE teachers on the area strengthening the mesosystem and influencing the micro system.

There were good connections in IEE between the Trio School and the local community, including participation of some parents. Introductions of IEE and outreach of programs such as the Coffee House where the public was welcomed indicated a level of participation

above the ordinary. This connection with the local community is a strength for IEE in Trio School and can help to develop it further and sustain its existence in the school curriculum. Further development of assessment of IEE work can both increase learner recognition rules and views of parents to realise its value. Leader participation and more positive attitudes of colleagues enhance each other in developing IEE further.

Now I will move from summarising the locations of IEE in the three schools to a more general discussion of the systems and settings in the EFD of IEE.

9.3.2 *Macrosystem – national blueprint*

The macrosystem interacts with and affects all the other systems. In a small country such as Iceland the macrosystem is similar for all schools. I suggest that society's view of innovation and the need for innovation education is clear in the law but is not found more widely in society, thus reaching only the Level 2 of development. The law in each country for schooling can be seen as laying the foundation or blueprint for actions in education. In Iceland the law for compulsory and upper secondary schools expects creativity in education. One emphasis of the curricula for compulsory schools as claimed in the 1995 law for compulsory schools was to enhance: 'Understanding, productive and creative work and seek for a balance between manual and academic learning' (Act 66/1995, article 29). This emphasis is even more clearly stated in the new law of 2008: 'Understanding of vital and creative activities, innovation and entrepreneurial studies' (Act 91/2008, article 24, 6). Furthermore the national curricula for both compulsory schools and upper secondary schools include chapters about innovation and entrepreneurship education.

Official and public discourses in Iceland show expressions of interest in innovation and creativity. Industry, business, finance, arts and science and technology express the importance of innovation in society and usually link it to the competitiveness of the country and financial gain. Although innovation is expected (economy) in society it is seldom linked to a defined policy in education. The 24-page report from the Office of the Prime Minister (2006) on the policy for science and technology in Iceland 2006-2009 mentions innovation 37 times but does not mention the need to cultivate innovation capacity through education. There is no specific official action plan for the development of innovation education in schools. Neither are there requirements for such education in teacher education in Iceland.

Evaluation plays a crucial role in deciding what learners learn and what teachers teach and can teach in schools (Agrwal 2004, Eisner 2002). Standardised assessment in grades 4, 7 and 10 in Iceland do not assess initiative and creativity. New pay scale structures for teachers no longer give credit for professional development activities. Principals have a

key role in supporting curriculum change and allocating resources to teachers all within an already overloaded agenda. IEE was added to the formal curriculum in 1999 without specific introduction or support to schools and teachers. Working conditions of teachers and of working parents are created through national agreements and have repercussions for school staff and family life. In City school the teachers were enthusiastic but tired and it was clear from their informal talk that tackling change as well as matters of family and home was tough. Development work is squeezed into overfull schedules. The analysis locates the Icelandic macrosystem for the three schools at Levels 1 and Level 2 with regard to innovation education. One challenge for the macrosystem is to provide coherent and consistent support for development of teacher education, both pre-service and in-service.

9.3.3 Exosystem – demands and aspirations in society

Events in the exosystem affect or are affected by the developing person although that person is not involved as an active participant (Bronfenbrenner, 1979, p. 25).

Characteristics of the exosystem indicate that the level views and attitudes in the society and the local community are located at Level 1 for City School and Country School. Community views towards innovation education are neutral as parents' involvement was minimal or none. The law for compulsory schools in Iceland (Act 66/1995) and more recent law from 2008 (Act 91/2008) requires each school to have a parent advisory council which amongst other things must approve the school curriculum. Parent advisory councils have little information to work with from sources other than their children, the school itself and results of national tests. Parents of the IEE learners in City and Country School have not complained about IEE being taught, but on the other hand have not shown special interest or been involved in supporting it. The exosystems interact with the micro and meso systems where the school staff has opportunities to talk about IEE with parents and show them examples of work being done in IEE. The level of the exosystem of Trio School is at Level 2 as information flow between the school and the community and collaboration with work life and parents is actively supported through their participation in IEE projects.

As in other countries a greater respect for academic subjects over creative arts and manual school subjects is also related to the esteem granted to traditional learning (Goodson, 1993; Guðbjörnsdóttir, 2003; Paecther, 2000). What and how children learn in different subjects is a low priority for both the ministry and local authorities (Icelandic Centre for Research, 2005) and no official evaluation on IEE has been carried out since the introduction into the curriculum in 1999.

The ecology of IEE is vulnerable as the exosystem is located at Level 1-2 and appears to be the most isolated of the systems. Few events occur in this setting that might strengthen

IEE. Interactions between the exosystem and the other systems are limited except in the Trio School case. According to the EFD model the next feasible step would be that parents and members of society in general are kept informed and thus become interested in IEE and see it as supportive for the development of their children and that it could be integrated with other subjects. That must be the joint task of the individuals in the schools, the micro- and meso system with support from the macrosystem.

9.3.4 Mesosystem – awareness, priorities and arrangements within the schools

The mesosystem is the interaction of two or more settings in which the developing person actively participates, in our case, teachers and leaders, as well as learners (Bronfenbrenner, 1979: 25).

The mesosystem of IEE at City School shows characteristics of Level 3 because of its emphasis in words and actions on project work, integrating subjects, manual subjects and arts and development of assessment that values creativity and process. IEE is also on the developmental agenda of City School where the whole atmosphere is linked to school-wide development but there was some tiredness in the staff as every teacher actively took part in some kind of developmental work. The next feasible level (Level 4) in the development of the mesosystem in City School would show IEE to be more visible and important as a curriculum area, increasing the connections to other school work, involving the whole school community and making facilities more supportive to IEE by supplying more storage space, tools and accessible organization of materials. These actions are intertwined with the microsystem and are logically interdependent.

In Country School innovation education has depended on a single individual and although the staff was conscious of school innovations and developments in other Icelandic schools, this interest in innovations in other schools has not been channelled into a working strategy involving IEE development. Current mesosystem implementation is mainly at Level 1 in Country School although the visibility of IEE in the school's curricula locates it partially on Level 2. Feasible development in Country School could be to prepare and implement a school policy of enhancing creativity and manual subjects, integrating subjects in project work and opening up the timetable to support such procedures. These are characteristics at Level 2. At the same time the school could place more value on process evaluation and integrating IEE into their developmental agenda. There was a will and an ambition to do good work that was apparent in the attitudes of leaders and teachers and appeared in participation in different developmental projects, one indicator being the ambition to work in the spirit of IEE. Access to and characteristics of mesosystem factors should also be considered as policy development is addressed.

Trio School's mesosystem is mainly located at Level 2 but starting to enter Level 3. The timetable has been partially arranged to open up a space for IEE in organizing three consecutive lessons as a slot for the projects for six weeks. The IEE lessons are within the main building and learners use several spaces for their work and IEE is clear on the official development agenda of the school. Work on evaluation procedures that include process and creativity is starting and is a part of their development agenda.

9.3.5 Microsystem – pattern of activities, roles, support and views of colleagues

A microsystem is a pattern of activities experienced by the developing person in a given setting (Bronfenbrenner, 1979, p. 22).

In City school middle management was actively taking part in developing IEE and it had explicit support from the principal locating them at Level 2. The principal also allowed external support offered from a specialist (the researcher) and the teachers in City school emphasised the importance of the support they had from the specialist's visits. The microsystem of City school has moved to a level more supportive than at lower levels and is partially located at Level 3, though the school community as a whole is not actively involved.

Country School and Trio School indicated similarities in their microsystems with their current location at Level 1 and Level 2.

In the Country School microsystem IEE was viewed as a one teacher task and the view of the school leader was neutral, allowing innovation education, permitting the researcher's support, but not making an effort to draw other teachers into the work. Other colleagues knew about IEE but did not take part in it. This year 2011 the acting principal of Country School has planned a course for all teachers in the school to introduce IEE and involve them in offering IEE thus moving ahead with the development of the area in the school.

In Trio School there was a mixed notion of support from leaders and colleagues (Level 2). IEE was a formal part of the curriculum and functioned as a collective enterprise though without the active support of the principal in Sif's view. However, the principal had initiated the development of IEE and agreed to the appointment of a lead teacher. The administrators also allowed external support from the researcher. The collegial work and the IEE courses helped the development towards the general support of the school staff community. The collective teacher efficacy developing within the school was not without tension and may need more wholehearted support of the administrators. Recent contact (June 2011) with the principal indicates a continuing interest in developing IEE in the school as he has arranged for a refresher course for the teachers in the school.

All three schools indicated a growing capacity to support the development of IEE within the timeframe of my research. In order to drive IEE development the schools and teachers should be looking for ways to move to the next levels within their schools (personal, micro and meso). City School could make the whole school community more involved, making IEE clearly visible in the formal curricula and highlighting and introducing IEE actively to society thus influencing the exosystem which would in turn support the teachers' work. Feasible actions in Country School might be to find ways of mediating more external support which could involve school leaders and other colleagues more in the development of IEE, strengthening both personal factors and the microsystem. This is now on their agenda. Trio School leaders need to support the development of the teachers wholeheartedly and become actively involved. The interaction between the individual and microsystem is important for sustained development. The danger is when a 'solo' teacher develops to the ideal level ahead of the microsystem. If the teacher leaves the school then IEE goes with her/him. IEE teachers may develop to higher levels within a neutral microsystem allowing individual teacher initiative, but their development would be enhanced by a leader's active support and colleagues' involvement.

9.3.6 Personal and professional characteristics for the implementation of IEE

All teachers in the three case schools showed some readiness to allow learners some autonomy and choice in the IEE lessons. They were also in most cases positive about learner ideas and were developing lessons towards increasing learner autonomy. All IEE teachers in City School and Sunny in Country and most of Trio School's teachers said that they wanted their teaching to be exciting and creative; they realized the need to build on structures that allowed freedom and creativity and showed a willingness to try something new and take risks in their teaching. Three of the teachers in City school seemed confident in taking risks, trying new things, using new materials and acting spontaneously as they went along. Runa acknowledged the need for structure and to learn how to use tools and methods but that she tended to prefer freedom to strict structure.

Some of Trio School teachers were reluctant to try IEE in the first place and were not willing to take risks. There were some differences in how the teachers handled matters when learners wanted to play with the freedom they were offered. Learners themselves did not always have much experience of freedom to make their own decisions. The four teachers in City School, Sunny in Country, and Sif in Trio School showed signs of a constructivist approach to teaching in the mind map they drew of themselves and in the interviews and also showed instances of an 'artistic orientation' in their teaching actions.

The artistic orientation is based on Eisner's (2002) understanding of an artistic approach to teaching. Sunny in Country school said:

I want to give my learners a chance to work where they are not hovering over books all the time. Rather I want to trust them to do a certain job, they create their own things. They get an opportunity to design and innovate and sort things out. (CO11It, 21)

Sunny in Country school, Helen and Rakel in Trio School and Heidi at City School, appeared to have moved on to Level 2 as professionals. They still leaned towards strong control over the learners' actions and decisions. Rakel however seemed most aware of her tendency to take over learners' decisions and was deliberately working against it. Heidi in City School and Sunny in Country School tended to take control and decide for learners, setting more limits to what was allowed, and thus may still be partially located on Level 1. Three of the teachers at City School seemed to have mastered the art of allowing the learners to experiment (Level 3) yet maintaining a level of control that did not stifle creativity. Responsibility for the work of the learners was shared. They knew when to 'stand back' when learners were developing their ideas and responded to questions openly rather than with 'right' answers. Sif the lead teacher in Trio School appears to be on Levels 3 and 4, supporting learners' initiative and activities, confident in IEE pedagogical knowledge and with several links between the school and the community in the IEE projects.

Teacher development towards the 'ideal' innovation teacher may depend on teachers making their own ways of teaching more conscious (Day, 1999) and moving from where they are towards a balance between the freedom and structure within which IEE blossoms and towards seeing connections with society as a normal part of their work. This awareness can build on realizing the many elements of framing that can be offered in different strengths and special attention should be given to making the criteria of evaluation visible. Visible criteria of evaluation can influence not just the recognition and realization rules of learners but also make clear to the public, especially parents, what is gained with IEE. Criteria of evaluation must be carefully chosen so that they do not display only what behaviour is wanted but also what kind of skills are valued.

In general, these findings set in the rubric of EFD show that interaction between systems is limited but has the potential to relate the exo- and macrosystems more directly to the meso- and microsystem.

9.4 Changing the ecology of education

9.4.1 *The nature of the innovation*

The purest form of IEE is the ‘integrated’ form when complete integration of knowledge builds on needs and interests of learners and they are independent creators (Figure 8.5). This requires teachers to be facilitators rather than “teachers” and preferably to work with others thus blurring boundaries of their roles. Sometimes this is a major disturbance of existing structures in schools.

In the course of my research I noticed that IEE is generally not to be found within or integrated with science, arts and crafts in Icelandic compulsory schools. Teachers seem to adapt most easily to IEE as a separate entity rather than as a tool or an approach to use within subjects or to integrate traditional subjects. One explanation is that the general population of school professionals in Iceland do not know about IEE and can therefore not be expected to implement it one way or the other. Some connections of IEE to arts and crafts were seen with IEE being offered under the name of ‘arts and crafts’ or in relation to it, being taught by arts or crafts teachers or being placed in the crafts room. Another explanation for adapting most easily to IEE as a ‘special subject’ is that the form and organization of education is mostly framed as subjects. That IEE is found in the timetable at all is maybe the first feasible step towards implementation.

It is worth contemplating whether Trio School principal Karl’s understanding depicts the sensible way to offer and develop IEE, that is that IEE must first be a ‘special subject’ so that people in schools get to know it and then that it can be integrated into or used to integrate other subjects. For this to be a more general strategy might need an official time allocation when schools were obliged to offer IEE as a formal subject. However the new curriculum of the Ministry of Education (2011) is now loosening the constraints of the timetable with competences as aims. It will be interesting to see how schools and a curriculum that are ‘subjectified’ and stratified will react to the competence model. The tendency to think about education in classified entities as school subjects must be considered when innovations such as IEE that have no boundaries or help to crosscut boundaries of subjects, are implemented.

Making visible the different influences on teachers, rooted in history, social interactions and local conditions is helpful but complex. I have tried to construct an image with both suitable detail and a broad overview. Bernstein’s theories helped here to identify the less visible factors of the pedagogy and regulating discourses whereas Bronfenbrenner’s theories offered both the broad overview and systems approach. Rogan and Grayson’s

theories highlight the progressive nature of school development and the EFD can indicate important potential routes in development.

As in other countries many factors influence innovations in schools. In Chapter 2, I discussed the introduction of similar innovations in other countries such as design and technology education (Jones 2006). Using the EFD model to develop and analyse the cases in this research helped to identify influences that interact in the progression of innovation and entrepreneurial education from one level to another. In order for curriculum reform programmes to take root, implementation strategies for educational innovations need to take into account the local context, the diversity within each context, the nature of the innovation and psychological factors that influence learning and change (Rogan & Grayson, 2003). The EFD rubric that was developed in this research helped to locate IEE in three schools and recognize constraints and contributors. The structure of the EFD rubric can be applied to other curricular innovations, adapted to topics and other contexts, revealing constraints or contributors in underlying systems local and remote.

9.4.2 *Teachers' orientation to the innovation*

I asked in the beginning if IEE relies on the characteristics of teachers and their pedagogy or if something in their context supports or obstructs such education. The findings show that the IEE teachers have to build on or acquire approaches and views that sometimes are different from what they are used to. They have to develop the 'artistic approach' in teaching and holistic thinking that can easily override boundaries of subjects and social relations. There was a noticeable difference in how easily teachers tackled the role of the IEE teacher. The ability to stand back when learners were developing their ideas was difficult and some teachers tended to control many aspects of IEE lessons with strong and sometimes very strong framing. The awareness of the tendency to control was becoming apparent with some teachers, such as Fanny's development showed, and sometimes with the help of colleagues, such as Rakel described.

The 13 teachers in Chapter 8 were found to display three different modes of IEE, *emancipatory*, *progressive* and *controlled* according to classification of teacher-learner roles and strength of framing. These modes were influenced by the teachers' personal and professional choices but also by the structure and ethos of their schools. These modes can be seen as steps towards the emancipatory mode with the controlled mode as the least developed and the progressive mode as having a good basis to develop into the emancipatory mode.

The innovation education teachers in the case schools were found at different levels of IEE development in the EFD rubric, and these locations depended on training, the school ethos

and their personal and professional inclinations. Teachers gain from various kinds of support and their professional and personal orientation is fundamental to change and makes a difference where they start in a journey to innovation. They are at different levels of thinking about their teaching. Artistic orientation with mixed framing seems to help some teachers deal with the balance needed between freedom and structure in the classroom, where teachers seek to give value to learner voice, elicit tacit knowledge of learners and situate learning in their context. This capacity of the teachers to allow enough freedom, accepting the role of the ‘flexible teacher’ in order to enhance learner agency and creativity within reasonable boundaries and within different contexts, seems to make the greatest difference in realising the potential of IEE.

What is expected of teachers within the microsystem and how that fits with their teaching philosophies does matter and needs to be understood by each and every teacher (Darling-Hammond 1999). Supporting teachers in making their educational philosophies visible and facing possible *chaos angst* when taking on new demands can be supported by actions within the micro and mesosystems, that is within the schools, by arranging for time and specialist support. These would be influenced in turn by actions within the exosystem and macrosystem that indicate the kind of knowledge and skills that are considered important and supportive working conditions. It seems that individual teachers can develop to a relatively high level of IEE compared to the levels in the surrounding systems. Sustaining that level however and further development seems unlikely without development in the neighbouring and remote systems as was pointed out in Rogan and Grayson’s research.

9.4.3 *School ethos and structure – micro- and mesosystems*

Some differences were detected in school ethos, policy, and the construction of the school curriculum and timetabling decisions. The *interdisciplinary* and *integrative* nature of IEE is somewhat of a challenge to the segmented organisation of schools in general. City School had a policy of crossing boundaries of subjects and age groups and was therefore more accommodating to IEE than the other two schools. They and Trio School had a team of innovation education teachers that made up the communal cluster (Shulman & Shulman, 2004) necessary for development but the cluster members need to expand and distribute their acquired expertise within the school. Dedicated and enthusiastic teachers are not enough to balance the increased workload of reacting to change demands without risking exhaustion (Ballet & Kelchtermans, 2008). Such demands refer to the macrosystem as well, where working conditions of teachers and of working parents are decided. The growth of collective teacher efficacy in IEE seems to be a promising arrangement to enhance and sustain IEE development.

9.4.4 *Potential growth – the exosystem*

The current interaction between the exo and the other systems is docile, as the parents and the local communities are not active participants in the area of IEE and the other systems are not reaching for contact with the exosystem. However the outreach of IEE in Trio School to the local community is a promising seed for growth and interaction between school and society. The general lack of interaction that is more typical than the Trio School example depicts decreases the potential for development. Schools can work at enhancing interaction if they are interested in driving the development of innovation education. One way is to make an impression on the parents and the local policy makers by discussing the value of this kind of education, making it more visible and including them in IEE activities. A general introduction to innovation education and its potential could be offered to parents and the local society, preferably with the active participation of learners, in the spirit of IEE. The collaboration with the local society in Trio School is a way to enhance and strengthen interaction and interest in IEE. Assessment of the quality of education is important to parents and therefore they need to appreciate that other forms of evaluation are more appropriate for innovation education than traditional tests and that these form are valid and reliable. A part of making the value of IEE visible is making the criteria for evaluation visible, building it on the aims of IEE. The official RD on innovation could give the tone for evaluating IEE.

9.4.5 *The blueprint – the macrosystem*

The macrosystem, the underlying culture in Iceland is supportive of a new curriculum area such as IEE. The official discourse on innovation in Iceland is a positive discourse depicting a strong belief in the power of independence, innovation and entrepreneurship. This discourse is relocated in policy documents and official curricula where innovation and creativity were portrayed as important in the compulsory school curriculum in 1999. The rationale of the official discourse and policy documents are very much in the spirit of economy and the competence to create economic worth. The tone of the curriculum is not only of economic importance but also of strengthening each individual's constructive participation in society. This tone is stronger now with the six key issues that are to guide the education of young people and school curricula in Iceland (Ministry of Education, 2011).

Visible in the Icelandic macrosystem is an increasing global influence including policies of the European Union such as the policy for the year of 2009 for Innovation and Creativity (European Union, 2008) and the policy of the UN of the Decade of Education for Sustainable Development (UNESCO, n.d.). Such external policies put pressure on the

Icelandic macrosystem to deliver the kind of creative and integrative education of which IEE is an example. The resources for change required of teachers to work in the way IEE entails, is currently not found by the macrosystem in Iceland.

The next feasible steps for the macrosystem would be a focus on parties in the exosystem and the views of society, and could include a convincing introduction of the promise of IEE and development of credible evaluation procedures. To increase harmony between teacher education in Iceland and the official innovation discourse, there needs to be a substantive offer of training for learner teachers in innovation education that is not currently available. The macrosystem of New Zealand could be taken as a model for Iceland as they offer all learner teachers for primary school training in technology education and have been offering substantial courses for in-service teachers since introducing technology education into their compulsory curriculum (Jones, 2006).

9.5 Final words

In this chapter I reflect on my project and discuss the value of Bernstein's pedagogic device for analysing the implementation of new ideas in education.

9.5.1 Looking back

In order to enhance the capacity of people through education to be innovative and creative, imagine possible futures and choose the one preferred, education needs skilled teachers with the frame of mind suitable for IEE. Such teachers need to be able to balance freedom. Using the Bernsteinian indicators tools may be seen as reducing teaching and learning to a mechanistic construction. However the purpose here has not been to minimize the complexity of teaching IEE but rather to make the complexity explicit and to provide tools that increase awareness of the variety of factors affecting teaching. Using the Bernstein's pedagogical palette artistically, to support and enhance creativity, is to consciously adjust framing according to the aims and goals of education.

Implementation policies and strategies need to take into account both personal factors and local context. Innovations that require new thinking, a different frame of mind, must have substantial support within the schools and from policy makers. Contradictions between the prevailing structure and intended changes can be dealt with constructively but need infusion and interaction in all systems. Bernstein's theories helped to reveal and to deconstruct the nature of the prevailing structures and can be used to change them, first by making them visible and then by altering them according to our educational visions.

Changes in education will not take root without strategies that also take into account less visible and more remote factors that influence each other in complex ways.

In my research I did not use Bronfenbrenner's 'chronosystem' (Bronfenbrenner, 1994) that comprises the element of time. Although most of my research data was assembled over a period of two years (2006-2008) it is interesting to see that the zeitgeist of Iceland since the introduction of IEE in 1999 is one of fast change, technological innovations and an ethos of entrepreneurship (Guðbjörnsdóttir, 2005; Jónsson, 2005) that seems to be conducive to the development of innovation and entrepreneurial education. However IEE needs a discourse at odds with the prevailing structure of schools. Similarly the general views in society towards what 'real' school is like are a historical cultural legacy and Bernstein's theories helped to deconstruct that structure and open up potential to construct a different kind. Thus I have some reservations about the recently announced changes in the Icelandic school system although I welcome them. I know though that they offer an opportunity for deep change, for developing a frame of thinking that includes the connectedness of systems and individuals and respects the universal, the personal and the local at the same time.

The main focus of the research was on the work of the teachers although some attention was given to learners work in IEE and their attitudes. No clear differences could be detected in the way boys and girls experienced working with IEE although some descriptions in the case schools show some differences in behaviour in lessons. The learners' experience of IEE is of fundamental importance and should be examined in more scope and detail than was possible in this research in order to make it possible to infer more clearly what kind of learner experiences IEE offers to different genders and also if socio-economic status is relevant in this kind of learning. These issues and others relating to how and whether IEE can contribute to citizenship and sustainability education could be a focus in research focusing on the influence on learners in IEE and their experience of it.

All three case schools have worked on development of IEE since my research with them finished and would probably be located at higher levels in the ecology of feasible development now. Using an ecological approach made it possible to draw the findings together in a holistic picture that showed the complexity and interconnectedness of factors that impact the development of IEE.

The ecology of feasible development (EFD) model offers an approach to identify the current and accessible levels of development of curricular innovations, including effects of interacting systems, allowing a coherent picture of a specific area to emerge in some detail. A range of social and institutional influences on the work of teachers can be identified using the EFD model. Using it on my data helped to make visible the influences and

opportunities of IEE in three Icelandic schools and their local and remote environments. It seems that the change of the role of the teacher from the ‘traditional’ to the ‘flexible’ teacher is a part of the ‘deep’ change that is rooted in various social ecologies and requires a collective effort.

The obscure interaction between the macro and exosystems is sometimes difficult to distinguish but it is possible and helpful to analyse the exosystem separately. The general views of society including parents towards IEE are the least developed but can be and need to be influenced. The public can be made aware of the relevance and nature of IEE. Further research on the influence of the exosystem, i.e. parents’ and societal views and policy in local areas could be revealing and helpful in taking steps for the enhancement of innovation education in Iceland. Research is also needed to identify more explicitly the indicators for the development of IEE in other settings. The development of relevant and reliable assessment methods of innovation and creativity in learners could contribute to society’s understanding for the kind of education IEE and similar subjects offer. Assessment methods could support teachers in their work, validate learners’ achievements, reassure parents and give authorities the proof they need for the quality of the education.

It seems that teachers and schools can work with IEE to some extent without support of the exo and macro systems but weak support makes the development fragile and more likely to fade away, in the same way as educational innovations in the last century have tended to do. Top down forces could increase policy implementation by supporting the complicated interaction needed for change and developing the appropriate support and interaction but more support is also needed to make bottom-up contributions to change sustainable. The interactions between systems are crucial to the development of the social ecology of IEE and can be enhanced. In feasible development all systems interact and support continued growth.

9.5.2 *The pedagogic device of IEE*

In Chapter 5, I gave an account of the distributive rules in the official discourse and the intended curriculum. I presented case studies in Chapters 6 and 7 of the enacted curriculum of IEE. Drawing on these findings I was able, in Chapter 8, to make proposals about the recontextualisation of IEE in schools of the curriculum decisions that underlie the integration of IEE into the school (Figure 8.5) and the modes of pedagogy adopted (Figure 8.4). I was also able to present key features of the settings in which the recontextualisation takes place (Figure 8.2).

My key research question has been:

- Where and how is IEE located in Icelandic compulsory schools?

I am now in a position to give an answer. Bernstein (2000, p. 37) has outlined the rules for the pedagogic device as being distributive, recontextualising and evaluative. I link his device to my findings in Figure 9.1.

Distributive rules Innovation discourse (Ch. 4)	
Recontextualising rules The intended IEE curriculum (Ch. 4)	
Settings Recontextualisation in schools (Figure 8.1) Dormant Enclosed Developing Feasible	
Modes of IEE pedagogy (Figure 8.4)	Curriculum integration (Figure 8.5)
Transmissive Controlled Progressive Emancipatory	Discipline-based Separate disciplines Interdisciplinary Integrated (pure IEE)
Evaluative rules Assessment of IEE barely visible	

Figure 9.1 The pedagogic device of IEE

I have found the innovation discourse relocated in the intended curriculum and considered its relocation in the enacted curriculum. I found settings in schools that gave IEE the space needed to adapt the available structure to accommodate IEE by moving from an *enclosed* into a *developing setting* where others had set up flexible spaces almost by ‘default’ such as City School. From here it is possible to move into a *feasible setting* for IEE. The pedagogical modes of IEE of different teachers were found to vary from *controlled* and *progressive* to the one most supportive of IEE, the *emancipatory* mode. Curriculum integration was quite mixed though the *integrated* or pure form was found to be most conducive to the goals of IEE and enhance creativity as innovation and action. Although I can identify several modes of pedagogy, levels of curriculum integration and the receptivity of settings I have noticed that there was very little discussion of assessment of

IEE in schools (Figure 9.2) though there was some evidence of this in the step-by-step development observed in one case school. What is assessed or evaluated in education often shows what is really valued in education and yet in IEE in Iceland assessment is almost invisible, a silent voice waiting to be heard as well as reflecting the marginalised place of IEE in the curriculum.

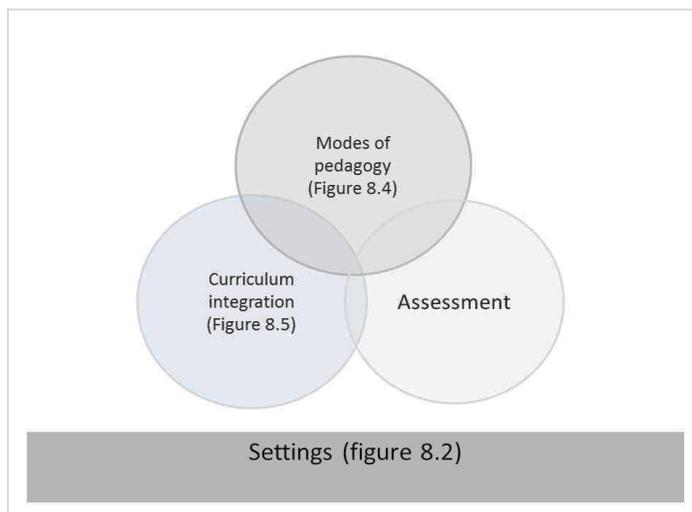


Figure 9.2 Curriculum, pedagogy and assessment

One possible explanation for the silence of IEE in schools can be found in the guidelines given in the intended curriculum on assessment of ITE and IEE:

Evaluation – ITE chapter (Ministry of Education, 1999b, p. 9. Subjects in the area, other than design and woodwork, are integrated subjects. Evaluation is therefore the responsibility the teacher of the school subject, which the component of the ITE subject area is integrated into. Evaluation of the subject-specific objectives of information education must be the responsibility of the teacher that teaches the subject, in the event it is not the class teacher.

Evaluation – IEE chapter (p. 34). All studies in innovation and the utilization of knowledge are project oriented i.e. the student makes something. There is no expectation of the student taking an exam testing his or her knowledge. Instead it is suggested that the evaluation takes the form of a checklist or benchmarks that the teacher puts together and shows to the students before the project begins. Among other pre-clarified components of evaluation should be whether group or individual marks will be given for work on projects, what demands are made, and what specific aspects teachers will evaluate.

These messages are contradictory. The former quote, from the general introduction to the *Information and technology education* curriculum is addressed to the subject teacher with the suggestion that he/she be responsible for an evaluation of learning when the school subject is integrated with IEE. The latter quote, from the section on IEE, presents an approach that is entirely different and builds on evaluating the development of competences. It is not impossible to integrate the two but that requires collaboration and work on knowledge criteria and evaluation procedures that are just beginning in Iceland, procedures that value process and creativity. The recognition rules of a different education and a different way of evaluating learning require valid assessment methods visible to learners, parents, society, administrators as well as teachers. This development task is for the professional that collaborates with his/her colleagues, society, parents and learners on shared goals in emerging curriculum areas. It is a professionalism that requires teachers to go beyond teaching as an instrumental process of putting “what works” into practice but rather to be what Sachs (2003) calls ‘the transformative professional’ i.e. to be responsive, active, progressive and collaborative. Therefore it is important that teacher education includes the development of sensitivity to the impact of classification and framing and how these can be tuned to support creative, emancipatory learning.

9.6 Strengths and weaknesses and further research

The underlying purpose of this research has been to strengthen the practice of IEE in Iceland. I embarked on this research to find an answer to the question of the location of IEE in school practice and in the process identify its characteristics and what supported its development. Although the intention was not to generalise I think the findings can support others in developing their own versions of IEE. The research revealed the complexity of implementing radical innovations into set structures of schooling.

The main strengths of the research lie in the research methods of qualitative origin and the use of powerful theoretical frameworks. Using case studies, interview data and document analysis was appropriate to gain an understanding of the official and pedagogical discourse, different settings and modes of pedagogy. The complex social reality was mapped into a model of a social ecology of IEE that can be adjusted to other educational ecologies of a similar nature. Another strength of the research is in the understanding gained by considering the transformation of discourses into practice seen through Bernsteinian “glasses” to examine how settings, modes of pedagogy and curricular models can be influenced.

A weakness of the research is that the major case study of City School was done when the opportunity presented itself even though the literature review and the theoretical framework were still incomplete. If I had befriended with Bernstein earlier perhaps I would have recorded my data in a different way, but then I would not have had the benefit of also looking at my data inductively.

A limitation of the research is that it could have generated more data, for example, by following more teachers into the classroom, but this would have expanded the scope of the thesis considerably. I needed to understand settings and structures thus my focus on case studies. New opportunities for research are to explore the views of parents and the views of learners more fully. The function of evaluation or assessment could also be followed up and its 'silence' revealed.

As mentioned above I realised there were several aspects that would be useful to understand better, such as the views of parents towards IEE and its role in the education of their children. Related to that is the development of reliable and relevant evaluation of creative work that could be supported by research and could become a key tool to enhancing IEE in all systems.

The notion of 'chaos angst' seems to be something teachers deal with in different ways and I also think this element could be scrutinised by further research. How other teachers use framing and develop their pedagogy in relation to their settings is of interest in IEE and other creative pedagogies. The 'chat' or 'the creative conversation' is related to this issue and seemed to me to be one of the most delicate moments in IEE lessons, and warrants further research in relation to IEE.

The new curriculum in Iceland (see Postscript) requiring new ways of thinking about and organising education than before, thinking that is similar in some respects to the IEE pedagogy, demands extensive research. The 'new professionalism' and collective efficacy of teachers dealing with new demands should be on the development agenda of policy makers and of researchers.

POSTSCRIPT: RECENT CHANGES IN ICELANDIC EDUCATIONAL AND CURRICULUM POLICY

In early 2011 considerable changes were announced in the policy for compulsory education in Iceland through the new national curriculum that may open up spaces for IEE to flourish. The focus on innovation was made more explicit in the 2008 law on compulsory education, than in the law from 1995. For the first time the law introduces ‘innovation and entrepreneurial studies’ as one of twelve main elements: “understanding and vital and creative activities, innovation and entrepreneurial studies” (Act 91/2008 article 24, f).

The publication of the general guide to the new curriculum in May 2011 identified six *important issues* (í grunnþættir) as core issues in all education from playschool to upper secondary school (Ministry of Education, Science and Culture, 2011, p. 25). These issues are:

- Literacy
- Sustainability
- Democracy
- Equality
- Health and well being
- Creative work (Ministry of Education, Science and Culture, 2011, p. 25).

A competence model is adopted as a new way of looking at the outcomes and aims of formal education and this view could be conducive to IEE and the way IEE is organised as it is about attaining certain attitudes and skills, practicing and gaining knowledge and putting it into action. Bernstein’s (2000) discussion of the competence model offers informative aspects that must be considered in implementing such a model, about the social logic, discursive forms, pedagogic modes, nature of evaluation and the economy.

In the new curriculum there is a different kind of time allocation than before, where instead of minutes per week and per year in each subject, minutes per school level are introduced. By offering schools this new way of looking at hours of instruction they have more flexibility in how to organize time. It also puts a lot of responsibility on the administrators’ shoulders and must rely on their professionalism and managerial skills. This flexibility of time holds promise of creating school cultures that are supportive and in the same spirit as IEE and other new curricular areas that require different organization and different kind of thinking than for strictly classified school subjects.

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APPENDIX I SCHEDULES FOR INTERVIEWS

Teacher Frame for interviewing an innovation education teacher

1. a What is your background (age, family)?
1. b. What sort of education do you have, which route did you take and why did you become a teacher?
1. c What kind of specialty do you have (if it hasn't appeared)?
1. d What kind of teacher would you like to be?
 1. Do you teach innovation education / have you taught IE before/ how long have you taught IE?
 2. Where do you „take“ the lessons for teaching IE (also for administrators) ?
 3. Have you taken a course in IE? Where – how long?
 4. Why did you start to teach IE ? IE is without time allocation but you teach it here, why and who decided?
 5. What do you think is accomplished by teaching IE/ do you hope to accomplish ? what do you think is accomplished that would not be without it but is important to have in school work? Which elements?
 6. Where do you get the aims for your innovation education that you put in your school curriculum? (from the teaching materials, from the course, from the 1999 official curriculum)?
 7. Do you work with some or all of these elements in your IE teaching: searching for needs – using the small notebook – links with the students' lives – links with the world of work – searching for solutions – brainstorming – drawings – making models – making prototypes? Can you give me examples – how do you work with these elements in the classes?
 8. Is there anyone that shows interest in the work you are doing in innovation education ? Co-teachers, administrators – other co-workers – what are the reactions like ?
 9. Have you introduced the IE contest to your students and are they interested in it ? Is it motivating in the lessons?
 10. How has the experience been so far of teaching IE? What do you notice? Is something different from other lessons? How does this fit with other teaching in the school?
 11. Do you think learning IE benefits students – in other studies/in live? How, in what?
 12. Woodwork/crafts and connection with IEE.
 13. What about Information technology/arts/ other subjects?
 14. do you feel you are capable to teach IEE? Do you need further knowledge or skills in any area?
 15. What do you find most challenging in teaching IEE?

16. What is easiest and what is most enjoyable?
17. Have you noticed if any student are enjoying/blooming in IEE that are not enjoying other school work?
18. Do you find gains in carrying on with the IEE lessons?
19. How do you find the conditions in this school for teaching IEE, tools and equipment and space?
20. What hinders IEE? hvaða hindranir eru?
21. What supports?
22. What is lacking?

Administrator interview

1. Why do you support IEE being taught at your school (no time allocation in the official curriculum)?
2. Where do you “take” the time for teaching IEE?
3. What is in your opinion important about IEE that other subjects do not have or what important qualities does it have in addition with what you are already doing?
4. How does IEE fit into what you are doing in this school – your policy?
5. Is there a need to introduce this part IEE of the curriculum better? to teachers and administrators –to parents for example?
6. What is holding subjects like IEE back (hindering) (time allocation, reporting (counting hours for subjects), lack of teachers that know how to teach IEE, funding for trips, more subject division in older classes, the classification of subjects, emphasis on official tests, emphasis on academic learning and more respect, other?)
7. What supports a subject like IEE (time allocation meant for this subject, access to teachers that are skilled IE teachers, reports that ask for IEE, acknowledgement of the subject’s value from schoolpeople, public, access to quality evaluation methods that value processes, enough funding for field trips).
8. What are the visions you have on behalf of your school?
9. What would you see done better – what kind of work would you like to see more of and what less, in this school and in education in general?

Frame for student interview

1. What subjects do you like the best in school? Least? Easiest? (why)
2. Have you had IEE lessons this schoolyear?
3. What sorts of lessons are these? What are you learning? Practicing?
4. Describe to me what you do in IEE lessons in the classroom?
5. Do you go on visits outside the school – what do you do when you go on fieldtrips or visits?

6. When is a IEE lesson enjoyable? Good, fun?
7. When do you find you learn best? (lectures/ explanation from the blackboard, see what the teacher does in experiments, experiment myself).
8. Are the lessons built on your own interests, experience and knowledge? Are you asked about problems or needs you know? Can you give me examples
9. Do you learn to use a notebook for your work in IEE?
10. Do you have to do homework for IEE lessons? What about finding needs? What about the notebook?
11. Do you ever brainstorm together? Allowed to suggest all kinds of solutions and all is allowed – the teacher allows you to gibber and say just about anything?
12. Do you write in IEE lessons?
13. Draw, construct (make), paint, talk, craft, design – mess, make experiments?
14. How do you understand the word innovation education (nýsköpunarmennt)? What, shy, what do you envision – what sort of school subject is IEE – is it really a school subject?
15. What do you think when I say the word ‘science’ – ‘technology’ – are they related to IEE?
16. What do you think you have learned in IEE this semester?
17. Do you want to learn more? What?
18. If you had the power to decide how IEE was done, what would it be like? (you have 9-19 years experience from schooling, the older groups).
19. Is there anything that you think should be more of in this school – anything that is completely missing?
20. Anything you would like to add?

Focus group – interview with teacher group

Interview taken at the end of the first IEE school year in City School – some questions were influenced by the codes and themes that had emerged in the first rounds of analysis of the data collected over the school year.

- I am wondering about what kind of teachers you are and how you approach your teaching in general. I want to ask how IEE or teaching innovation fits your approach in teaching – in what way?
- What do you find important/most important in teaching? What do you find valuable in IEE?
- Did you have to adjust anything or change, your thinking or how you approach learners, your way of teaching or other to get good results in IEE?
- IEE is not common in schools even though it is in the curriculum so this seems like a bit of experimental teaching, somewhat bold – why were you willing to take

part in such an experiment? But you all were willing to take part – are you ready to take a risk in your teaching? What could be the benefit? What is difficult about it?

- Freedom – control – organization – how do these appear in IEE (how do they matter in IEE or in school activities)?
- Can you describe some episodes? Can you give me an example?
- What did you think of having this as a special subject in the timetable? Was it connected to other school activities?
- What were the strengths of your IEE activities? Weaknesses? What supported you? Did you feel competent in this teaching?
- Can you tell me about IEE lessons/episodes that went especially well? What about something that didn't go so well?
- What did you think of the time span for these lessons? Were they suitable? What about the conditions? Support from administrators? What would be the dream conditions?
- Is there anything that you think has influenced you in becoming the sort of teacher you are? In your upbringing, your youth, your schooling? Good or bad teacher – or a person that has made an impact on you?
- Take a look at these pictures I have taken in your IEE lessons – can you tell me anything about them? Would you like to comment on them?
- How do you experience the ethos in this school? What's it like to work here?
- Would you like to add anything?

APPENDIX II CONSENT – AGREEMENTS AND INTRODUCTION OF RESEARCH

Permission and consent

On account of Svanborg R. Jónsdóttir's Ph.D research on innovation and entrepreneurial education. The research is conducted at the University of Iceland, School of Education and the lead supervisor is Allyson Macdonald.

Agreement for an interview with a teacher/administrator about innovation education.

Reykjavík ...date 20xx.

I the undersigned permit permit Svanborgu R Jónsdóttur to interview me about my innovation education teaching (IEE teaching in the school) and that the interview will be recorded. The recording will be transcribed with pseudonyms and deleted at the end of the research. No one except the researcher and potentially the supervisor will see the transcript which will have fake names. If references will be made to the interview it will not be possible to trace who said those words. If I or others in the school wish then writings about the school may be in its own name and that will be done in collaboration with us.

If I choose at any time in the research process to withdraw my interview and my information I have the right to do that.

Teachers consent:

Verification of researcher:

Agreement about research:

Administrator of xx school

Innovation education teacher leadername

Svanborg R Jónsdóttir

School xx ... date 20xx

On account of Svanborg R. Jónsdóttir's Ph.D. research on innovation and entrepreneurial education. The research is conducted at the University of Iceland, School of Education and the lead supervisor is Allyson Macdonald: The undersigned agree to collaborate about the following:

On the one hand teachers at school allow Svanborg to observe (and assist as needed) in innovation education lessons on the dates and on the other hand Svanborg will if asked for give advice on the practice of IEE in the school.

In the research Svanborg will observe the organization, execution and evaluation of the lessons. Interviews will be conducted with the IEE teachers, teachers in science and administrators and groups of students and furthermore if possible to informally talk to other staff.

Introductory letters will be sent to parents and they asked for permission for observations and photographing and promised that pictures will not be used for publication except with the permission of students and parents/guardians. Furthermore a letter will be sent to the parents of the students that will be interviewed in groups (1-2 groups of 4-5 students) and their written consent sought for interviewing and recording.

In the research, information will be treated confidentially and what will be published will not be tracable to persons and the name of the school only used if the school (administrators and teachers) think it will benefit them. If there will be a special introduction of the work in this school it will be done so in collaboration between Svanborg and the school. Otherwise the data collected there will be a part of a larger database where the staff and the school will have pseudonyms.

Administrator of xx school

IEE teacher leader

Svanborg R Jónsdóttir Ph.D student at the University of Iceland, School of Education

Permission from parent/guardian of student for and interview with a group of students at the xxx school about innovation education

On account of Svanborg R. Jónsdóttir's Ph.D research on innovation and entrepreneurial education. The research is conducted at the University of Iceland, School of Education and the lead supervisor is Allyson Macdonald.

The research focuses on the role of the teacher and how schools and staff fares in implementing innovation education. In order to get more views than just from staff it is necessary to extract the attitudes of students to increase understanding of the subject and get more reliable findings.

Date.....20xx

I the undersigned give my permission for Svanborg R Jónsdóttir to interview _____ along with 2-3 other students about innovation education that she/he has had at the xxx school this school year and recorded. The recording will be transcribed with pseudonyms and the recording destroyed after the research. If references will be made to the interview in writing about the research, it will not be possible to trace who said those words.

Parent/guardian consent:

Sincerely,

Svanborg Rannveig Jónsdóttir

Introduction of research and opportunity of consent or opposition

Reykjavík date 20xx

Dear parents/guardians

According to the general curriculum of 1999 innovation education is a part of the Information and technology curriculum and the school of xxx has offered such education. I started my doctoral research at the Icelandic University of Education now School of Education at the University of Iceland which is on the implementation of innovation and entrepreneurial education in Icelandic schools. My lead supervisor is professor Allyson Macdonald.

I hereby ask permission to observe innovation education lessons in the class where your child is located. I will observe lessons and jot down notes and interesting points and take pictures on a digital camera and assist if needed. I will also occasionally speak with the students in lessons.

If any of these data will be used in writing about the research it will not possible to identify which child is described and students and schools will have pseudonyms.

This study is a part of my research that the Data Protection Authorities in Iceland have been informed about.

The main emphasis is on how teachers handle executing this kind of education and what needs and problems they have to tackle and possibly what kinds of rewards it comes with.

If you oppose that your child takes part in the research, please let its teacher know.

Sincerely, Svanborg Rannveig Jónsdóttir.

APPENDIX III RESEARCH DATA – DETAILS

LOCATING INNOVATION EDUCATION IN ICELANDIC SCHOOLS. RESEARCH DATA THOROUGH OVERVIEW 2006-2011.

Case/participants/nature of	Description – purpose	Interviews/information – number	Number – field-notes or items	Photos – number	Other data
City School	Classroom observation: 20 Innovation education classes: 18 General classes 2	Innovation education teachers : Individually:4 Focus group with 4 teachers: 1 Students’ focus group: 1 Headmaster: 1 Interview with 2 IE teachers in autumn 2007	28	166	Teachers journal: from 3 teachers Mind-maps: I the IE teacher 3
Country School	Classroom observations: 8 Innovation market: 1	Innovation education teacher: 1 Headmaster: 1	11	109	Teacher journal: from one teacher Mind-map: I the IEE teacher
Trio School	2007 :Students and teachers prepare a coffee-house (a project).1. Students run the coffee-house – teachers assisting 2009 1. Lessons in IE 3. Teacher group meeting 2. 2009-2010 e-mail communication with lead teacher and principal	Interview with a focus group of students 1 Discussions of a group of teachers about innovation education 1 2009 Semi-structured to open interviews about IE teaching experience /lessons Interviews – student groups 2 Interviews – individual teachers 4, teacher leader 2 and administrator 1	4 14 10	48	Mind-map: I the lead IEE teacher E-mail communication with lead teacher 10 and headmaster 2

Individual teachers	Interview with one teacher.	Design and crafts teacher of 8.th grade in a small town near the capital: 1. Design and crafts teacher in the capital: 1	2		
IR research	Interviews with teachers.	Design and craft/innovation teachers with 2 Reykjavík (the capital) and vicinity and 1 in a rural area: 3	4		
Pioneers – teachers/science teachers	Interviews with one teacher twice each.	Rósa a pioneer and science teacher: 1 and information by e-mail Kolbrún a pioneer, general teacher, IE teacher and headmaster in a small rural school: 1 interview and 1 public lecture on IE	4		
Discourses on innovation, science, technology and arts (also official documents below)	A ceremony of The Icelandic Centre for Research and The Trade Council of Iceland for giving a price for the best contribution to innovation in the economic sector – in 2007 and 2008		2		Science and Technology Policy, 2003 – and 2006-2009 Law about The Science and technology board, 2003 Conclusion of The Science and Technology board, 2007
Innovation contest	Workshop of selected ideas for the final competition.	Short standard interviews with 49 learners	2	23	Short interviews – with 49 students attending the workshop

Data from the Intentions and Reality research (on science, technology and IEE)	Used as background data to get an overview of general knowledge of IEE in schools and if offered where located.	Interviews with students, administrators and teachers in compulsory and upper-secondary schools about science, technology and innovation in 19 schools in different areas in Iceland.			Answers to questionnaires from teachers in same schools
Data from IEE courses for in-service teachers	Identification of pedagogy and discourses. Identifying RD	Who initiated – support and potential in schools	6		Teacher PPT introduction with notes. Plan and documents distributed in the courses.
Teaching materials: Innovation and science	Identification of pedagogy and discourses. Identify pedagogy and RD.	Four folders: Initiative-creativity, Ideas-ingenuity, Innovation-technology and Environment-design,	4		
Policy-official documents	Material for analysis of discourse and describing the official and pedagogic fields in relation to innovation and IEE.	Science and Technology policy, 2003- and 2006-2009 Law about the Science and technology board, 2003 Observations at official ceremonies (Centre for Research and The Trade Council of Iceland). Speeches of ministers of Trade, industry and education. Policy document of Minister of Education in 1998, 2009 and 2011 The Curricula of 1999: General;ITE: Design and Crafts, Information and Technology, IEE; Arts and Science New curricula of 2006-2007, law of 1996 and new law for compulsory schools 2008			

APPENDIX IV EXAMPLE OF CODING PROCESS – GATHERING CODES, CATEGORIES AND EMERGING THEMES

City school	Theme – category	Code – emergence – field notes (FN) nr. Pg.nr	Conclusion – comment – reflection
The school			
	Open spaces – open organisation – flexibility	The housing is open and flexible to a certain level 1,3 – school ethos open and organisation, many kinds of work going on at the same time 1,2; 2,2; 2,8; 2,9; 4,2; 4,3; 4,6;5,2; 5,3; 5,4; 5,6; 6(1,2,3,); 7,7; 8 (2,4,photo pg 6,8,9; 22); 11 (photo 2); 13,3; 14,7; 16,9; 18,3; 20,3 Team teaching Learners working in different locations (FN 20) requires flexibility,8; 1,9; 2,9 Open curriculum 20,7 Thematic work FN20 Large number of students reduces flexibility – more complex 26,31 Organisation is a „headache“ 26,38	Is the flexibility more on the surface? Is there a different kind of RD working silently against?
	Good acoustics	Not a lot of noise e.g. in the canteen	
	Neat surroundings (huggulegt)– good spirit	Elegant design, feeling of space, light atmosphere in the teachers’ lounge (gift game). Good spirit confirmed of teachers 26,39	Energy and interest
	Developmental work	We are experimenting, trying out 23,16 Experimental will 26,21 Teacher collaboration is supportive 26,22 Support of specialist important 27,22	Arts and crafts division administrator is supportive towards arts and innovation teachers. 26,40
	Women’s workplace	22,5 in the teachers’ lounge 17 women 2 men	
	Manual subjects (Handverksgreinar)	Arts and manual subjects are highly held – a special division administrator – organization and vision towards and catering for such	

	vs. national tests – respect of school subjects	work. Working against this view has been to get a qualified design and crafts teacher (that fits into their open thinking, culture FN20,7) The national tests still control samt FN18 Respect of subjects differs (some tested in the national tests)	
	Team work on developing assessment methods – assessment/evaluation	Work on developing specific assessment methods that suit well for theme work and arts processes. Among other methods performance assessment. Recorded during lessons and after lessons 21,11 (also increasing pressure) 22,16 (choice) Developing assessment methods for ongoing processes 26,23	Is this “real” assessment in the eyes of: learners, parents and even teachers themselves?
	Organisation – control – rules	A need for organization to support reaching the goals of individualised learning (FN20) Organisation creates boundaries– Organisation is necessary in a large school 22,2 Organisation and education in giving learner groups specific names (groups have names according to the surrounding nature, e.g. name of mountain Keilir 22,2) Organised so that there was a space in the timetable for IEE 24,14 Still missing a bit of flexibility in some lessons for different pacing 24,11 (or at least her organisation missed that kind of flexibility) The conditions in the crafts room supports and hinders V19,10 (they know the conditions and can make them more supportive) Loosen deliberately the classification of arts and crafts V20,6 Sessions loosen classification of the structure of lessons PBS behaviour control system 22,9 Sometimes needs to „step back“ 26,18	Chaos – Chaos – angst
	Conditions – setting	Trash with IEE– needs various materials, cast off for recycling, tools, ample space – related to conditions. Nee all kinds of materials 24,9-26,2-26,29	Chaos – angst

		Need a space to display learner work 22,16 Need better conditions for IEE 24,6- 23,9 Space and materials for learner work in progress 26,29 Where is the learners' work visible in this elegant space? 26,36	
	Attitudes	Isolated 24,14-15 „there are very few other teachers that know what is going on here“ Class teachers complain that learners are going to arts lessons – class teachers have reservations 26,38	IEE suits well the general ideology of the school to work on creative projects 26,21 and a will to try new things and experiment 26.21
Content, characteristics and arrangement of IEE lessons			
	The national innovation contest	Not a lot of emphasis – but some offers of taking part 23,10-23,5 – 24,10	
	Connections to other subjects (science, arts, design and craft, location of IEE)	ESD a natural/rational connection 24,9 – environmental education 26,22 Connection with the future, how to think and live 24,12 Philosophy 24,13 Life (more than design and craft) 24,8 More freedom in IEE than in arts 24,7 A similar way of thinking than in arts but different emphasis 24,10 – everything is allowed Connects to many things „it's sort of all subjects“ All mixed together 24,6 Many elements (margþætt) Connects 23,12 – 23,13 „needs to be from all subjects, connect in all directions“ More related to arts than design and crafts 24,10 Connections to science 24,11 Environmental awareness 24,11	Seems to lack connections with field visits and other science lessons („I seldom meet them“ 21,17 Rúna) See connections with science and technology 23,11, Biology 24,8 A bit of connection 23,12 Open workshop (similar approaches) was immensely popular 23,4

		Call for a more integration with other school work „les isolation“ 24,14-15 „very few know what we are doing here“ Opens in all directions, 26,22 Mathematics 26,23 (connects with reality) Philosophy 26,22 Great to have special lessons for IEE 26,24	
	Responsibility – discipline	A mixture of learner responsibility and external discipline (PBS 22,9) Locked rooms 21, 9 untidiness – mess (chaos?) Learners take part in tidying up in the canteen 11,4	Chaos – angst/ work against
	Freedom vs. structure	26,11 freedom versus structure (Runa, a good reflection about freedom and structure) Give a loose leash 26,13 (to be creative) Freedom to explore, faffing, create 26,16 Sense the responsibility of freedom 26,16	NOT Chaos – angst
	Flexibility	Adjust to their own conditions V1,7 Lacks flexibility V17,2 (F++)	
	Flow – joy of creating – creativity	Many examples with the younger groups in IEE 11,7 11,8 og 9 V19,9 Creativity, creating 26,4	Not so visible with the older – not had IEE before (V18)
Fundamentals and elements in IEE lessons	Inventor’s way of working	Learn the process (would like to skip drawings 27,19) The process is more important than the product 26,4	
	The small notebook	24,6- (several problems linked with practicing its use) gave up 26,26 –	
	The chat	23,14 learn to think about what is around them	
	The black hat	Considered undesirable in the ideation process – is visible sometimes with teachers or learners V17	
	Links with learners’ lives	24,4-24,8 –24,27 – 26,37 (graffiti in a lesson) Link to learner interest 26,8	

	Learners' interests	Interest and ponderings 26,18 Link to learner interest 26,8	
	Links to work life	24,4-24,6 – 24,7	
	Links to reality	26,23 – 26,10	
	Written Hands-on	Most do not like it Too much paper work in lesson projects (teacher) 26,5 They long to get tangible materials, make things and choose their own materials 11,5 They are drawn to the manual (hands-on) almost like thirsty V17 – V19,9 Want to make, create 26,4 and 5 Works best... to make/create tangible 26,4 and 5 To make and think 26,30	
	Looking for needs	23,6- 24,3 –24,6	
	Analysing needs	26,3	
	Working on solutions	23,7-24,4	
	Brain storming	23,8-24,4	
	Making models	23,8-24,4	
	Experiments	With materials 23,8	
	Working on eliminating “the mental hindrances”	Silly, get over that 23,10 Information as ignition 26,15	
	Technology affordances new in IEE.	V19 three dimensional computer program used Drawing programs work well in IEE for older learners 26,27	
	Time (within lessons/within the timetable)	Time to allow the ideation process – time to “do nothing”, think (teacher “steps back” as in the English research) V18,4 Takes time to train 23,14 Takes time to build up self-confidence 23,120 Takes time to embrace and start to ponder 23,14 Limited time 24,6 Time limits the freedom 26,29 (projects and tasks need to be more	V18,4 Chaos – angst and perhaps a fear of the silence in lessons (offering Chaos – angst a space?) A need for the third space– room 13 ?

		specific if the time is short) Excellent to have a special time in the timetable 26,24	
	Think and ponder (pæla)	Make and create 26,30 Ignite pondering and thinking 26,3 Interest and ponderings 26,18 Discussions and ponderings (í.Umræður og pælingar) 26,6 Older learners, good thoughts/ponderings (í.Unglingastigið, góðar pælingar) 26,28	
	Teacher supports, helps	Learn with them 26,4	
	Clarity of aims in the lessons	Not very visible – might perhaps be made more clear	Could reduce Chaos – angst Goals and aims not clear? Do they not matter?
	Conditions	Junk comes along with IEE – demands the use of many sorts of materials, recycle materials and hand tools, needs ample space – linked to conditions Need a space to display artefacts 22,16 Lack of good conditions (aðstöðuleysi) 24,6- 23,9	Chaos – angst
	Invisible school subject	Isolated, unknown 23,9 we could show this more	
The teacher			
	Teacher business/pressure	Teacher's illness Drive to the nursery and school to pick up your kids Lots to do in lessons V19 – v17, v18 (not time for deep contemplation or reflections) Salary: we are losing people in the middle of winter because of salary V20, 12. Enter information about learners in the program Mentor (addition to the teachers job) 21,12 Buying materials for the arts and crafts 22,9 Try to meet regularly but are not always able to 23,16 Teachers trips for professional development, learning from schools	

		abroad 21,13 Professional development/lifelong learning (símenntun) Pressure and business to temp for other teachers (sick, having kids) 27,2	
	Invisible part of teachers job	21,13 teacher collaboration (team work- team teaching) Whole school staff meetings Meetings of specialty groups (arts and crafts) Searching on the internet (preparation at home) Field trips	The teacher that did not take the course has a bit more restricted vision of IEE (mainly from the teaching materials and the teaching plan it offers)
	A resting place (Afdrep) (teachers’)/need for rest	Teachers seek the teachers’ lounge (without learners) – are often discussing something totally different from teaching or related to learners	
	A balancing act	Flexible, experimentalive V19,9 Supports, helps V19, 4 – V19.	Chaos – angst
	Warmth/support	Talks in a low voice, is friendly, calm 22,3	
	Special knowledge and skills/ lack of	They say they need a design and crafts teacher – they need the knowledge and skills 24,13 – 23,9 – 22,5- 24,10 Collaboration with design and crafts teacher would be ideal 23,13 Lack the d&t knowledge and skills 27..21 – 27,23	Four of them have an arts teacher education (24,2)- (three of the four main teachers)
Attitudes – professional		Want to work with children – important to be creative and see learners working in a creative way (23,3) I also want to give information/knowledge 23,4 that learners can be active in building up	Practical education to have alongside an artist’s career 24,2
	Role of creativity	Important that teaching is creative 26,14 in order to “ignite” them IEE is an exciting subject to teach 26,2 Risk 26,7 I thrive on ... doing new things It is fun to be creative 26,8	

		<p>Fun to try new things 26,8 I am creating myself 26,8 Interest is number 1,2 and 3 26,14 – 26,16 Creativity and creating is fun because you know how much fun it is Creativity and creating is necessary because you know how much fun it is 26,13 Knowledge and creativity 26,9 Influencing factors in youth and school: creativity, experiments, freedom, recycling 26,32 and 33 and 35</p>	
Gains / for what	Importance of IEE	<p>Get a belief in own might (self-efficacy?) Fáir trú á eigin mátt 23,5 Enhances creativity 24,7 Independent work Work into a certain form – deliver work Some blossomed here that did not in other school work 24,4 To see that all things are made by man – the source of things 24 Thinking behind things 26,24 Strengthen self-confidence 26,19 Experienced themselves mighty (í. Fundu sig máttug) 26,18 Learners had a new role 26,19 Little teachers 26,18 One blossomed 24,13</p>	
The learner			
	Need for warmth, caring , approval	<p>Incident in the free periods: 11,2 Attitudes orders towards learners, harsh 11,3</p>	
	A thirst for doing (hands-on)	V17 – V19,9; 26,4; 26,5; 26,30	
	Girls – boys	<p>Girls: doodle, quiet Boys: noisy, fiddle V19</p>	Different need for movement or brought up, nature or nurture? (enculturation)
External factors	Iceland		

	Attitudes	Generally positive but colleagues are not asking about IEE 24,4	Mentor- a way to reach parents
	Parents working outside home	21,9 takes care of her kids, takes to the play school and the other to school, I don't get an extra playschool/school time for my kids 27,29	
	Teachers' general contracts – conditions	Salary of teachers slim 21,10 Found a better paying job 21,10	
Administrators	Principal		
	Experience	Considerable experience in compulsory school – experience of integrative teaching and learning and integrative curriculum	
	Vision – overall vision. Loosen the C of arts and crafts subjects	CS20,6	
	Supportive/ leading	Opens up for IEE– lead it in 23,5	
	Introducing IEE in the curriculum in 99 was lacking	CS20	
	Classification of IEE	It is a learning element within the arts and crafts subjects (námsþáttur innan list og verkgreina) V20,6 it replaces 'design and craft', but still not	A strict counting of hours (lessons) is hindering
	Collaboration	Trust – shows her colleagues trust Find out together CS20	Salaries and contracts are a hindrance for collaborative work V20,12
	Open, in and out	Information must be accessible for anyone – e.g. on the internet Many people come to the school to learn from them, teacher students, school staff, it is open in and they seek knowledge and information from outside. CS20	
	Stabilize	Principal thinks the school needs time to settle – stabilize CS20	
	Axis	Classification or chaos angst?	
		How to live with classification/organisation and chaos angst without reducing potential for active and creative learning	

APPENDIX V PHOTOCOPY OF CODING

ættu að fara, en tveir hópar fara á morgun. Rúna sagðist þurfa að hitta nokkra kennara vegna ferðarinnar og fór um skólann í leit að þeim og ég elti. Ein sem hún talaði við þurfti að vita hvenær yrði farið því hún átti að fara með í ferðina. Næst fann hún Ósk sem var inni hjá yngri krökkunum þar voru krakkar í ýmsum verkefnum um líkamann, sumir voru að klippa út hendur sem þau höfðu teiknað á lítað blað og limdu svo á heilt blað í öðrum lit, aðrir voru í spili sem var eins í laginu og líkami og einn var í tölvu og týndi inn líffærin eitt af öðru inn á líkama sem var á skjánum. Það var mikið í gangi en ekki læti. (AR: það var mikið að gerast, margir krakkar á svæðinu en allir virtust vera virkir, ég sá stráka að vinna í þessu fönndri sem voru að því er séð varð ánægðir). Rúna talaði við Ósk og sagði henni eitthvað um ferðina, hún sneri frá mér og ég heyrði ekki hvað hún sagði. Rúna heldur utanum skipulagið í sambandi við nýsköpunina og er ekki viss um að þeir sýni nægjanlegt frumkvæði sjálfir eða að þeir séu óöruggir á því sem er þeirra hlutverk og hennar. Framundan í næstu viku eru annarskipti og þá tekur Bryndís við af Ásu. (AR: Ég vona að hún verði samstarfsfús eins og Ása og þetta skemmi ekki okkar samstarf. hún er glæðleg þegar ég hef hitt hana og hún var á námskeiðinu okkar Gísla):

Rúna fer inn á kennarasvæðið og ljósritar nöfn barnanna sem eiga að fara í ferðina til að geta merkt við þau og enginn tónist. ÉG spyr hvort það sé eitthvað búið að undirbúa ferðina með krökkunum, þau gera spurningar eða eitthvað slíkt en Rúna segir það ekki hafa verið gert. Við göngum fram og í gegnum kennslusvæðið þar sem krakkarnir eru að vinna í vefmyndum og að gera verkhöppu um jurtir og jurtalitun. Rúna segir mér að skólinn taki þátt í að sýna á næsta ári afrakstur tveggja verkefna á ráðstefnu og sýningu sem heitir Arfur fortíðar í hönnun framtíðar en það er samstarf skóla frá

Viðna þýð þessu
v/ skipulag
Rúna's work on
organizing &
covering

Margir í gangi
Margir hlífirgjörð

NOT NOISY

ORGANIZATION

INSECURE
ICE teachers
- therefore
lack initiative

SKIPULAG
ORGANIZE

Motivation & Ambition

læra þetta. Þau voru með kannski 10 ára gömul, ég meina voru þau með fslenskuna á valdi sínu. Þá þurfti ekki að vera kenna þeim meira eða verja meiri tíma í að kenna þeim ypsiloníð. Það var bara alveg komið og þá var maður ekkert að því. Þú veist það er eiginlega þetta sem..... eða veistu að þetta var svo mikil Paradís að það getur enginn skilið þetta nema sá sem fékk að njóta þess.

Þetta er bara búíð og verður aldrei aftur en sko það er alveg klárt að nýsköpunarkennslan eða hugsunin eða þetta það kom ofan á þetta einhvern veginn og ég var búin að læra þá þegar. Ég var náttúrulega búin að kenna síðan 1982, ég var búin að kenna þarna í áratug og ég var búin að læra svo mikið af krökkunum. Ég var búin að læra af þeim skilurðu, (AR: mikil virðing fyrir víska barna)

Ég setti upp eitthvað, ég vissi að þau þyrftu að ná þessu, þessu og þessu. En maður einhvern veginn varpar einhverju fram til þeirra og fylgdist maður með þeim sko, hvernig ætla þau að gera þetta. Svo passaði maður bara að þau myndu læra þetta þrennt en þau máttu gera það á sinn hátt. Þau máttu gera það.S: Hvaða þrennt?K: Nei skilurðu eitthvað vissi. Sko mér var þá alveg sama hvað þau gerðu ef að þau bara lærðu sko ég hafði í huga á bak við hvað þau ættu að kunna. Þú skilur mig af því þú er kennari.

S: En hvað myndurðu segja að þetta væri þessi nýsköpunarkennsla. Er þetta bara kennsluáferð eða er þetta eitthvað meira, er þetta námsgrein eða námssvið. Hver er bara kjarninn í þessu? Hvað er þetta?

K: Það er ansi stórt spurt. En það kemur upp í hugann að þetta sé bara vinna með mannlega eiginleika. Þetta er bara, sko ég fékk þínultíð nýja sýn á þetta ekkert fyrir löngu síðan þegar ég kynntist hugarkortinu sem þú veist hvað er. S: Já.

K: Ég hafði kannski ekki getað sett á þetta nöfn eða einhvers konar ramma en ég hafði átt að mig á, bæði hafði ég sjálf upplifað hvað gerist og ég hafði séð það í krökkunum. Það kemur upp í hugann núna þegar ég tala um þetta að sko með stærðfræðikennsluna. Eitt af því sem ég held að orsaki það að krakkar frjósí á stærðfræðinni það er akkúrat þetta

Paradise
Paradise
paradise thinking
with girls (var)
með góðum
+
Respect
Vísun
Children's wisdom
11-teachers here!!
Clear goals
Mentoring
Selfie
Freedom
I am happy
I am free (smile)
I had this very concept

S: Ekkert spennandi. ~~Svo~~: Svo er leiðinlegur kennari í enskunn og leiðinlegur kennari í eðlisfræði. S: Það sem ég heyrir út úr þessu að kennarinn skiptir rosalega miklu máli. Ekki sko endilega fagið en kannski svolítið. LH: Ég man núna hvað ég ætlaði að segja hvað mér þætti líka leiðinlegt, mér finnst landafræði ógeðslega leiðinleg af því við erum svo oft í henni og líka í ógeðslega leiðinlegur. Það er svo leiðinlegur kennari. S: En það er þá sko þá bæði fagið en kennarinn skiptir samt rosalega miklu máli. N: Já.

person
Kennarinn
Teaching
personality

S: Ég veit að margir krakkar myndu segja að stærðfræðin væri leiðinlegust en þá er það sem sagt kennarinn sem bjargar því.

N: Mér finnst stærðfræðin svo skemmtileg af því að kennir hana og einu sinni þegar ~~það~~ var ekki, þá átti þessi sem kennir okkur ritþjálf og þetta þarna leiðinlega, þá átti hann að kenna okkur stærðfræði og þá fannst mér stærðfræðin bara leiðinlegust í öllum heiminum. S: Þannig að kennarinn skiptir mjög miklu máli. Allar: Já, alveg rosalega. S: Hvað finnst ykkur auðveldast og hvað erfiðast í skólanum svona yfirleitt? Ef ég byrja aftur á þér ~~þetta~~.

Kennarinn
Svo þetta
Mest
Væðing

R: Mér finnst, ég bara veit það ekki. S: Mörgum finnst auðvelt í heimilisfræði, eruð þið í heimilisfræði? Allar: Já. S: Og sumum finnst líka mjög gaman í heimilisfræði. R: Það er gaman í heimilisfræði og að sauma líka. Bekkurinn skiptist í smíðar og sauma og skiptum við eftir áramót. Mér finnst léttast í heimilisfræði og stærðfræði eða hún er svona miðlungs ef það séu einhver erfið dæmi og svo finnst mér íslenskan létt og já ég held ekkert meir, já í dönskunni líka.

Complex school
subjects
Háskóla
Háskóla

S: Léttast eða erfiðast? R: Léttast. S: ~~Svo~~? Sa: Mér finnst mjög létt að vera í íslenskunni og heimilisfræðinni. En svo finnst mér mjög erfið þegar ég er komin út í eðlisfræði eða líffræði, já og landafræði. Það verður að útskýra svo mikið og þá er ég bara orðin svo rugluð. S: En ~~svona~~? LH: Mér finnst mjög létt í heimilisfræði og myndmennt, af því að kennarinn sem kennir okkur myndmennt segir okkur aldrei: "Teiknið þetta" Heldur segir bara "Þið megið gera hvað sem þið villið". Við megum þess vegna bara spila í myndmennt. Þess vegna finnst mér myndmennt mjög létt.

Vitum
Heldur
Freedom in
arts lessons

APPENDIX VI EVALUATION FORM

Evaluation form for learner work in arts and crafts and integrated work in City School

Evaluation of learner performance	Working with ideas	Working skills	Diligence	Orderliness
20 points	Works independently and has initiative.	Shows good understanding of tasks.	Starts work quickly and is diligent.	Orderliness and behaviour is commendable.
15 points	Interested and applies her/himself.	Is able to use the methods taught.	Usually does as told and works well.	Is orderly and behaves well.
10 points	Shows interest but lacks initiative.	Is insecure in using the methods and often needs guidance.	Needs encouragement to work but has been improving.	Orderliness and behaviour usually good.
5 points	Is often disinterested and lacks initiative.	Needs considerable guidance with tasks.	Works slowly and has limited endurance.	Needs to improve orderliness and behaviour

APPENDIX VII TRANSLATION OF THE CHAPTER ON IEE IN THE CURRICULUM 1999

Translation of the IEE chapter and the introduction to the ITE curriculum. Translation from Icelandic to English by the author – revised by AT.

Foreword (p. 5)

In the subject area (í námssviði) of information and technology education (ITE) there are three school subjects: design and woodwork, innovation and utilization of knowledge, and information education. Furthermore, general objectives are presented about students' information literacy under the component of use of computers in compulsory schools. The goals for use of computers are not tied to a specific school subject but are integrated into teaching and learning of other subjects.

Innovation and the utilization of knowledge has a somewhat unique position within the subject area. There is no dedicated time allocated to the subject, but rather the decision lies with school administrators, whether they use the aims to integrate the components of technology and innovation into other subjects.

Use of computers in compulsory school, a separate component, is also without dedicated time allocation in the subject area of ITE. Learning goals for information technology in each of the school subjects are introduced. The minimum teaching time in information and technology education refers only to design and woodwork (hönnun og smíði) and information education (upplýsingament). According to the reference timetable of the Ministry of Education the minimum instruction hours per week are to be two hours towards the subjects within the area. School administrators have the option of choosing to add lessons to specific subjects and components.

In the curriculum final goals are presented for all subjects and learning components within information and technology education. The purpose of final goals is to give a holistic picture of what the aims are in the teaching of specific subjects. The final goals explain the general purpose of learning and describe what schools should aim for and what students should have acquired by the end of compulsory school.

(p. 6)

Aims (í áfangamarkmið) are also listed for all subjects and learning components within the subject area. Aims are the main benchmarks in learning, and are divided into the three levels of compulsory schools. First, aims are listed for the end of grades 1-4, second for grades 5-7, and third for grades 8-10. The aims are explained in such a fashion to allow relative ease of measurement or evaluation on whether or not they have been attained.

There are only objectives, and no aims, listed for the subject design and woodwork and for the youngest level of the subject information education. The reason for this is that, aside from design and woodwork, the content of ITE subjects and components is largely sought from other school subjects, the integration of which is more logical at the level of the school curricula, versus the national curriculum.

Introduction (p. 7)

Information and technology education addresses how technology and practical skills (í verkleg kunnátta) have been used to satisfy the needs of people and to deal with their environment in an effective, creative and constructing way. It is important to address the

technological environment in a holistic way, especially in regards to how nature, society, and culture are an integrated whole that must be considered in technological utilization. A special emphasis is put on the contemporary technological environment, which is characterized by ever-changing technologies and constant development of new knowledge and skills that individuals must continuously acquire throughout their lives. To this end the subject area of ITE fosters a new school subject in compulsory school, information education, which has the objective of enhancing student information literacy.

Technology is one of the creative components of culture, and gives form to culture's appearance, content, meaning and purpose. Culture is formed as people apply their imagination, creativity, knowledge and practical skills to tackle their environments in a deliberate manner.

Technology is created as we interact with our environment, because of situations we want to alter, influence or utilize. Our environment in this sense is:

- nature (i.e. utilizing natural resources, harnessing the laws of nature, sustaining an ecological balance)
- society (i.e. civic arrangements, business, division of labor and administration)
- culture (i.e. communication, conservation and distribution of knowledge, speech, music, and pictures) (p. 8)

This distinction is important, as it emphasizes that we do not just apply technology to deal with these areas, but also deliberately utilize knowledge that is ingrained in their nature. To gain a holistic view of modern technology we need to be literate in most areas of science, the arts, and academics, such as linguistics, humanities, natural sciences, and economics.

Even though technology includes its own epistemology and methodology, the technological utilization of knowledge is often derived from other areas of human activity. The interaction between science and technology is especially close; science has the objective to gain knowledge and search for understanding, but technology aims to utilize knowledge and apply insight to create products, systems and environments. In this day and age the close interaction of science and technology are particularly important. Modern science is equipped with tools that can process types of knowledge and quantity of information that our senses and insight alone cannot capture. Modern science is therefore the main source of technological knowledge.

Technology acquires knowledge not only from the sciences and academia. Technology is also greatly inspired by the arts. Artists' engagement with forms, colors, music, rhythm, and word has great epistemological and methodological value for technology to create practical artifacts. Technology also creates equipment for artists to tackle the unfathomable and the ambiguous.

Learning and teaching

Within each subject there is a special chapter on learning and teaching but in general the emphasis in the subject area should be on training students in utilizing technology and information with skill and knowledge. It is important that students acquire a view of being active doers in their environments (p. 9) and that continuous education is a lifelong endeavor in a society characterized by the constant introduction of new knowledge and technology. This does not necessarily mean the same resources will fit all, but rather that

comparable and equal opportunities are offered. Great care should be taken to offer tasks that appeal to both girls and boys.

From a certain standpoint an educational policy can be seen as the environmental policy of the Internet. By using the Internet for schooling, students are introduced to the tumultuous world of information, a world that is characterized by chaos and improper materials at the same time one that contains some of the greatest gems of culture. That is why it is hugely important that individuals, companies and institutions that put materials on the Internet keep in mind that it is also an educational field for children and youth. Through clearly described objectives in the National Curricula for pre-schools, compulsory schools and upper secondary schools, individuals, institutions and companies in the country have been given a unique opportunity to construct a clear policy of how they introduce the materials they put on the Internet so that these materials can be utilized in the teaching and development of human resources of Iceland.

Evaluation

Subjects in the area, other than design and woodwork, are integrated subjects. Evaluation is therefore the responsibility the teacher of the school subject, which the component of the ITE subject area is integrated into. Evaluation of the subject-specific objectives of information education must be the responsibility of the teacher that teaches the subject, in the event it is not the class teacher.

Innovation and the utilization of knowledge

Introduction (p. 31)

Modern economic life is increasingly built on knowledge and working with ideas. Its surroundings are continuously changing due to constant innovations in technology and knowledge. To be able to deal with this economic reality individuals must be able to adapt to innovations quickly, be able to spot opportunities in new knowledge, and must have the skills to utilize new knowledge and develop from it valuable products.

Innovation and the utilization of knowledge are about activating student ideas on how to utilize the knowledge and skills in each subject to solve problems, meet needs, or create other goods that make a difference. The purpose is to strengthen students' ethical sense and initiative through creative work where the student is trained in systematic methods to develop his or her ideas from the first glimpse of an idea to the finished product. In this context, product means various kinds of goods, services, leisure activities, knowledge and other things that have market value.

Emphasis should be put on connecting students' ideas and projects to real circumstances, on how the skills and knowledge of school learning emerges through work in the local society, the society at large, and internationally. Innovation and the utilization of knowledge is thus to be both a vocational and innovation subject.

Learning and teaching (IEE)

Innovation and the utilization of knowledge is not allocated a separate time in the reference timetable of the Ministry of Education. The subject is integrative and runs across

knowledge areas and should be integrated with one or more subjects. Innovation and the utilization (p. 32) of knowledge is a special method that schools can use to transform each subject into a vocational and technological subject. Thus innovation and the utilization of knowledge can provide good support for the objectives of other subjects by putting the content into a new context and connecting it to students' reality, creativity and playfulness. Presumably innovation and the utilization of knowledge can be integrated into school operations in three ways. First, it can be integrated with the allocated time of other subjects. Second, the school can utilize elective hours for the subject. Third, these two arrangements can be mixed.

Projects in innovation and the utilization of knowledge could for example be to have students ponder how to utilize grammar. Can knowledge of grammar be utilized to solve a compelling need or solve problems? When the idea has emerged, the next phase is to actualize it. The role of the teacher is to be a kind of process manager and a guide in the solution and production process. He or she is not in the role of the one that knows all the answers but rather guides and navigates the way towards the solution, i.e. the teacher's role is to teach a certain methodology to develop an idea into reality.

Innovation and the utilization of knowledge is not a technology subject in the traditional sense of the word. The projects of students can just as well be about care and other services as about technological solutions, such as automation, computer controls, factory production, etc. Since the modern work environment is so technologically equipped it is still important to work against a potential "technology phobia" of students later in life. Games can be an important way to accomplish this. It is especially important to take care that such games appeal both to girls and boys.

(p. 33)

The curriculum for innovation and the practical use of knowledge includes three components:

- Information and technology literacy
- Idea, solution, product
- Individual, technology, society

Information and Technology Literacy

Information and technology literacy includes students acquiring the knowledge, skills and technology needed to develop their own ideas into a visible product. The main emphasis must be on the knowledge and technological areas of the particular school subject being integrated with innovation at any one time. Through this component there is an opportunity to train students in self-directed studies, to introduce to others the outcomes of gathering information, to teach others about new knowledge and skills, and so on.

Idea, Solution, Product

This component includes students learning the methods required to actualize an idea from the first notion of an idea to a developed product. The emphasis is on students learning about professional methods of ideation, development and the manufacture of products. This forms the bulk of the subject and can among other things include project plans that

the students follow. In the development of this component it is important to take into account the particular professional methods of the arts, academia, or practical subjects, into which innovation and the practical use of knowledge is being integrated.

Individual, Technology and Environment

This component includes aims about increasing the awareness of students to the reciprocal connections between individuals, technology, and the environment. As in the former components the emphasis must be on connecting innovation and the practical use of knowledge to the particular subjects with which it is being integrated. For example, if innovation is being integrated with sports, then the goals of this component (p. 34) could be that students collect information on and discuss the relationship between science and performance in sports, the history of sports, and the importance of sports in society. The curriculum only lists aims for grades 1-4 (lowest level), grades 5-7 (middle level), and grades 8-10 (adolescent level). Objectives are not described in the curriculum for the subject. The aims are described so that they form a collection of objectives that can be used to put together a holistic frame, without having to address them all at the same time. The nature of the objectives of the lowest, middle and adolescent levels differs. For instance, the objectives of the lowest level assume more integration with other learning and role play, while the objectives of the adolescent level, as there is more flexibility on the adolescent level to teach the subject as an independent technology and innovation subject than on the younger levels.

Evaluation (IEE)

All studies in innovation and the utilization of knowledge are project oriented i.e. the student makes something. There is no expectation of the student taking an exam testing his or her knowledge. Instead it is suggested that the evaluation takes the form of a checklist or benchmarks that the teacher puts together and shows to the students before the project begins. Among other pre-clarified components of evaluation should be whether group or individual marks will be given for work on projects, what demands are made, and what specific aspects teachers will evaluate.

Final objectives in innovation and the utilization of knowledge (p. 35)

The student

Information and technology literacy

- has knowledge of the use, handling, and potential of technology
- has knowledge of the nature of design and technological solutions
- has knowledge of technological language; this includes that the student can utilize work drawings
- technical handbooks and instructions
- knowledge of work opportunities and demands relating to technology
- Idea, solution, product

- can create and analyse main ideas that guide a work process
- can identify needs, opportunities, and potential in designing and producing an artefact, system or surroundings according to a main idea, which includes:
- identifying, evaluating and choosing suitable solutions
- organizing time, man power and raw materials to achieve a set goal
- convincing others of the value of the outcome and to start production
- performing a continuous process evaluation of plans, production and products
- using information technology in design, presentation and production
- being able to use knowledge and technology of the various arts and academic fields
- Individual, technology and environment
- gain insight into how views, values and ethics are formed within individuals and groups
- enhances or hinders technological development
- influences attitudes towards technological development
- gains insight into the influence of technology on society and international context

(p. 36)

Aims for innovation and the utilization of knowledge by the end of year 4

The student should

Information and technology literacy

- know and be able to use common field-specific concepts
- be able to identify how products of the field/area appear in the environment
- understand how information and communication technology are used in connection with the products of the area
- understand how “raw materials” of the area are transformed into fully completed “products”
- understand that there are data available that can be obtained and used to describe the position of the area/field in economic life, such as quantity numbers, pictorial materials, moving images, text
- understand that information on previous products of the area can potentially be obtained from museums
- understand how the product/artefact and information about it are distributed in society and through which channels

Information, solution, product

Work with ideas

- know the process need-solution-product
- know how to search for needs and problems in his or her environment
- be able to participate in group work and learn to respect the ideas of others
- have used various computer aids to describe his or her ideas and solutions in the work process (design and drawing programs, media tools)

- have used computer tools to develop a fully completed idea
- Training in group work and using technological media
- have tried playing computerized role games
- have tried making environments or machines in computers (for example: Simtown, The Incredible Factory, Gizmos and Gadgets, Logotools)
- have taken part in a collaborative project with other pupils in other schools and have gotten acquainted with the conditions and work of others through such projects

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- Training in role-play/virtual environment
- be able to work in a project in a group where everyone has a specific role to play or a set task (role play)
- have taken part in creating a virtual environment (society, production, shop, service) and have played the part of a person in that environment (for example: The land settlers method of Herdís Egilsdóttir)
- Acquiring and presenting knowledge
- have searched for knowledge outside the school and the library in connection with a project (for example; web quests, pupils' e-mail communication with specialists (for example: the Jason project), visits to work sites, searching web sites and e-mail communication)
- have tried working in a group to collect data and use computer tools to transform them (for example to collect data through a questionnaire and present the findings visually)
- have in collaboration with other pupils made multimedia materials related to the production and presented them in some way

Individual, technology and environment

- be able to discuss how products and or technology related to the area appear in his or her daily life
- understand how technology/utilization/products of the area appear in his or her environment and is able to discuss their influence on it
- understand that technology, understanding and attitudes towards the area and its products may have changed through time and can also differ between countries
- understand that the product/artefact influences its environment and can be able to suggest how to decrease harmful effects if relevant (pollution of various causes; chemical, noise, visual, stress, expenditure)
- be able to suggest how technology/artefacts/products may be used to increase the quality of life

Intermediate objectives in innovation and the utilization of knowledge by the end of year 7

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The student should

Information and technology literacy

- know and be able to use common technical concepts in context with the trade names of the subject area
- be able to use common tools, such as the Internet, CDs, media, libraries and databases to look for information
- be able to use common tools such as various computer programs to draw together information and convert them into new knowledge
- be able to identify various products of the area in his or her environment and how they solve various problems
- have examined examples of Icelandic work life and have understood that production in the area has potentially changed in the last decades
- have realized how the production and marketing processes of the products of the area are transformed from raw material to sales products
- understand how production, transport and exchange of goods are interlinked and how information is created in this process
- be able to give examples of how information and communication technology influences the production and distribution of products in the area
- have had the opportunity to follow the production process of a producer in the area and collected information about it (numbers, reports, organizational charts, flow charts, etc.)

Idea, solution, product

- have searched for needs or problems in his or her immediate environment
- be able to work according to the process need-solution-product
- show initiative in ideation work in a group and respect for others' ideas
- have learned to describe his or her ideas of solutions to problems with explanatory images and tables and with the aid of various computer programs

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- recognize the limits and possibilities of information and communication technology and be able to utilize that knowledge in a production process
- be able to work according to a design process with emphasis on execution and functionality
- Realization and execution
- to be able to work in a group according to a plan where the whole class works in collaboration at making surroundings, an object or a system
- be able to work according to a work schedule and project description
- have had training in using group systems in computers (internet games among other things) and work in internet collaboration projects with partners outside the school
- have taken part in an international collaboration project aimed at working together towards a set goal, collecting data or making an artefact, environment, or system
- have taken part in group work for designing virtual environments (a society, trade, production, service) and have tested its function

Collection of information, searching for knowledge

- have had training in getting assistance from specialists outside the schools through computer communication
- have worked on gathering and processing information about firms or a line of business
- have worked on gathering and processing information related to culture and arts and transferred this information to a technological medium
- Efficiency, organization, time management and presentation
- be able to utilize a cost estimate
- be able to utilize a time schedule
- be able to read and understand a figure or a chart of a project that has been broken down into parts of a work process

(p. 40)

- be able to define a target group for a product, service or method
- be able to discuss the value of a product for society
- understand the demands for a product/service/method and sales potentials
- be able to promote a product and describe its qualities to potential users
- Individual, technology and environment
- know and understand the fundamentals of the history of Western technology
- understand how technological changes have influenced work culture and social life in his or her local society in this century (1900-1999)
- be able to identify how the environment is influenced by technology and work customs from many periods
- understand how information technology and automation change work in the labour market and how new opportunities arise
- be able to identify how the use of technology and automation make it possible to reduce pollution and cost
- be able to identify how the use of technology and automation can increase the quality of life of those who are impaired by disability, age or other factors

Intermediate objectives for innovation and the utilization of knowledge by the end of year 10 (p. 41)

The pupil should

Information and technology literacy

- know and be able to use common concepts related to technology and the economy
- be able to read and work with different data that describe the economy or an operation (for example: cost and quantity numbers, analyst numbers and standards, organization charts, flow charts, tables, reports)
- have experienced using versatile tools and media to search for and condense information, rearrange and convert it into new knowledge
- have scrutinized technology in his or her environment and investigated examples of how different solutions address the same need, and have observed how factors

like technological development level, knowledge, costs and the foundational systems of society influence which solution is chosen

- have examined select examples from professional life and be able to analyze how they have changed in the previous decades and how they are likely to change in the coming years
- have followed the production and marketing processes of a given product or service, to see how raw materials are transformed to sales products and how production, transport, and trade are interlinked and how information is created in this process
- be able to give examples of how information and communication technology is changing society and how it influences people's work and free time
- have visited a professional firm, service or cultural institution, and followed the work process and gathered data about it (numbers, reports, organizational charts, flow charts, and so on) and worked with that data

Idea, solution, product

Work with ideas

- show initiative in looking for needs or problems in his or her immediate environment
- be able to work independently through the need-solution-product process
- (p. 42)
- be able to define a main idea
- be able to work through the design process based on a certain main idea
- be able to work through a design process with an emphasis on execution and function
- be able to describe his or her ideas on solutions to problems with explanatory images and charts, with the assistance of relevant computer programs and be able to use digital technology to make and try models and prototypes
- be able to evaluate, test and examine his or her own work
- be able to utilize trends and movements in culture and social life in developing ideas and solutions in his or her own projects
- understand the limits and potentials of computerized steering, remote tasking and automation and be able to work with ideas about such production methods
- have had training in working on ideas in a group and have learned to respect the ideas of others

Execution and development of ideas in group work

- be able to work independently in a group according to a delegated work plan where a group works on making environments, artefacts or systems
- be able to work independently off a time plan and work description
- have had training in working in several group systems in computers, among others in computer games on the internet
- have worked through a computer network on collaborative projects with people outside the school

- have had training in seeking assistance from specialists and gaining additional knowledge from outside the school and its closest environment through computer communication
- have taken part in an international collaborative project at working towards a common object, collecting data or making an artefact, environment or a system
- have taken part in group work designing a virtual environment, for example a society, production system, trade or service and tested how it works

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Collecting information and the presentation of knowledge

- have worked on collecting information and analyzing information about a business or a trade, drawn that information together and transferred it to technical media
- have worked on collecting information and analyzed information related to culture and arts, drawn it together and transferred it to technical media

Effectiveness, organization, time management and production

- be able to prepare a cost estimate
- be able to identify a target group for a product, service or a method
- realise the demand for and potential sales of a product/service/method
- be able to rationalize the value of a product for society
- be able to develop and follow a time plan
- be able to divide a project into work tasks
- be able to produce and distribute a fully made product (good, service or intellectual property)
- be able to advertise products and make plans for presenting them
- be able to react immediately and change and adapt plans if new conditions arise
- have had training in taking decisions and executing them in uncertain conditions
- Individual, technology and environment
- be able to identify the main elements of the history of Western technology
- have got acquainted with how technological changes have influenced the economy and social culture of the world during this century (1900-1999) and how the development and conditions vary in different countries and social groups
- have scrutinized how the environment is influenced by technology and work customs from different time periods
- know how information technology and automation changes jobs in the labour market and what new opportunities arise

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- have seen how the use of technology and automation makes it possible to reduce pollution and production costs
- have scrutinized how the use of technology and automation can increase services and improve people's conditions
- be acquainted with both the negative and positive influences of technological changes on society
- be acquainted with how education, training, career choice, and overall life plans relate to changes in technology

APPENDIX VIII RESEARCH FINDINGS PRESENTED AT CONFERENCES AND SEMINARS –ON IEE IN THE PERIOD OF THE RESEARCH

At the University of Iceland School of Education, doctoral seminars:

- *The social ecology of innovation education*. Poster session. 05.06.09
- *Er hægt að kenna skapandi hugsun?* Introduction. 05.06.09
- „*Þetta tengdist bara öllu ...*“ *Skilningur kennara og nemenda á nýsköpunarmennt í íslenskum grunnskólum*. 30.05.2008
- *Félagsleg vistfræði nýsköpunarmenntar*. 11.01.2008
- *Ljósmyndir sem rannsóknargögn*. 01.06.2007
- *Mótun rannsóknartækja í Leitinni að lyklum að læsingum menntakerfis*. 21.12.2006
- *Short introduction of research project* June 2006
- Introduction of innovation education for Delta Kappa Gamma May 7 2011.
- *Annual conference of FÍKNF April 3 2009 at Oddi in The University of Iceland: Hvað er nýsköpunar- og frumkvöðlamennt?*
- Celebratory annual meeting of Fræðslunets Suðurlands at Fjölbrautaskóli Suðurlands Selfossi *Nýsköpunarmennt, jaldséður gestur í íslenskum grunnskólum* January 9 2009
- SERA conference Perth Scotland *Why is an important subject an unwelcome stranger in Icelandic compulsory schools?* November 26-29.11. 2008
- CREATE seminar University of Exeter, School of Education and Lifelong Learning “*It was just related to everything ...*” *Perceptions of teachers and students of innovation education in Icelandic compulsory schools*. November 24 2008.
- Presentation for Samtök um skólaþróun *Keflavík, Hvað þurfa nemendur 21. aldarinnar að læra?* 7.11.2008.
- ECER conference Gothenburg Sweden *Innovation policy discourse translated to innovation education* September 8-11 2008
- BERA conference – student day: “*It was just related to everything ...*” *Perceptions of teachers and students of innovation education in Icelandic compulsory schools*. 3.-6. September 2008 Edinburgh Scotland.
- FUM – (Icelandic Educational Research Association) conference. *Félagsleg vistfræði og nýsköpunarmennt* (co-author Allyson Macdonald). 23.feb 2008 IUE Reykjavík.
- Nordic conference: *Relationen mellem læreruddannelsen og skoleudviklingen. Regulation and innovation: stimulating students’ creativity and thinking through innovation education in Ingunnarskóli*. (Co-author Allyson Macdonald). 23.May 2008 IUE, Reykjavík
- Science conference. *Tæknimennt í íslenskum grunnskólum – mikilvægur en óvelkominn gestur?* (Co-author Allyson Macdonald). 10.June 2008 IUE Reykjavík.
- NFSUN international conference research in science education. *The silence of innovation education in Icelandic science classes*. (Co-author Allyson Macdonald). 11.-15.June 2008 IUE Reykjavík.
- Conference about Entrepreneurship in vocational education in Reykjavík. *Entrepreneurship Education in VET in Iceland*. 12.oct 2007.
- Annual research conference at the IUE. *Kennsla á að virkja sköpunarkraft nemenda og fá þau til að hugsa...* (co-author Þorgerður Hlökkversdóttir). Reykjavík 19.October 2007
- A seminar on innovation education and entrepreneurship in Iceland and Denmark.

Innovation Education and Entrepreneurship in the Icelandic School system. "...this was just connected to everything". 21.09.2007 IUE Reykjavík.

- SERA conference Perth Scotland. *The ecology of innovation education* (co authored with Allyson Macdonald). November 2007.

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