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The alphabet soup agenda

What can Iceland learn from global programmes?

Educational policy-making is a complex issue, with some decisions being made far from the classroom or school. Iceland belongs to a multitude of international organisations which concern themselves with educational policy and achievement. Two such organisations are UNESCO and the OECD and the aim of this article is to see what we might learn from some of their activities, in this case focusing on sustainable development and educating for sustainability. Several years ago the United Nations charged UNESCO with developing and implementing the Decade of Education for Sustainable Development from 2005-2014, an initiative which has informed the debate on appropriate school activities and provided a wealth of resources for use at local and national level. Iceland participates actively in OECD programmes, one of which is the Programme for International Student Assessment, commonly known as PISA. Some questions in the PISA 2006 study concerned the views of 15 year olds on environmental issues. In this article definitions of sustainability will be considered prior to a short discussion on education for sustainable development and a consideration of selected PISA results from Iceland.

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Global initiatives in education

Policy-making in education is a complex issue ranging from decisions made in classrooms by individual teachers to the development of guidelines for the development of a national curriculum. Increasingly policy is shaped by regional, global or economic partnerships. Iceland is a member state of the OECD (Organisation for Economic and Cultural Development) and has a permanent delegation to UNESCO (United Nations Educational, Scientific and Cultural Organization). Iceland participates in a range of OECD and UNESCO activities, including assessments and initiatives in education. This purpose of this short paper is to highlight two major activities currently underway at the OECD and UNESCO and consider what might be learnt about education in Iceland from such partnerships. The particular example in this paper is education for sustainable development, also known in the literature as ESD.

The Programme for International Student Assessment (PISA), developed in the late 1990s by the OECD with international surveys scheduled every three years to test key competencies of 15 year olds in reading, mathematics and science. The first survey was in 2000. Key features driving PISA have included policy orientation, an innovative 'literacy' concept, relevance to lifelong learning, regular testing and breadth of geographical coverage (OECD, 2007, p. 16-17).

In 2006 the main assessment area was on science competencies. Some items measured knowledge of science and others assessed whether students could identify scientific issues, explain scientific phenomena and use scientific evidence. Applications of science were set in personal, social and global settings and issues such as health, natural resources, the environment, hazards and frontiers of science and technology were raised in assessment items (OECD, 2007, p. 21). The level of awareness of the role of science and technology in shaping our environment and the level of concern for the environment was also assessed. Some results from PISA will be presented later in the paper.

In recent years the United Nations has charged UNESCO with two key initiatives which echo OECD interests. One is the Decade of Literacy (UNLD) from 2003-2012 and the other the Decade of

Education for Sustainable Development (also known as DESD) from 2005-2014. Such initiatives are carefully monitored for progress towards their goals (UNESCO, 2007, 2009, United Nations, 2008), including the progress being made by individual states. There are some signs that the DESD is starting to make an impact in Iceland both on policy and practice, in government ministries, schools, local authorities, civil service organisations and companies. Seminars have been held (Umhverfisfræðsluráð og Landvernd, 2009), research projects are underway (e.g. GETA, 2008) and new policy documents on sustainable development are being prepared (Umhverfisráðuneyti, 2009).

In the next two sections there are short discussions on current understandings of sustainable development and ESD. Then some relevant PISA findings will be considered, particularly the attitudes and awareness of 15 year olds with regard to environmental issues and sustainable development.

Sustainable development

Sustainable development is a 'contested concept' drawing on a variety of world-views (Giddings, Hopwood & O'Brien, 2002, Huckle, 2005). Three sectors have been traditionally involved in the concept – economy, environment and society. The model of intersecting sectors (Figure 1) is based on a rational approach where the solutions to sustainability in one sector are generally sought within that sector and only occasionally through interacting with one or both of the other sectors. A nested model or radical approach to sustainable development (Figure 2) is such that the sectors are interdependent with the environment as the limit. Giddings et al. (2002) maintain that the nested model still suggests that economy, environment and society are somehow separate entities. They argue that the boundary between society and the environment is 'fuzzy', and that it may be more helpful to focus on the more general idea of human needs and well-being than on the economy or society, leading to the model in Figure 3.

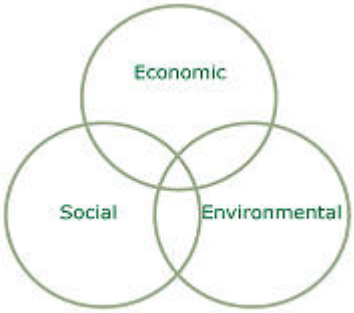

Figure 1 - Intersection model of sectors involved in sustainable development (from Giddings et al., 2002, Huckle, 2005).

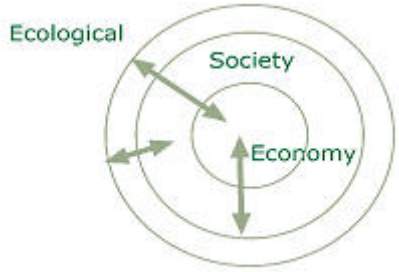

Figure 2 - Nested model of sectors involved in sustainable development (adapted from Giddings et al., 2002, Huckle, 2005).

Figure 3 - Re-interpretation of the nested model of sustainable development (adapted from Giddings et al., 2002).

Hopwood, Mellor and O' Brien (2005) then go a step further in disentangling the two entities shown in Figure 3 by mapping them on separate axes of equality and the environment (Figure 4). This makes it possible to tease out both the level of environmental concern and the extent of socio-economic well-being and equality in particular initiatives. Hopwood and colleagues take examples and conclude that much of the current debate on sustainability and related activity is still located in the 'status quo' region. Approaches which build on the transformative approach are more radical and are more likely to

threaten business leaders and politicians (Hopwood et al., 2005).

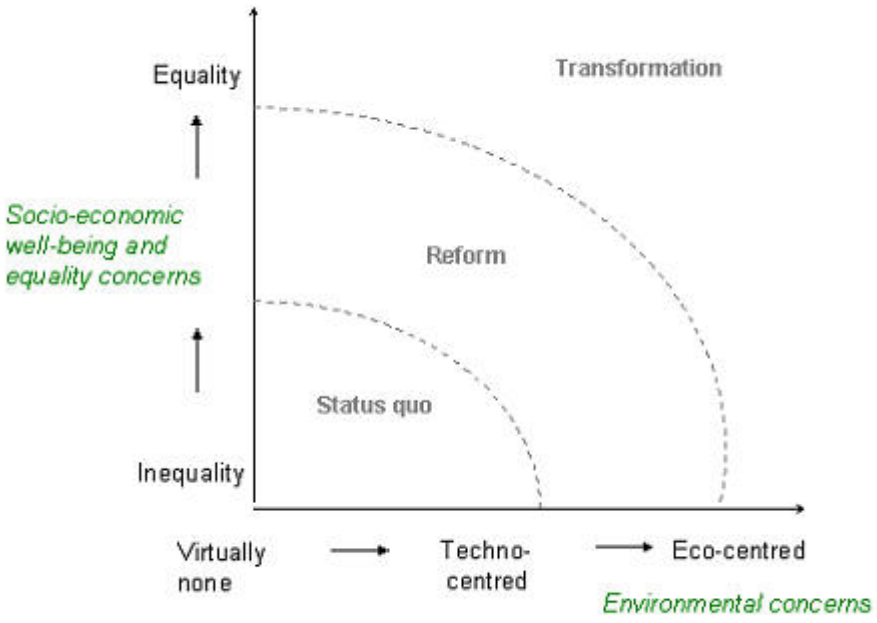

Figure 4 - Mapping of views on sustainable development (from a more detailed version in Hopwood et al., 2005).

Educational action for sustainable development

The problem for educators is to recontexualise the issues and models of sustainability into formal and informal educational settings (Bernstein, 2000) where they can become frameworks for teaching and learning about sustainability. The different representations of sustainable development either suggest a disciplinary approach (Figure 1) with perhaps a token nod to other disciplines or an integrated approach (Figures 2, 3 and 4). For many the place to start has been environmental education, of which the Eco-school (n.d.) movement is a typical example. UNESCO identifies eight themes which fall under ESD: sustainable urbanization, sustainable consumption, peace and human security, rural development, cultural diversity, gender equality, health promotion and finally, environment. Integrated or cross-curricular approaches in formal schooling have proved difficult to implement (Bonnett, 2007, Bernstein, 1996/2000, Huckle, 2005, Macdonald & Jóhannsdóttir, 2006).

In a report prepared for the UK-based Teacher Training Agency Huckle (2005, p. 15-16) talks about sustainability as **a frame of mind**, a way of relating to nature. “Such a frame of mind is committed to the co-evolution of human and non-human nature and seeks relationships within and between bio-physical and social systems which allow their mutual development to take place in sustainable ways” (Huckle, p. 15-16). Bonnett (2007, p. 712) reminds us that it is important that “we experience nature as ‘self-arising’ … nature is not socially produced”. Bonnett (p. 717) suggests that the kind of knowledge that learners require will not be exclusively or even predominantly scientific:

> The value of a more intimate, intuitive, non-logical style of encounter with the world needs to be acknowledged, one whose rigour derives less from adherence to superimposed rules upon experience and more from an open attentiveness to the things experienced.

If Bonnett and Huckle are correct, then ESD should be about developing a “frame of mind” and needing many kinds of knowledge, as is clear from the eight themes suggested by UNESCO. The questions for educators would be – what sort of views are to be developed among learners? Are only rational views involved? Roth (2007) has suggested that emotion plays a key role in learning. Littledyke (2008) has discussed the relationship between cognitive and affective learning issues. The question for ESD might be – how do we evoke emotion among learners? Where is emotion to be found in Figures 3 and 4? A powerful, perhaps emotive, idea for ESD is found in Bowers (2007, p. 48-49) who suggests that we reintroduce the notion of the commons:

> … as practiced over the time span of human history, represented by what is shared in common and upon which life depends: water, fields, woodlands, animals, plants, air, and so forth. The commons also includes the symbolic systems of the culture – language, narratives, expressive arts, technological knowledge, norms governing moral reciprocity, and so forth. … While one of the primary goals of the Western techno-scientific-industrial culture is the further enclosure of the commons, there are still aspects of the natural and symbolic world that have not been brought under the control of market forces.

The central issue for educators is the nature of the knowledge needed for thinking sustainably and its relocation from society and official discourse into educational settings. The PISA surveys can give us a glimpse of the kind of knowledge and attitudes that 15 year olds possessed in 2006. PISA assessed not only scientific literacy, but also engagement in science and attitudes towards the environment, one of the eight UNESCO themes.

Knowledge of and attitudes towards science and the environment

PISA 2006 assessed the performance of 15 year olds in all 30 OECD countries and 27 other countries on a variety of measures related to science, as well as reading and mathematics (OECD, 2007). The mean for OECD countries was set at 500. Finland, the top performing country had a mean score of 563. Iceland had a mean score of 491 and was grouped with countries like Sweden (503), Denmark (496), France (495), the US (489), Spain (488) and Norway (487) (Almar Miðvik Halldórsson, Ragnar F. Ólafsson & Júlíus K. Björnsson, 2007, p. 25).

Results on the value of science, awareness of environmental issues and concern, optimism and responsibility towards sustainable development are presented in the next section with a comparison of the Icelandic and the OECD mean. Results from the same questions have been discussed for the United States (Bybee, 2008) and for the United Kingdom (Schleicher, 2007). An analysis of student performance in environmental science and geoscience in PISA 2006 can be found in a report from the OECD (2009).

The value of science and technology

Some questions in the PISA study assessed the extent to which students valued the role of science in understanding the natural and constructed world (OECD, 2007, p. 127). Icelandic students distinguished between advances in science and technology improving the economy, with 76% agreeing with such a view, but only 53% indicating that advances usually bring social benefits (Table 1), a similar result to Denmark. About two-thirds of OECD countries valued science less than the overall mean for all 57 countries. Students in non-OECD countries were often more likely to value science than students in OECD countries.

Table 1
Percentage of students who agree or strongly agree with statements on the value of science and technology (extracted from OECD, 2007, p. 127–129)

Statements on the general value of science	% who agree or strongly agree		
	% OECD	% Iceland	Diff
Science is important for helping us to understand the natural world	93	93	0
Science is valuable for society	87	86	-1
Advances in science and technology usually improve people's living conditions	92	90	-2
Advances in science and technology usually help to improve the economy	80	76	-4

Advances in science and technology usually bring social benefits	75	53	-22

Being aware of environmental issues

Students were asked whether they were aware of selected environmental issues (Figure 5). Many Icelandic students were less aware of issues related to greenhouse gases, acid rain, nuclear waste and genetically modified organisms than their peers in OECD countries.

Student awareness varied between countries on particular issues. For example, 83% of Irish youth were aware of acid rain problems, but only 37% of Icelandic youngsters. Icelandic youth had the lowest awareness of environmental issues (as shown in Figure 5) among the Nordic countries and were the second lowest among OECD nations, only Mexico ranking lower in the OECD group.

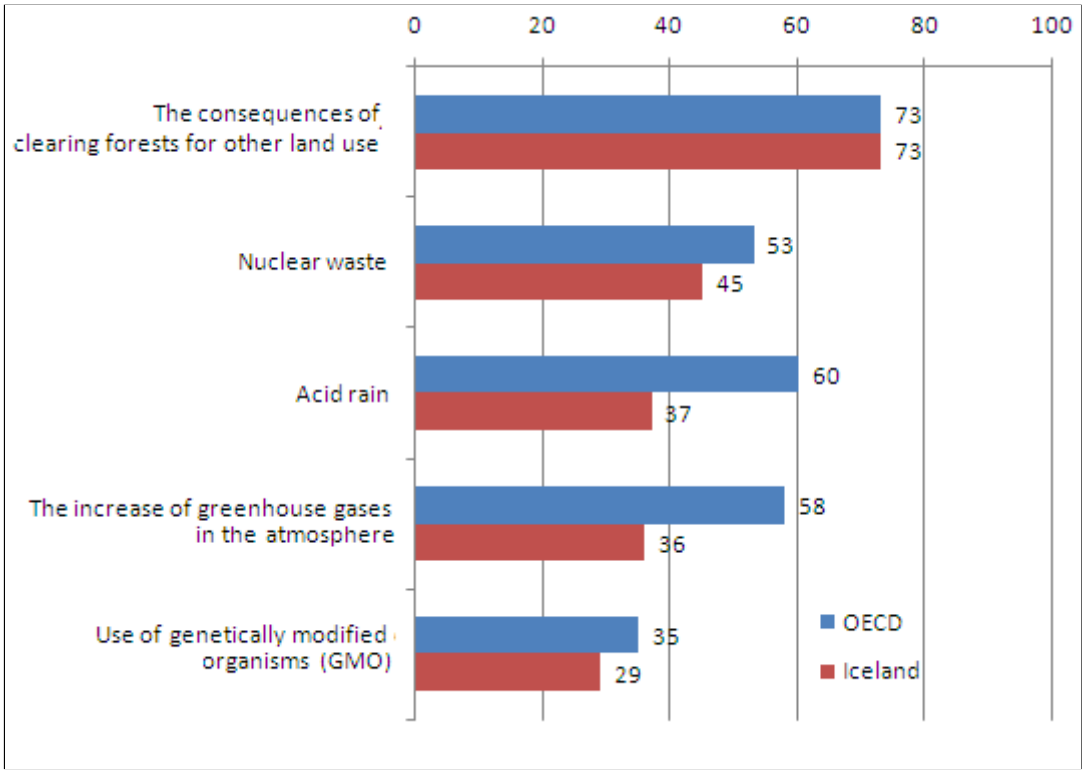

Figure 5 - Index of student awareness of environmental issues (extracted from OECD, 2007, p. 156)

Being concerned by environmental issues

Students were then asked whether they were concerned by these issues (Figure 6). The levels of concern shown by Icelandic students on issues such as nuclear waste (42%), water shortages (49%) or energy shortages (62%) were at least 20% lower than the OECD means. Although some of this lack of concern may be attributed to Iceland being an island community with no nuclear power and an abundance of water, it can be inferred that Icelandic students have not taken to heart global environmental problems.

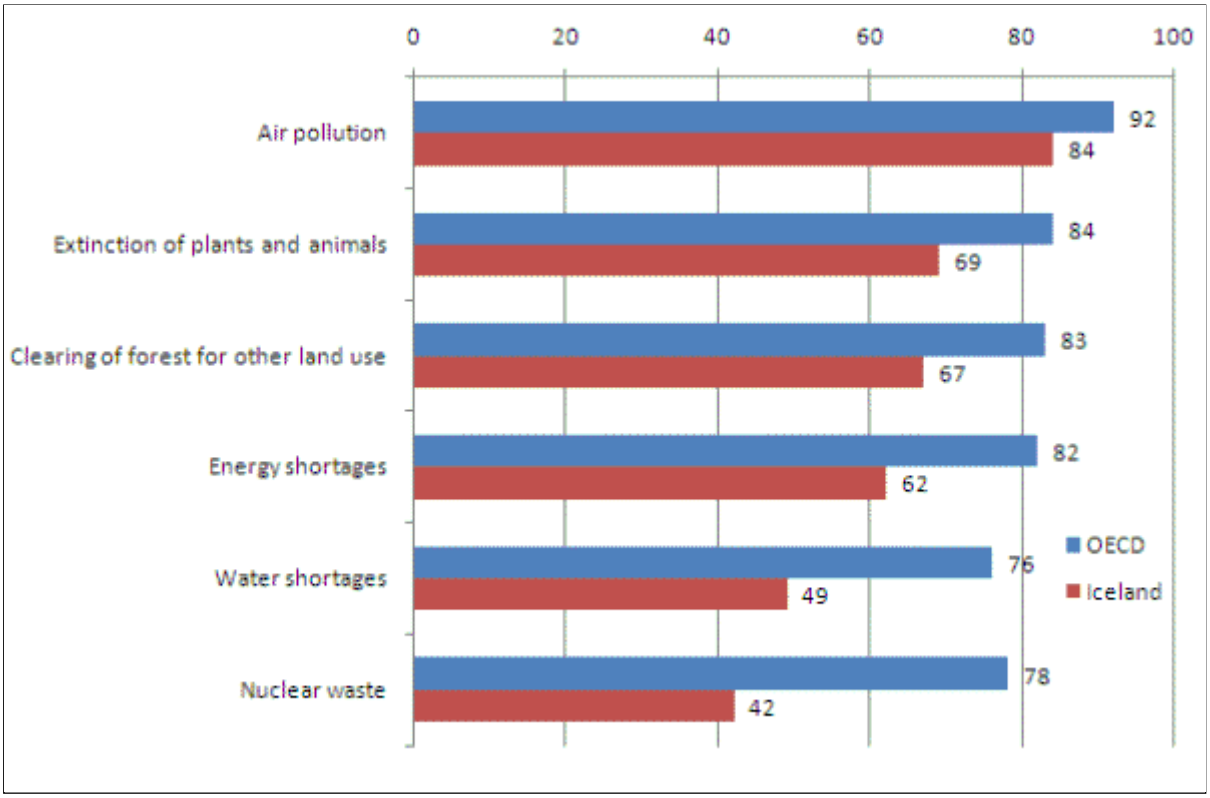

Figure 6 - Level of concern for environmental issues (extracted from OECD, 2007, p. 159)

Optimism or pessimism

Students were also asked whether they were optimistic or pessimistic about improvement with regard to these issues. Of the six problems Icelandic students were least concerned about nuclear waste (Figure 6) and most optimistic about improvements in the area, more so than in other OECD countries (Table 2). In general the learners who answered the survey were not optimistic about the future and there was weak negative association between performance and optimism, i.e. the less students know, the more optimistic they then tend to be.

Table 2
Percentage of students who believe problems associated with environmental issues will improve over the next 20 years (extracted from OECD, 2007, p. 160)

	Percentage who believe problems will improve over the next 20 years		
	% OECD	% Iceland	Diff
Neuclear waste	15	20	5
Water shortages	18	20	2
Energy shortages	21	21	0
Extinction of plants and animals	14	13	-1
Clearing of forests and other land use	13	11	-2
Air pollution	16	13	-3

Taking responsibility for sustainable development

Having assessed the level of awareness, concern and optimism with regard to the six issues in the previous tables and figure, the survey then required students to indicate the level of responsibility they were willing to take towards sustainable development in a number of problem areas. On six of the seven statements in Table 3 Icelandic students showed only slightly less willingness than other 15 year

olds to shoulder responsibility for environmental hazards. There was though a huge difference (24%) in the proportion which was concerned about wasting energy on electrical appliances.

Table 3
Percentage of students who agree or strongly agree with a statement indicating a willingness to take responsibility for sustainable development (extracted from OECD, 2007, p. 160)

Statements concerning responsibility for sustainable development	% of students agreeing or strongly agreeing		
	% OECD	% Iceland	Diff
I am in favour of having laws that protect the habitats of endangered species	92	91	-1
Electricity should be produced from renewable sources as much as possible, even if this increases the cost	79	77	-2
Industries should be required to prove that they safely dispose of dangerous waste materials	92	89	-3
I am in favour of having laws that regulate factory emissions even if this would increase the price of products	69	65	-4
It is important to carry out regular checks on the emissions from cars as a condition of their use	91	86	-5
To reduce waste, the use of plastic packaging should be kept to a minimum	82	73	-9
It disturbs me when energy is wasted through the unnecessary use of electrical appliances	69	45	-24

Correlations between awareness, concern or responsibility and performance

In Iceland levels of awareness of environmental issues explain nearly one-quarter (23%) of the variance of performance in science, but this is true only up to a certain level of performance which is between 550 and 600 (Almar Halldórsson et al., 2007). Higher levels of awareness do not change performance beyond that point. In Iceland awareness was correlated with performance with r=0,484. This is slightly higher than the correlation of performance with enjoyment of science (r=0,473), self-efficacy (r= 0,463) and self-image (r=0,475) (Almar Halldórsson et al., 2007, p. 71).

In all OECD countries, learners from more advantaged socio-economic backgrounds showed higher levels of awareness, and those from more disadvantaged backgrounds were less aware of hazards such as acid rain or nuclear waste (OECD, p. 155). Levels of concern for environmental issues (Figure 6) are not strongly associated with socio-economic status nor with performance in the OECD countries. The PISA team comment however that '...relative ignorance in science may cause these issues to go unnoticed by many citizens' (OECD, p. 157). Lower performers are also more 'complacent' about the environment than high performers (OECD, p. 161). Males were more optimistic than females about the next twenty years, and high-performance students were less optimistic than low-performing students (p. 161, 163). A stronger sense of responsibility for sustainable development, as defined by seven statements (Table 3), is linked with higher science performance in all OECD countries (OECD, p. 161). This is also true of socio-economic status but the effect is slightly weaker.

In summary the results of PISA 2006 tell us that:

- Icelandic students perform slightly below the OECD average in science.
- Awareness of environmental issues in Iceland is lower than in all other OECD countries except

Mexico.

- Awareness of environmental issues explains 23% of performance in science in Iceland.
- Levels of concern about the environment are lower in Iceland than in almost all other OECD countries.
- Icelandic students, like their OECD counterparts, are generally pessimistic about problems being solved in the next 20 years.
- Other factors, which each explain about 20% of performance in science in Iceland, are enjoyment of science, self-efficacy and self-image.
- Just over one-half of Icelandic students feel that advances in science and technology bring social benefits, less than the OECD mean of 75%.
- Only 45% of Icelandic students are disturbed by energy being wasted by electrical appliances, compared with an OECD mean of nearly 70%.

Today is the very first day of the rest of your life ...

The PISA questions presented here give teachers and policy-makers in Iceland a brief glimpse of student views on science, technology and the environment. PISA does not give us information on student views on other sustainability issues such as rural development, gender equality or health promotion. Nor is it obvious where such cross-curricular topics might be found in the typical Icelandic school curriculum.

There is little doubt though that the task of working on ESD is not only multi-faceted but also urgent. Both OECD and UNESCO tend to invoke the 'future' as a rationale for PISA or the DESD. For example, the main results of the PISA 2006 study are presented under the title Science competencies for tomorrow's world and the PISA report issued by the OECD begins with the words:

> Are students well-prepared to meet the challenge of the future? Are they able to analyse, reason and communicate their ideas effectively? Have they found the kinds of interests they can pursue throughout their lives as productive members of the economy and society? (OECD, 2007, p. 16).

Similarly UNESCO states that:

> The basic vision of the DESD [Decade of Education for Sustainable Development] rests on the principle of using education – formal, non-formal and informal – as en effective vector to bring about change in values, attitudes and lifestyles to ensure a sustainable future and the evolution of just societies (UNESCO, 2007, p. 5).

The problems of sustainability, as shown by the UNESCO themes, are not though imagined problems, they are immediate problems. The PISA results for Iceland on environmental awareness indicate that many Icelandic students may not be well-prepared to meet these challenge of the 'present'. Might a more tangible goal for education - for sustainability - be something like the statement of purpose from the Paul F-Brandwein Institute (Bybee, 2008, p. 578):

> ... education should help students understand their interdependence with nature and develop responsibility for sustaining a healthy and healing environment.

Bybee's themes are reflected in the three principles and three levels of action for ESD (Table 5) recommended by the GETA project here in Iceland (GETA, 2008). It is within educational settings that the principles of knowledge, respect and responsibility can be nourished (Auður Pálsdóttir, Allyson Macdonald & Ingólfur Ásgeir Jóhannesson, 2009).

Table 4
Principles of and actions for ESD as proposed by the GETA project (2008)

Developing knowledge for and about sustainable development	Actions for teaching and learning, in formal and informal settings, that enable teachers and learners to build up their knowledge about natural resources and sustainable development.
Encouraging respect for nature and society	Actions within schools that encourage a respect for critical values, democratic procedures and social inclusion in developing sustainable practices in Iceland and elsewhere.
Nurturing a sense of shared responsibility for our common future	Actions at local community level that encourage schools and other organisations to work together in sharing responsibility for a sustainable quality of life.

The PISA results would indicate, with regard to the environment, that actions at all three levels are necessary if Icelandic teachers and learners are to develop the frame of mind necessary for sustainability to be a real option. It follows that teacher educators, both preservice and inservice, need to bring issues of sustainability into the curriculum and the principles of knowledge, respect and responsibility into the foreground. A good starting point for teacher educators are the web-based resources and report by John Huckle (2005) prepared for the Teacher Training Agency in England.

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