Learning Grammar in a Suitable Way:
Teaching children with SLI and autism to identify the gender of Icelandic nouns

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Learning Grammar in a Suitable Way:

A look at how children with autism and SLi could potentially learn to identify the gender of Icelandic nouns

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Ritgerð þessi er 10 eininga lokaverkefni til B.A. prófs í þroskaþjálfafræði. Óheimilt að afrita ritgerðina á nokkurn hátt nema með leyfi höfundar.

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Prentun: Bóksala kennaranema á Menntavísindaviði
Reykjavík, Ísland 2013
Abstract
This multiple baseline study looked at the effect of a teaching technique combining methods from second language learning and behavioral science on the skills of children with Specific Language Impairment (SLI) in identifying the gender of Icelandic nouns with regular or irregular endings. The participants were three elementary students, 7 to 14 years old, identified as using grammar incorrectly in their daily speech. One participant had been diagnosed with SLI, the other two were diagnosed with autism and SLI. The interventions involved teaching a formula for categorizing gender of nouns with regular endings using a visual prompt, a flashcard and/or written exercise and prompt fading. Also one exception to the rule was introduced. A single-subject multiple baseline design over participants showed that all participants learned to identify the gender of Icelandic nouns with regular endings. Results regarding learning the gender of nouns with irregular endings were inconclusive because of time restraints. The results indicate that a visual formula can be helpful for learning the gender of nouns with regular endings but that exceptions to the rule require a longer learning process. The results also point to the need for individualized teaching methods which emphasize generalizing grammatical skills into both written and spoken forms.
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Prologue

Three years ago I began my studies in social education (þroskaþjálfafræði). For me my studies were personally motivated because I am the mother of two young men that are diagnosed with autism and specific language impairment (SLI).

My sons have overcome many of the symptoms of autism. I believe that early intervention in preschool through applied behavioral analysis has been a key factor in their success. However, there is a barrier that still profoundly limits their lives. It often causes them confusion, frustration and difficulties in communication. This barrier is caused by SLI. SLI is a disorder where children have abnormal language development and perform below age level on language measures (Rice, Warren & Betz, 2005). It is a very frustrating condition to have because words are the medium in which most of us use to communicate. I believe that words are much like a foreign language for my sons. They think in pictures.

Other parents at the Icelandic autism society have shared their frustrations with me. Several parents have talked about their children with autism and SLI preferring to speak English rather than Icelandic. Could this be a clue that teaching methods designed for second language learning may be more suitable for people with autism and SLI?

I have been experimenting with one of my sons explaining Icelandic grammar visually through rules and formulas that were originally set up for use with foreign students at the University of Iceland. I want to look at this method and structure it using applied behavior analysis. Could combining these two methods be potentially helpful for individuals with autism and SLI?

I don’t stand alone in my efforts. There are many people that have helped and encouraged me with this project. I am extremely thankful to all the parents and professionals that have contacted me about possible participants for this study. I want to thank María Anna Garðarsdóttir and Sigríður Þórvaldsdóttir for their advice and guidance in regards to the Icelandic language. I also want to thank Evald Sæmundsen, Olgeir Jón Þórisson, Bergljóð Brynjólfsdóttir, Svanhildur Tinna Ólafsdóttir, Kristín Guðjonsdóttir and Brynjólf Ólafsson, and of course, the participants and their parents. But especially, I want to thank dr. Anna-Lind Pétursdóttir who was my teacher and advisor in this study whose support and guidance made this project possible.
1. Introduction

This research looks at the effect of using teaching techniques which combine methods from second language learning and behavioral science on the abilities of children with SLI in identifying the gender of Icelandic nouns that have both regular and irregular endings. This research builds on my previous B.A. thesis written for the School of Humanities at the University of Iceland where I studied Icelandic as a second language. My thesis was written in 2012 and was entitled: *Tillaga að kennsluaðferð í málfræði. Ætlad einstaklingum með einhverfu og málhömlun* which means a proposal for a grammar teaching method that is intended for individuals with autism and SLI (Ralston, 2012). This previous thesis explored various linguistic theories such as Chomsky’s theory about the language acquisition device, Skinner’s theory about environmental influence on communication and Manfred Pienmann’s language processing theory. Furthermore, this thesis looked at how these theories might be applicable to Icelandic grammar lessons for individuals with autism and SLI.

My current thesis is written as part of a BA study for the Social Education Department (þroskþjálfafræði) at the University of Iceland. It looks at the application of a technique designed to teach second language learners at the University of Iceland how to identify the gender of nouns. This particular technique was then restructured for this study to fit with the principles of behavioral analysis, and then applied to teaching elementary school students with SLI.

This paper begins with looking at social education and why research about SLI is appropriate subject matter for social educators. This is followed by a 3rd chapter which focuses on autism and specific language impairment and also looks at behavioral science and how the principles from behavioral science can be used to structure teaching. Then in the 4th chapter is a description of the method used in this study and the procedure. In chapter 5 are the results, and chapter 6 concludes with the discussion.

2. Why is research about grammar usage and SLI an appropriate topic for research in social education?

Some have questioned whether research about grammar usage, autism and SLI is an appropriate topic for social education. Therefore it is necessary in this paper to begin
with looking at the profession of the social educator and his or her duties in Icelandic society in order to explain why research about grammar is a significant topic for social education in Iceland.

2.1 What is social education?
Social education was once a profession that was strictly found in Northern and Central Europe where professionals worked with children and young people that had been for various reasons institutionalized (Nordic Forum for Social Educators, 2003). However, today social education is a profession that is found in many countries worldwide (International Association of Social Educators, n.d.). The profession is constantly evolving to adjust to the changes of society which now involves a very diverse clientele that can include any group of people that have been socially excluded in society (Nordic Forum for Social Educators, 2003). Social educators are no longer just employed to work in various institutions. Their work place now varies in accordance with the needs of their clientele (Nordic Forum for Social Educators, 2003; Folkestad, 2005).

The International Association of Social Educators (AIEJI) defines social education as

> The theory about how psychological, social and material conditions and various value orientations encourage or prevent the general development and growth, life quality and welfare of the individual or their group. A fundamental element in social educational work is to facilitate integration and prevent marginalization and social exclusion. This is done in a process of social interaction in order to support and help exposed individuals and groups at risk so that they can develop their own resources in a changing society (International Association of Social Educators, 2010, p. 3).

2.2 The Code of Ethics for Icelandic social educators
Icelandic social educators work according to a specific code of ethics as do most other professions (Просякайсфалфейял Эйландс, n.d.). The first two articles in this code of ethics for Icelandic social educators are especially pertinent regarding the issue of research on grammar usage and SLI.

2.2.1 The first article in the code of ethics and quality of life.
In the first article it states that social educators have the duty to use their professional skills to improve their clients’ quality of life (Просякайсфалфейял Эйландс, n.d.). Quality of life is dependent on many variables and these variables likely vary somewhat between individuals. Communication, however, is a basic skill that affects everyone
and their quality of life. It is vital that people develop good communication skills to be able to partake in almost all aspects of society (Downing, 2005). Therefore as a social educator it is necessary to look for opportunities to help people that are in need of improving their communication skills. The ability to speak and write correctly are important skills that are necessary in many aspects of life. Good communication skills can open doors to education, employment and social opportunities. Choice and integration in society lead to increased quality of life. Therefore any research that is geared to improving the quality of life of people that have been excluded in society is pertinent to social education.

2.2.2 The second article in the code of ethics and the protection of legal rights.

The second article in The Code of Ethics for Icelandic social educators states that social educators have the duty to protect their clients legal rights (Þroskaþjálfafélag Íslands, n.d.). This article is pertinent to this paper because the research in this paper attempts to take a beginning step into looking at the possibility that students with SLI may not be receiving appropriate assistance in building up basic grammar skills in Icelandic. The right to an education is protected by law in Iceland and in the United Nations Convention on the rights of the child (Lög um grunnskóla nr. 91/2008; Lög um framhaldsskóla nr. 92/2008; United Nations Convention, 1989). In the law for elementary schools in Iceland it states in chapter four in the 13th article that students have the right to be taught with a suitable method and in an inspiring environment within appropriate housing (Lög um grunnskóla, 2008/91). It is also stated in the Icelandic law about students with special needs in elementary school, in chapter three in the 8th article, that students with special needs have the legal right to appropriate support in their educations (Reglugerð um nemendur með sérþarfir í grunnskóla, 585/2010).

Therefore if a social educator were to discover that students were being educated in a way that is unsuitable for them due to their disability, it would then be the duty of the social educator, according to the second article in the code of ethics (Þroskaþjálfafélag Íslands, n.d.), to try and take the necessary steps to correct this issue.
3. A Theoretical Chapter

3.1 Autism and SLI

The 10th version of International Statistical Classification of Diseases and Related Health Problems (ICD 10) is a medical classification list published by the World Health Organization containing information about many kinds of diseases, health problems and developmental disorders. This includes information about autism spectrum disorders and SLI which is found within the 5th chapter entitled Mental and behavioral disorders.

Here, in the ICD 10, autism spectrum disorders are referred to as pervasive developmental disorders with the codes F84.0 –F84.9. All pervasive developmental disorders have the following symptoms in common: abnormal social interactions, abnormal communication patterns and abnormal repetition of activities and interests. Only the pervasive developmental disorders that commonly co-occur with SLI will be discussed in this study.

SLI is referred to in the ICD 10 as disorders of speech and language under the code F80. Speech and language disorders are defined in the ICD 10 as disorders where the development of language is abnormal from early childhood and can not be attributed to any other conditions or sensory impairment. These disorders are said to often be accompanied by other difficulties such as reading, spelling, social and behavioral issues (World Health Organization, 2010).

3.1.1 What is childhood autism?

Childhood autism is a pervasive developmental disorder and is listed under F84.0 in The ICD-10. The symptoms of childhood autism appear before three years of age, and are seen in abnormalities in three areas which include: the usage of language in social communication, the ability to reciprocate in social situations and development of normal attachments to others, and the existence of repetitive and restricted behaviors (World Health Organization, 2010; Loucas et al., 2008).

3.1.2 What is atypical autism?

Atypical autism is a pervasive developmental disorder and is listed under F84.1 in the ICD-10. Atypical autism varies from childhood autism in that symptoms of autism sometimes do not develop until after three years of age. Another variation that can
differ is that children with atypical autism may not develop symptoms from all three of the areas listed above as symptoms of childhood autism. Children with atypical autism may only develop symptoms from two of these three areas (World Health Organization, 2010).

3.1.3 How prevalent are autism spectrum disorders?
Autism spectrum disorders are not uncommon in society. The prevalence of autism was estimated in 2008 by the Center for Disease Control and Prevention in the United States. This study focused on 14 specific areas within the USA, estimating the prevalence of autism spectrum disorders within these sites. The results showed that 11.3 per 1000 children had autism spectrum disorders which is 1 in 88 children (Center for Disease Control, 2008). Another recent study looked at conditions that co-occur with autism, examining data from 2,568 American children that were 8 years of age and had been diagnosed with autism spectrum disorders. Here it was found that language disorders were the most commonly co-occurring condition with 63% of these children having a diagnosis of a language disorder (Levy et al., 2010).

In comparison, The Icelandic Diagnostic and Counseling Centre found that 1.2% of Icelandic children were diagnosed with autism spectrum disorders. This calculation of prevalence was based on 267 Icelandic children who were born in 1994 – 1998. They were diagnosed with autism spectrum disorders according to ICD-10 criteria for pervasive developmental disorders. Within this group of 54 children, 20.2% were also diagnosed with SLI (Evald Sæmundsen et al., 2013, submitted).

3.2. What is SLI?
SLI is a disorder where the development of language is abnormal from early childhood and can not be attributed to any other conditions or sensory impairment. Children with SLI are often late in learning to talk and tend to make grammatical errors in their speech (National Institute of Health, n.d.).

3.2.1 How prevalent is SLI?
It is estimated that 7-8% of American children are affected by SLI, and its impact is said to carry on into adulthood. Children with SLI tend to have difficulties conversing with others (National Institute of Health, n.d.). Icelandic data about the prevalence of SLI in the general population of children is not yet available (Icelandic Diagnostic and Counseling Centre, 2006).
3.2.2 The manifestation of SLI

One common trait found with English speaking children with SLI is errors in the usage of verbal tense (National Institute of Health, N.D.; Håkansson, 2001). Many studies with English speaking children have focused on grammar skills involving verbal tense, and some have theorized that SLI is an impairment that affects the ability to learn grammatical rules (Joanisse, 2004). However grammar differs between languages and according to Gisela Håkansson, this has an effect on the type of grammatical errors that individuals with SLI make. For example, Swedish children with SLI have been said to have more difficulty in regards to word order than English children, and German children with SLI have been said to have difficulties with both word order and subject and verb agreement (Håkansson, 2001). Therefore language structure is a possible variable that may have an impact on how SLI manifests in different languages.

Some have hypothesized that SLI is an impairment that affects the ability to learn grammatical rules. However, Joanisse (2004) points out that most studies that look at the usage of regular and irregular verbs in children with SLI find little difference or worse performance on irregular verbs.

Another well-known characteristic found in individuals with SLI is difficulties with exercises that involve non-word repetition (Conti-Ramsden & Botting, 2001). In a non-word repetition test, participants are asked to repeat non-sense words directly after hearing them (Williams, Payne, & Marshall, 2012). It has been found that the longer nonsense words are, the more difficulties these exercises pose for individuals with SLI. Research points to this deficit as a suspected clinical marker for SLI (Conti-Ramsden & Botting, 2001).

In recent years there has been much speculation about SLI and whether children with autism and SLI actually have the same condition as children with only SLI (Whitehouse, Barry & Bishop, 2008). However, recent research using non-word repetition points to these two conditions manifesting slightly differently within the two groups. The children with SLI made more mistakes with longer words. However, the children with autism plus SLI made mistakes that were more random and unpredictable (Riches, Loucas, Baird, Charman, & Simonoff, 2011). Then recently another similar study looked again at non-word repetition and found that children with autism and SLI made very similar mistakes to younger, neuro-typical children that were measured to be at a similar stage in language development which may
reflect the delayed language development in children with autism. The children with SLI were again measured to make predictable mistakes with the repetition of longer words (Williams et al., 2012). This study points again to the conditions, of SLI and autism co-occurring with SLI, to likely be two separate types of conditions that manifest slightly differently.

Other traits have also been studied including a theory on phonological deficits which is the inability to encode the words one hears correctly (Joanisse, 2004; Archibald & Gathercole, 2007). This theory suggests that incoming information about sound is sometimes encoded incorrectly in the brain of individuals with SLI. This theory could potentially explain why non-word repetition is so difficult for individuals with specific language impairment. In the past difficulties with non-word repetition were often attributed to poor short-term memory (Bishop, 2006).

3.3 The Science of Behavior applied to Teaching Language

3.3.1 Behavioral Science’s Influence on the Development of Teaching

The studies of behavioral science focus on the relationship of behavior and environmental variables that affect behavior. This is a science that can be applied in various environments. Burrhus Frederic Skinner is one of the pioneers credited with discovering the basis for behavioral science (Vargus, 2009) and wrote the book Behavior of Organisms: An Experimental Analysis in 1938 (Kristján Guðmundsson, 2005). Since then, various branches and methods of behavioral science have developed that encompass Skinner’s original principles and have been successfully used as teaching methods.

3.3.2 What is learning according to behavioral science?

According to Vargus (2009) behavioral science defines learning as “a change in behavior as a result of interacting within one’s immediate environment” (p. 36). There are two types of learning. The first involves responding to stimuli as part of a reflex which is learned through responding to environmental stimulus. This is called respondent conditioning. Respondents that involve emotions such as anxiety or anger can affect students in the classroom. This can happen when a neutral stimulus is paired with an event that was formerly punishing or elicits any sort of emotions (Vargus, 2009). Operant conditioning is another type of learning. This type of learning involves regulating one’s behavior according to its potential consequences.
(Pierce & Cheney, 2004). This type of learning encompasses skills learned in school such as reading and math (Vargus, 2009). With operant conditioning, it is the consequences in the environment that affect how likely it is for the behavior to reoccur (Vargus, 2009).

The learning of language also results from operant learning. Hart and Risley (1975) looked at language learning in their study of preschool children. They found that learning language occurs naturally when children are given the opportunities to converse and learn from adults in naturally, stimulating environments. However, children with development disabilities may often need increased opportunities within the environment for learning to occur. This was shown by Ivar Lovaas (1987) in his studies where he designed an early intervention method for young children with autism using applied behavioral analysis. It was found in Lovaas’s experiment that the group of children who received the most behavioral methods benefited the most. This again shows that environment affects learning. Then in later years, others have compared this comprehensive and intensive behavioral intervention, that was originally developed by Ivar Lovaas, with other well known methods. Here, each intervention was applied in equal amounts of time. The results showed that the children that had received applied behavioral analysis benefited the most (Eikeseth, Smith, Jahr & Eldevik, 2002; Howard, Sparkman, Cohen, Green & Stanislaw, 2005; Eikeseth, Smith, Jahr & Eldevik, 2007). These results show that environmental influence is of utmost importance for young children with autism. Also these studies give evidence for the effectiveness of behavioral analysis as a teaching method for children with autism.

3.3.3 What is teaching according to behavioral science?

According to behavioral science, “Teaching is the arrangement of contingencies that produce learning “(Vargus, 2009). Skinner wrote the book, The Technology of Teaching in 1968 which describes how to use a system of positive reinforcement to improve on academic performance (Pierce & Cheney, 2004). Reinforcement is defined in behavioral science as “a change in the environment that strengthens the operant that produces the change” (Vargus, 2009, p.46). Past research has shown that reinforcement is very effective and essential in regards to changing behavior (Leaf & McEachin, 1999). By analyzing behavior, teachers can adjust reinforcement to produce learning. Skinner originally established this relationship of reinforcement and
learning through the use of measuring techniques. Skinner built a cumulative record which was a device that automatically measured the rate of actions showing the speed in which the behavior occurred. Skinner discovered that by varying the reinforcement schedule it is possible to shape behavior and produce the desired effects (Vargus, 2009). Methods that encompass the principles of behavioral science often entail the practice of daily continuous measurements of specific curricula as were first practiced by Skinner. Studies have shown that teachers that use such evaluation techniques, as is found in Precision Teaching and other methods based on behavioral science tend to produce high levels of student achievement (Kubina, Morrison & Lee, 2002).

The first step in behavioral analysis is to identify the problem and set a goal that is specific, measurable and well defined. Applied behavioral analysis does not focus on the cause of problems in learning such as lack of coordination or inadequate intellectual skills. It rather focuses on consequences of potential actions (Vargus, 2009). Greer describes the characteristics of teaching according the principles of applied behavioral analysis in the book Designing Teaching Strategies (2002). According to Greer, instruction that encompasses the principles of applied behavioral analysis needs to be individualized and should ideally be continuously measured.

Learn units can be used to measure the interaction of students and teachers, and have the purpose of analyzing and measuring both the student’s and the teacher’s performance and motivational factors. Learning has occurred when learn units are present. When learn units are absent, learning has not occurred (Greer, 2002). For example, Greer and Ross (2008) review the components of the learn unit in the book Verbal Behavior Analysis. It is emphasized when presenting learn units, that all requests made to the student must be clear. For example, if the student is asked to identify a square it must not resemble a possible rectangle. Greer and Ross also state that it is important to ensure one has the student’s attention. If not, the learn unit must be repeated. After the presentation, the student has to have a suitable amount of time to respond. Prompts are often used to aid learning of new material. “A prompt is an antecedent that enables a learner to respond appropriately” (Vargus, 2009, p. 201) The prompt then must be gradually withdrawn or faded as learners become more skilled in responding (Vargus, 2009) to foster independence. In turn, teachers must immediately respond to the learner’s response to the learn unit, by giving reinforcement for a correct response, or correcting an incorrect response. In the case of an incorrect response reinforcement should be withheld in most cases, and the learner should be
assisted in repeating the correct response. The accuracy of each response is recorded, and then it is proceeded to the presentation of the next learn unit. At the end of each session all data is recorded so the information from the learn units can be of use in the next instructional decision (Greer & Ross, 2008). Statistical graphs and charts should ideally be used to plot and illustrate the progress of the individual learner. This information is then used to determine which tactics should be chosen for future use, and these decisions are based upon the data recorded from past performance. Decision making techniques are based on “the moment to moment responses” (p.14) of each individual student which are all recorded. It is beneficial when using behavioral analysis teaching methods to keep constant record of the progress and have this information available for viewing. These basic principles come from behavioral science and can be used to make teaching various types of curricula more effective (Greer, 2002).

Another important aspect to consider when working with children with special needs and especially with disorders on the autism spectrum is the teaching of generalization. When skills generalize, learners then have the ability to apply their learned skills in new situations both inside and outside of the classroom (Vargus, 2009). Children with autism tend to have difficulties with generalizing skills (McHugh & Reed, 2008). Therefore teaching methods based on behavioral science tend to be designed to exercise learned skills in various forms and environments as is, for example, described by Leaf and McEachin in their book, A Work in Progress. Teaching methods that use verbal behavior analysis also tend to entail such techniques (Greer & Ross, 2008). Greer and Ross (2008) write that “response is generalized when a student emits it twice in a non-instructional setting” (p. 41). Naturally, language and verbal skills must be learned so they can be applied in multiple environments and in both written and spoken forms.

3.3.4 Verbal Behavior Analysis
In 1957 B.F. Skinner published the work Verbal Behavior which gives a theoretical explanation about the functions of language (Skinner, 1957/1992). Skinner wrote that stimulus, response and reinforcement were the three main events to consider when looking at verbal behavior under stimulus control. In the definition of one of the key variables of verbal behavior Skinner wrote, “A mand may be defined as a verbal operant in which the response is reinforced by a characteristic consequence” (p. 35).
An example given by Skinner is “pass the salt” (p. 36). Here the words, pass the salt, are the mand which are verbal operants and salt becomes the reinforcer. Another key functional term defined by Skinner is the tact. Tacts could simply be described as the labeling of objects or characteristics of objects which are then reinforced with social approval. This illustrates how the power of reinforcement motivates verbal behavior (Skinner, 1957/1992; Vargas, 2009). An example that Skinner gave of using a tact is a child pointing at a doll and saying the word, doll. According to Skinner, this child is seeking the social approval of others and therefore is motivated to point and say the word, doll (Skinner, 1957/1992).

Therefore by setting up conditions that encourage learning and providing reinforcement for specific verbal responses one can influence and teach various forms of verbal behavior. Verbal analysis makes use of these principles by developing individualized tactics and reinforcement that are designed to fit specifically with each individual. The goal of the verbal behavior approach is to teach this information about the function of language to individuals, giving them the means to use language to communicate (Greer & Ross, 2008).

3.3.5 Behavioral Science used to structure lessons about gender of Icelandic nouns

In contrast to verbal behavior analysis which is set up to teach individuals about the function of language, grammar is a subject that teaches about the structure of language. Learning grammar is necessary to use the correct form for communication whether it be through speech or writing. According to Greer and Ross (2008), language structure and grammatical principles can be taught in the same manner as used in the teaching techniques from verbal behavior analysis. Here they stated that “there are readily available education standards and curricula for this purpose that can be modified by inserting learn unit instruction and other behavior analytic tactics” (p. 217).

3.3.6 The structure needed to build a lesson

The structure for lessons needs to be set up in what Greer describes as a “decision tree” (Greer, 2002, p. 58). A “decision tree” is a structure that organizes the steps to achieving each specific goal as in task analysis. Each step is carefully described in detail, and the tactics used are decided by the results of each step. If the tactic is successful, the student moves on to the next step. If the tactic is unsuccessful another tactic is selected (Greer, 2002).
In the School of Humanities at the University of Iceland, foreign students and others study to improve their skills and earn degrees in Icelandic as a second language. The grammar teaching technique used with the second language learners in this department has been set up in a bottoms up teaching design that gradually builds up basic knowledge about the grammatical structure of the Icelandic language (María Anna Garðarsdóttir & Sigríður Dagný Þorvaldsdóttir, 2012). The main textbook used to teach grammar is written by Ásta Svavarsdóttir and Margrét Jónsdóttir and is called Íslenska Fyrir Útlendinga which means Icelandic for foreign students (1998). This book is structured to focus first on teaching students about the regular conjugations and declensions. Then later it proceeds to lessons in the irregular forms of words. The first lesson in this book is about how to identify the gender of nouns

There are three possible genders for Icelandic nouns: masculine, feminine and neuter. The pronouns, hann, which means he, and hún, which means she, can be used to refer to inanimate objects in Icelandic. The word, það, is also a pronoun used for objects that are neuter in gender and equivalent to the English pronoun, it. For example, in Icelandic a car can be referred to as he, because it is of the masculine gender. A sweater can be called she, because it is of the feminine gender. It can be confusing for second language learners to identify gender in Icelandic. However, students learning Icelandic as a second language at the University of Iceland are taught that these three genders can often be identified by looking at the endings of nouns. This explanation about the tendency for nouns to end on certain letters is found in the book Íslenska fyrir Útlendinga (Ásta Svavarsdóttir & Margrét Jónsdóttir, 1998). For example, nouns of the masculine gender often end with the letters: -ur, -i, -nn, -ll. This is shown below in table 1.

**Table 1. Regular endings for masculine nouns in Icelandic**

<table>
<thead>
<tr>
<th>Horse = Hestur</th>
<th>Pen = Penn</th>
<th>Stone = Steinn</th>
<th>Car = Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ur</td>
<td>-i</td>
<td>-nn</td>
<td>-ll</td>
</tr>
<tr>
<td>(strong declension)</td>
<td>(weak declension)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the research of Ásta Svavarsdóttir, it was found that regular weak declensions of masculine nouns make up 7.83% of all nouns and strong masculine declensions such as found in the word horse/hestur make up 8.31% of nouns. The Icelandic nouns that
are feminine in gender come in two regular forms which decline in different ways as shown below in table 2. The so called strong declension tends to end on consonant letters. However, other than that there is no particular pattern regarding what letters these nouns end on. This strong feminine form of declension is found to occur with 17.29% of nouns. However, the feminine nouns that have weak declensions end on the letter –a, and make up 11.27% of nouns (Ásta Svavarsdóttir, 1993).

**Table 2. Regular endings for feminine Icelandic nouns**

<table>
<thead>
<tr>
<th>Strong feminine nouns:</th>
<th>Weak feminine nouns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>no particular endings</td>
<td>ends with -a</td>
</tr>
<tr>
<td>picture= mynd</td>
<td>sweater= peysa</td>
</tr>
<tr>
<td>spoon= skeið</td>
<td>cake= kaka</td>
</tr>
<tr>
<td>door= hurð</td>
<td>hat= húfa</td>
</tr>
</tbody>
</table>

This lack of endings in the feminine, strong declension can cause second language learners to confuse the strong feminine nouns with nouns that have strong neuter declensions as shown in table 3. Strong neuter declensions make up 31.81% of Icelandic nouns (Ásta Svavarsdóttir, 1993).

**Table 3. Strong feminine Icelandic nouns and neuter nouns**

<table>
<thead>
<tr>
<th>strong feminine nouns</th>
<th>neuter nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>no particular endings</td>
<td>no particular endings</td>
</tr>
<tr>
<td>sun/ sól</td>
<td>house/ hús</td>
</tr>
<tr>
<td>rose/ rós</td>
<td>bicycle/ hjól</td>
</tr>
<tr>
<td>bean/ baun</td>
<td>television/ sjónvarp</td>
</tr>
<tr>
<td>beach/ strand</td>
<td>nose/ nef</td>
</tr>
</tbody>
</table>

When individuals do not develop a natural feel for grammar as with second language learners. It is necessary to find other means to teach these skills as with second language learners. At the University of Iceland, second language learners have been taught about each type of declension in the singular, pleural, indefinite and definite form for each gender (María Anna Garðarsdóttir & Sigríður Dagný Þorvaldsdóttir, 2012). This is done step by step by first teaching the grammatical patterns of declensions for each gender of regular nouns. Then moving on to include irregular
forms later after the learner has developed a basic understanding for the regular forms. This teaching technique emphasizes building an understanding for the basic structure of the language before introducing small details or irregularities as is also the tradition in the behavioral teaching technique, Direct Instruction (Magliaro, Lockee, & Burton, 2005).

By selecting a group of commonly used Icelandic nouns for each gender in both the strong and weak forms and systematically teaching and repetitively exercising the various endings, it may be possible to gradually build a feel for the various declensions and help individuals with SLI improve their grammatical abilities. This idea is described in more detail in the following Icelandic thesis: Tillaga að kennisluafærð í málfraði. Ætlad einstaklingum med einsverfu og málhömlun (Ralston, 2012).

3.5 Previous research about teaching grammar to children with autism

According to Tager-Flusberg and Joseph (2003) and Eigsti, Bennetto and Dadlani (2006) there are few studies that look at language deficits and grammatical abilities in children with autism. This is despite the fact that language deficits and grammar difficulties have been identified as a common deficit found with autism (Tager-Flusberg & Joseph, 2003).

However, there are a few studies that seem to shed light on this particular matter. For example, if one looks at research about methods that have shown to be most beneficial in teaching communication skills to children with co-occurring autism and SLI, then behavioral interventions have been reported as successful (Vismara, & Rogers, 2010). McHugh and Reed (2008) write that despite the known success of behavioral strategies to teach functional communication to children with autism, research has seldom addressed the issue of teaching children with autism to communicate grammatically correct. Also they mention that children with autism often have difficulties with generalizing learned information to other environments and forms. McHugh and Reed emphasize the issue of generalization as important and believe that this issue must be addressed when constructing grammar teaching methods for children with autism.

Because of the success rate of behavior treatments with communication in autism (Vismara, & Rogers, 2010), it seems logical to look at the possibility of using behavioral science to build grammar in children with autism spectrum disorders.
McHugh and Reed (2008) reviewed the history of the use of behavioral science in teaching grammar which included research on teaching non-humans such as chimpanzees and pigeons simple grammar and language through the use of behavioral science. However, McHugh and Reed describe that research regarding the use of behavioral science and teaching grammar to children with autism as being more scarce. They do name two books which were published in the 1990s that describe techniques designed to teach grammar to individuals with autism. However, according to McHugh and Reed, these techniques lack empirical evaluation about their effectiveness.

This same issue of lack of empirical evidence can also be found in more recent methods like the grammar trainer, a recent computerized teaching method designed for children with autism. This teaching method is said to use some principles from behavioral science regarding reinforcement and prompts (Grammar trainer, n.d.-a). It was designed by linguist, Dr. Katharine Beals who specializes in English as a second language (Grammar trainer, n.d.-b).

Other linguists have contributed to the research about the grammatical abilities of individuals with SLI. For example, Håkansson from Sweden looked at grammatical abilities in children with SLI. Håkansson found strong similarities in the grammatical abilities of Swedish children with SLI and children that were learning Swedish as a second language (Håkansson, 2001). However, there is not yet Icelandic research to compare this with, and there seems to be a lack of research regarding whether similar teaching methods could be suitable for both second language learners and individuals with autism and SLI. A lack of empirical studies about teaching grammar through combining techniques for second language learners and behavioral science, makes it necessary to look at known successful teaching techniques for children with autism that are similarly structured to this current study.

One such study was conducted by Tarbox, et al. (2011). Here it was looked at how behavioral analysis could be successfully used to teach rule-governed behavior. It was found that children with autism, who had previously struggled with following rules, could learn to respond appropriately to rules. These children also learned to generalize this newly learned behavior to other situations. This study by Tarbox, et al. (2011) could potentially support this current study. Both of these studies are similar in many ways. They both begin by focusing on using rules to teach children with autism various skills through the use of behavioral analysis. Then, the focus in both studies
shift, and the emphasis changes to generalizing these same skills to other environments. A similar approach could be used to teach children rules to learn grammar. In this study, the goal is to explore the effects of teaching techniques that combine methods from second language learning and are structured with behavioral science on the abilities of children with SLI in identifying the gender of Icelandic nouns with both regular and irregular endings.

4 Method

4.1 Participants
The participants were 3 Icelandic boys that attended Icelandic elementary schools. These boys were 7, 9 and 14 years of age. Participant 1, who was the oldest of the participants, had been diagnosed with autism and SLI. Participant 2 had also been diagnosed with autism and SLI. Participant 3 was the youngest of the participants and had been diagnosed with SLI only. All of the participants were literate, and had been identified by both their parents and teachers as having difficulties in their daily speech regarding the correct use of the gender of nouns. Each had demonstrated the ability to distinguish the gender of people in an entrance test administered at the beginning of this study after parents had provided their written consent (see Appendix A) for their child’s participation.

4.2 Setting
This study took place in quiet areas or rooms within each of the participants’ schools. These areas or rooms were all familiar to the participants because they were accustomed to receiving individualized instruction in these particular areas on a daily basis.

4.3 Materials
The written material used in this study consisted of a pamphlet that was designed by the researcher to explain the gender of nouns through using pictures and formulas. This pamphlet was used as part of a previous BA thesis in the School of Humanities at the University of Iceland in the study of Icelandic as a second language. Also 38 flashcards were used in this experiment to exercise the participants abilities in
identifying the gender of nouns (Appendix B). The nouns on these flashcards had regular endings and were not used on any of the versions of the written test.

### 4.4 Tools of measurement

Five comparable versions of a written test (Appendix C) were used to measure the participants skills in identifying the gender of Icelandic nouns with regular and irregular endings. These five versions of the test were designed with the purpose of measuring participants’ abilities to determine the gender of regular and irregular groups of nouns. Here the intention was to look at the possible need of students with SLI to learn the gender of individual words with irregular endings because it may be unrealistic to assume these students develop a natural feel for gender. At the top of each version of the test was a practice item to teach each participant how to answer the remaining questions. This practice item wasn’t calculated as part of the results. In each version of the test, the participant was to determine the gender of 20 nouns by circling either: hann, hún or það. This means he, she, or it in Icelandic. Five of these nouns on each test were masculine with two of these masculine nouns having strong declensions and two of the other nouns having weak declensions. The remaining masculine noun ended on the letters –ll. Seven of the nouns were feminine with three of these nouns having strong declensions, and the four remaining feminine nouns had weak declensions. Five of the nouns were neuter in gender. The nouns on all versions of the test were selected from material used in Icelandic grammar curriculum for elementary school children. The variety of endings of these nouns was specifically chosen to represent different types of declensions and genders in Icelandic. Also, all 5 versions of this test included the noun, stærðfræði/math which has an irregular ending to assess the effect of the teaching intervention on the student’s ability to learn its gender

### 4.5 Design

Multiple baseline design across participants was used to assess the teaching method’s effect on the skills of the participants in identifying the gender of nouns. If the method was effective, it would show an increase in the percentage of nouns with regular endings after the intervention began and a possible decrease in the number of nouns with irregular endings due to overgeneralization of the formula.
The teaching method began with the first participant after taking five baseline tests. This is illustrated in table 4. However, with the second participant, the teaching method began after the first participant had shown a measurable increase by identifying a minimum of 11 of 14 nouns with irregular endings correct in the same written test as used during baseline. Likewise, the teaching intervention with the third participant, began after the second participant’s skill level showed the same required measurable increase.

4.5.1 Independent variables

In this single subject design, the baseline was labeled A and the independent variables were labeled B1, B2 and C. The baseline measured the participants abilities to determine the gender of nouns before the intervention. Here in baseline it is looked at whether or not the participants had previously developed the ability to determine the gender of Icelandic nouns, as is most often found with native speakers.

Intervention B1 began with researcher showing the participants explanations about the tendencies of gender in Icelandic nouns through looking, reading and talking about explanatory pictures and symbols that describe the gender in nouns. The participants then exercised their abilities in identifying gender through an exercise using 38 flashcards. This exercise or presentation of learn units was designed to practice the categorization of nouns with regular endings until each participant was able to do so 90% correctly with the flashcards. The participants sorted these flashcards according to gender into piles labeled he/hann, she/hún and it/það. The nouns written on the 38 flashcards were not the same nouns found in the written tests. Only after the participants achieved 90% accuracy in these flashcard exercises, did they proceed onwards and take one version of the written test.

If the performance on the written test after intervention B1 remained in baseline range, then the participant was provided with more practice through flashcard exercises. If it was seen that the participant was still able to perform the
flashcard exercises with 90% accuracy, then the participant took another written test. If the performance on this written test still remained in the baseline range then intervention B2 was implemented.

Intervention B2 was specifically designed to address the issue of lack of generalization. It was only used when it was believed that the participant was having difficulties in generalizing the information from the flashcard exercises into written form. In this step, B1 was simply repeated conducting the categorizing exercises in both flashcard and written form. Here in B2, the written exercises worked with the same words that were written on the flashcards. These words were different from those used in the written tests used to assess the dependent variables. When the participants achieved 90% accuracy in both the written and flashcard exercises, then they took a written test. If the test showed improved performance, with at least 11 of 14 nouns with regular endings categorized correctly, then Intervention B3 was implemented. There were no specific requirements regarding the correct percentage of nouns with irregular endings. The focus was only on the correct percentage of nouns with regular endings. If these results did not show improvement, then the situation was reassessed.

In intervention C, the participant was shown an explanation about the irregular forms of nouns and was shown an example of one irregular noun, stærðfræði / math. The participant practiced identifying this new irregular noun with the same flashcard exercises from intervention B1. When the participant achieved 90% accuracy in the flashcard exercises, then the participant was tested again with a written test. In each version of the written test, the participants drew a circles around the gender of each noun, and the percentages of correct answers for both nouns with regular endings and nouns with irregular endings were calculated and recorded as the dependent variables in this study.

4.5.2 Dependent variables.
The dependent variables in this study were measured through numerous written tests that were taken in all phases of the study. In these tests the percentages of nouns correctly categorized according to gender with both regular and irregular endings were measured and recorded as dependent variables in all phases of the study. This included: baseline, interventions B1, B2 and C. The baseline tests measured the
participants abilities to determine the gender of both nouns with regular and irregular endings before the intervention. The written tests in B1 specifically measured the effect of learning a formula about gender. These skills were then practiced with flashcards exercises. The formula, in which was used in this part of the study, will be described in detail in chapter 4.6.3. Then in B2, the tests measured the participants abilities to identify gender in written form after receiving practice doing the same exercises that were formerly conducted in flashcard form in B1. This part of the study was only implemented when the measurements in B1 remained within baseline range. B2 was designed specifically to teach participants to generalize the information they learned in the flashcard exercises, and learn to apply this information in the form of a written test. In B3 the written tests measured the effect of a lesson that explained that the formula wasn’t always dependable. Here in this lesson the participants were taught how the noun stærðfræði math did not fit with this formula. This particular noun is feminine in gender and using the formula with this noun results in the wrong answer. This will be further described in the study in chapter 4.6.5.

4.6 Procedure

4.6.1 Selection of participants
The participants for this study were selected through contacting the director of special education in one of the schools in the Reykjavik area. This particular school is known for their expertise in using applied behavior analysis with students with autism. Also an advertisement was placed with the Icelandic Autism society seeking participants who clearly had difficulties in using gender correctly in their daily speech and also had a diagnosis of SLI.

4.6.2 Baseline
Baseline tests were administered to measure the participant’s ability to identify the gender of 20 Icelandic nouns. There were five versions of the test (Appendix C), and the order they were given in was randomly selected to prevent the order of the tests from confounding the results. Each version of the test began with a practice item which was set up to model how to answer the remaining questions. Therefore the participants received assistance in answering this first question. The remaining 20 questions were designed for the participant to answer on his or her own. There were a
minimum of three baseline tests administered to each participant, and the number of baseline tests varied depending on when the preceding participant showed improved performance by identifying at least 11 of 14 nouns with regular endings correctly during the intervention phase B1. Participants never took more than one baseline test per day, and the five versions of the test were chosen in a random order for each participant.

4.6.3 Intervention B1:

Formula + flashcard exercises with feedback & prompt fading.

During the first lesson of the intervention B1 participants studied and discussed a pamphlet with the researcher. This pamphlet consisted of the written material designed by the researcher that explained gender through the use of pictures and formulas. The formula is illustrated below and was used as a prompt to enable the participants to correctly determine the gender of the nouns:

The Formula for Gender
Masculine =(-ur, -i, -ll, -nn)
Feminine= (-a )
Neutur =(no specific endings)

After the introduction of the formula, each participant received practice through the use of 38 flashcards in identifying the gender of nouns. Here the participant categorized the flashcards according to gender and the letters they ended on. Each flashcard had one noun written on it (Appendix A). There were three category cards that had prompts and the corresponding gender written on them as shown in table 5. These category cards were on the table in front of the participant during these exercises to function as prompts in sorting the 38 flashcards into the appropriate piles.

Table 5. Prompts used during flashcard exercises

<table>
<thead>
<tr>
<th>category card 1</th>
<th>category card 2</th>
<th>category card 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>hann/ he</td>
<td>hún/ she</td>
<td>það/ it</td>
</tr>
<tr>
<td>-ur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-i</td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>-ll</td>
<td></td>
<td>Ø</td>
</tr>
<tr>
<td>-nn</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The 38 nouns that were written on the flashcards, all had various endings that corresponded to the genders as written on the formula. For example the noun, *bil* / car ends with the letters –ll and would be put next to the category card for the masculine gender and labeled *ham* / he. The word *stelpa* / girl ends on the letter –a and would be put next to the category for the feminine gender that is labeled *hún* / she. The word *hús* / house ends on the letter –s and would be categorized as neuter next to the category card labeled *það* / it. During this session each participant exercised his or her ability to categorize all of these flashcards in this manner. The goal at this stage was that the participant would learn to categorize the gender of nouns without needing any assistance from the researcher nor the visual support of the written prompt. The participant was continually praised and encouraged in this exercise. Any mistakes made were immediately corrected by the researcher by directing the participants attention to the category card with the appropriate prompt. If the participant didn’t show an interest in participating, then the exercise was attempted again the next day. The lessons lasted anywhere from 20 to 40 minutes depending on the situation at the school and the participant’s rate of learning. If the participant mastered this exercise quickly and could correctly categorize the flashcards without assistance from the researcher, then lesson could potentially be over in a shorter time. It was very important that the participant felt good about his or her skills and felt positive about the exercises. At the end of each days lessons the researcher offered the participant a sticker as a reward or another reward that was suggested by their instructor.

Next, the the same material was reviewed in the pamphlet as in the previous lesson(s). Then the same exercise of categorizing the same flashcards was repeated accept the flashcards were now reduced to be only 16 in number. This way the exercise was quicker and easier to repeat. The 16 flashcards were regularly switched so the participant worked with different nouns in each exercise. When the participant was able to categorize 90% correct with no assistance from the researcher then the process of prompt fading began as described later in this chapter.

However, if the participant didn’t show progress in the flashcard exercises after 2 days of lessons, then the exercise was shown to the participant’s instructor, and it was then discussed what could be done to induce learning. Various possibilities were then looked at, and the following issues were discussed: the type of reinforcement, the participant’s attention span, and whether or not the exercise and formula were explained in a suitable manner. In this case, the next step was to apply
the advice from the instructors and try changing the reinforcement schedule to a token reinforcement system with a fixed ratio schedule (Pierce & Cheney, 2004). Here, correct answers would be reinforced by writing the numbers one to ten on a piece of paper. Each time the participant answered correctly, a number would consecutively be crossed out. When the participant had achieved ten correct answers he or she would be rewarded with a sticker or other reinforcement as suggested by the participant’s instructor. After each exercise the number of correct answers needed for reinforcement was increased by two with each consecutive exercise, gradually thinning the reinforcement schedule. This process would continue until the participant could answer 20 questions correctly before receiving reinforcement. If this did not improve performance, then the procedure would be reconsidered again with the assistance of the participants’ instructors.

Prompt fading began when the participant could categorize 90% of the flashcards correctly without assistance from the researcher. At this step the researcher suggested to each participant that he or she try the exercise without the assistance of looking at the formula. When the participant accepted the challenge of doing the exercise without the formula in view, then the exercise was repeated without the formula. The three category cards used in the previous exercises now were changed and no longer contained prompts as shown in table 6. The English translations were not written on the flashcards.

<table>
<thead>
<tr>
<th>Table 6. The flashcard exercise with no prompts</th>
</tr>
</thead>
<tbody>
<tr>
<td>category card 1</td>
</tr>
<tr>
<td>hann/ he</td>
</tr>
</tbody>
</table>

The exercise was then repeated without the prompt. However, if the participant had difficulties with categorizing after the prompt was removed, then it was reinstated. When the participant achieved 90% accuracy without the use of prompts or assistance from the researcher, then a written test was given to measure the effect that the formula had on the participant’s ability to identify gender.

If the participant’s test performance showed that the participant was able to successfully use the formula in the written test to determine gender of regular nouns, then the second part of the study began. In this case, there was no need for
intervention B2 because the participant generalized his or her knowledge into another mode as shown by the written test. However, in the case that the participant’s test results were still in the baseline range, then the flashcard exercises were repeated in the next lesson to ensure that the participant was able to perform this exercise with 90% accuracy. If so, then the participant was tested again to compare or confirm the previous results. If the flashcard exercises were not performed at 90% accuracy, then more flashcard exercises would be conducted until 90% accuracy was achieved. Then retesting would occur. If the test performance showed learning had occurred with at least 11 of 14 nouns with regular endings correct, then intervention B3 was implemented. However, if the results still remained in baseline range, then intervention B2 was implemented.

4.6.4. Intervention B2:

*Formula + written exercise with feedback and prompt fading*

Intervention B2 was only used if the participant didn’t respond to B1. In this case the same flashcard exercises were repeated in written form and were set up to resemble the written test. Thus, common stimuli were programmed to enhance generalization (Stokes & Baer, 1977). The written exercises differed from the test only in that they used the nouns from the flashcard exercises. These nouns did not appear on any of the versions of the test. The exercises were now conducted in written form where the participant categorized nouns according to gender by circling *hann* he, *hún* she or *það* it. The first written exercises contained prompts. The prompts consisted of the formula which was written under each question in the exercise. The prompts were later removed when the participant could perform the written exercise with 90% accuracy. After the prompt fading, the same process of categorizing the nouns in written form was then repeated without prompts. The flashcard exercises were also continued to maintain this skill. When the participant reached 90% accuracy in both the written exercises without prompts and the flashcard exercises, then the participant was tested again. In this way the participant was taught to perform the flashcard exercises in written form, generalizing his or her skills which were previously learned through flashcard exercises.
4.6.5. Intervention C:  

*Visual prompt for exception to formula+ flashcard exercise*

The first step in Intervention B3 was to read an explanation about irregular endings of nouns in the pamphlet. The goal in this lesson was to explain that the formula pertained only to nouns with regular endings. The information read in the pamphlet compared nouns to a herd of sheep with a picture of a group of sheep where the majority of the sheep are white. However, there is a black sheep in the group. Sheep have a tendency to be white in color, but it isn’t 100% true to say that all sheep are white. Irregular nouns were then compared to black sheep, and the Icelandic noun, *stærðfræði* which means math in Icelandic. This irregular noun was printed on a flashcard almost exactly as was used in the previous flashcard exercises. The only difference was that this flashcard was marked with a black dot. The noun, *stærðfræði*, or math ends with the letter –i in Icelandic which according to the formula for regular Icelandic nouns should be a masculine noun. However, this noun is feminine. It is different like a black sheep that differs from all the white sheep in the herd. The participant was told that the black dot on the flashcard, marked *stærðfræði* math, was a symbol for being different like a black sheep. The participant was told that he or she will have to remember that this particular word was different and didn’t follow the formula.

The participant was then given the same exercise of categorizing nouns just as was practiced previously in B1 with 16 flashcards. Accept now the flashcard *stærðfræði* math was added to this exercise. This particular flashcard was marked with a black dot to symbolize that it was an irregular word and didn’t fit in with the formula. This exercise was conducted with 17 flashcards. However, one of the participants had issues with attention deficit disorder. Therefore, it was decided to reduce the number of flashcards to ten in this case.

When each participant saw the black dot on the flashcard, his or her new task was then to remember how the noun, *stærðfræði* math was different from the other nouns. This exercise was repeated until the participant was able to determine a minimum of 90% correct of the regular nouns plus remember correctly that the gender of the noun, *stærðfræði* math was feminine. The participant then took a written test at the end of the lesson to determine whether he or she was able to apply his or her
knowledge about the word stærðfræði/math in written form along with using the formula. The noun stærðfræði was in all versions of the test.

Then, on the following day a final test was given without any lesson or exercises. If the participant failed to generalize the information about the noun stærðfræði/math in the form of the written test, then a short exercise with ten flashcards was conducted to look at whether or not the participant was able to use his or her knowledge to determine the gender of the noun stærðfræði/math in the form of a flashcard exercise. The flashcard with the word stærðfræði on it was still marked with a black dot.

The participants’ instructors were then shown how the irregular word stærðfræði/math was explained to the participants, and information about how to continue the process of learning the gender of more nouns with irregular endings was explained to each instructor. This marked the end of participation in the study for that particular participant.

4.7 Data Analysis
The percentages of correct answers for nouns with regular and irregular endings were calculated for each test by the researcher. To assure reliability of the data, another impartial individual independently calculated the percentage of correct answers on 100% of the tests. If any discrepancies were found, they were reviewed and rechecked to assure correct results. The data was then recorded in a data sheet in Excel for analysis. It was plotted into a line-graph that illustrated the level and trend of each participant’s performance and the effects of each intervention. An additional chart was also set up to look at the effect of the teaching method on categorization of the word stærðfræði/math. In addition three bar graphs were designed. One bar graph looked at the number of lessons for each participant in the three parts of the intervention: B1, B2 and C. Another bar graph looked at the percent of correct answers for each gender in the participants’ baseline performance to explore any possible patterns in performance in categorizing the gender of nouns. The third bar graph also focused on the participants’ previous grammatical abilities in baseline to answer correctly for various types of nouns and declensions. This was illustrated in a bar graph that looked at participants’ performance in categorizing nouns by the letters that the nouns of the correct answers in baseline tests ended with.
5 Results

All the participants in this study responded to the interventions, but the response varied somewhat between the 3 participants. The overall results are presented in figure 1. The performance of participant 1 showed an increase in the percentage of correct answers for nouns with regular endings after the introduction of B1. However, this participant’s performance also decreased in the percentage of correct answers regarding nouns with irregular endings. Participant 2 had a very similar response with an increase in nouns with regular endings and a decrease in nouns with irregular endings that also occurred immediately after the introduction of B1. In contrast, the performance of participant 3 remained in the baseline range after the introduction of B1. It is not until the introduction of B2 that participant 3 performance changed. Here the performance showed the same pattern in B2, as shown by the other 2 participants in intervention B1.

There was a noticeable pattern of similarity in the response of participants 1 and 2 where the correct percentage of regular nouns increased after the intervention and the percentage of correct irregular nouns decreased. However, it wasn’t until after the written exercises were introduced in intervention B2, that the data of participant 3 also showed this same noticeable change in pattern where there was an increase in the percentage of correct nouns with regular endings and a decrease in the percentage of nouns with irregular endings.
Figure 1.

Test results: Participants percentage of correct categorization of the gender of nouns during baseline A, B1, B2 & B3

(A) Baseline: Categorizing gender before the intervention
(B1) Practice categorizing with flashcards and prompts in using the formula
(B2) Practice in use of the formula with written exercises and prompts
(B3) Learning about exceptions to the formula
Below in table 7 are the range and means of participants baseline performance in categorizing the gender of nouns with regular and irregular endings. Participants performance during baseline tests showed an overall range of 23-50% correct categorization of the gender of nouns with regular endings. The nouns with irregular endings had a larger range of 17-67% in comparison to nouns with regular endings which had a range of 23-50% as shown in table 7. The results of the mean score of nouns with regular endings were vary similar with all participants. However the nouns with irregular endings had a larger range in mean score.

Table 7. The range and mean of the baseline tests

<table>
<thead>
<tr>
<th>Participant</th>
<th>range of nouns with regular endings</th>
<th>range of nouns with irregular endings</th>
<th>mean score for nouns with regular endings</th>
<th>mean score for nouns with irregular endings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>31-50%</td>
<td>17-50%</td>
<td>40,6%</td>
<td>35,8%</td>
</tr>
<tr>
<td>Participant 2</td>
<td>23-50%</td>
<td>50-67%</td>
<td>36,25%</td>
<td>56,0%</td>
</tr>
<tr>
<td>Participant 3</td>
<td>36-50%</td>
<td>17-33%</td>
<td>43,4%</td>
<td>26,0%</td>
</tr>
</tbody>
</table>

Table 8 displays the range and means of the participants performance in categorizing nouns with regular endings and irregular endings after the intervention. The percentage of nouns with regular endings increased after the intervention, and the percentage of nouns with irregular endings decreased after the intervention. However, participant 3’s data remained in the baseline range until after intervention B2 as shown in table 8

Table 8. The range of the tests scores after the intervention

<table>
<thead>
<tr>
<th>Participant</th>
<th>range of regular endings</th>
<th>range of irregular endings</th>
<th>mean score for nouns with regular endings</th>
<th>mean score for nouns with irregular endings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>78-93%</td>
<td>0-33%</td>
<td>87,7%</td>
<td>15,7%</td>
</tr>
<tr>
<td><em>intervention B1 &amp; B3</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 2</td>
<td>100-100%</td>
<td>0-33%</td>
<td>100%</td>
<td>15,7%</td>
</tr>
<tr>
<td><em>intervention B1&amp; B3</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 3</td>
<td>33-50%</td>
<td>33-36%</td>
<td>41,5%</td>
<td>34,5%</td>
</tr>
<tr>
<td><em>intervention B1</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant 3</td>
<td>93-100%</td>
<td>0-17%</td>
<td>97,7%</td>
<td>5,7%</td>
</tr>
<tr>
<td><em>Intervention B2 &amp; B3</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
After completing the baseline tests, the 3 participants were retested when they achieved 90% accuracy in the flashcard exercises. The number of training sessions in each part of the interventions varied between participants as shown in figure 2. Participant 2 achieved 90% accuracy without prompts in the flashcard exercises after three training sessions in B1, while participant 1 achieved this same level of accuracy with 5 training sessions. Participant 3 achieved this after 6 training sessions. However, this participant appeared unable to apply the formula in the written exercises. Therefore intervention B2 was introduced to teach the participant to apply this information in written form. In turn, participant 3 achieved 90% accuracy in the usage of the formula in written exercises after 6 more training sessions. Then all participants completed part B3 in 2 training sessions.

![Figure 2.](image)

The number of training sessions used to reach 90% accuracy in intervention B1, B2 and B3.

Figure 3 displays the data showing the percentage of correct answers for different types of endings and gender for participants 2 and 3. This data has the purpose of exploring whether the participants showed patterns or differences in categorizing various genders of endings of nouns. Data from participant 1 was excluded from figure 3 because he used a system for answering the baseline test. This participant answered all versions of the baseline test as follows: hann/ he, hún/ she, pað/ it. Therefore this data certainly does not measure this participant’s knowledge for the
gender of nouns. Therefore, it was excluded from this analysis. The results from the baseline measurements for participants 2 and 3 are illustrated below in figure 3. Here it is seen that the percentage of correct answers ranges from 17%-49%.

Figure 3.
Percentage of correct categorization of nouns by endings during baseline

In figure 4, the results from the baseline measurements showed that participants 2 and 3 answered most often correctly when the nouns were neuter in gender as in comparison to the masculine and feminine forms.

Figure 4.
The percentage of correct answers according to gender in baseline tests
None of the participants answered consistently correct for the noun stærðfræði/math in the baseline tests. Table 9 shows how the interventions progressively affected their answers. All the participants answered incorrectly for the word stærðfræði/math in intervention B1. When intervention B3 was introduced both participants 1 and 2 answered correctly. In the test that immediately followed in the next session (without preparatory exercises) only participant 2 answered correctly. Participant 3 answered incorrectly in all written tests.

### Table 9. The participants categorization of the word stærðfræði/math

<table>
<thead>
<tr>
<th>Participants</th>
<th>B1</th>
<th>B3 first test</th>
<th>B3 second test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Preparatory exercises</td>
<td>No preparatory exercises</td>
</tr>
<tr>
<td>1</td>
<td>masculine</td>
<td>feminine</td>
<td>correct</td>
</tr>
<tr>
<td>2</td>
<td>masculine</td>
<td>feminine</td>
<td>correct</td>
</tr>
<tr>
<td>3</td>
<td>masculine</td>
<td>masculine</td>
<td>masculine</td>
</tr>
</tbody>
</table>

6 Discussion

6.1 Possible confounding factors and limitations in this study

It is important to look at various factors and limitations in this study that are good to be aware of when looking at the results and considering the effect of this teaching method.

6.1.1 The length of intervention B3

In intervention B3 participants were taught that the formula wasn’t dependable and they were shown through the example of the word, stærðfræði/math, an example of how this occurs. However, it could have been beneficial for this study to have been longer and presented more nouns with irregular endings to better illustrate whether nouns with irregular endings could possibly be taught to individuals with SLI. More words could have been individually introduced after the word stærðfræði/math had
been mastered. Perhaps an even longer study could have been most informative in this matter, exploring a bottoms up teaching technique for Icelandic grammar as described in the book, Íslen ska fyrir útlendinga (1998), by Ásta Svavarsdóttir and Margrét Jónsdóttir. Here students could have been taught the five regular declensions in all forms of the Icelandic language as described by Ásta Svavarsdóttir (1993) and followed by groups of irregular declensions. Studying the effects of such a lengthy teaching procedure could potentially show different results regarding nouns with irregular endings.

6.1.2 Version 4 of the test

It was discovered that in one of the five tests that the word eyra/ear had been incorrectly categorized as a feminine noun when designing the tests. Thus in version 4 of the test, there were 7 nouns that had irregular endings instead of 6, as found in the other tests. Thus, test #4 also had 13 nouns with regular endings instead of 14. This caused one correct answer regarding nouns with irregular endings on test #4 to be worth 14% instead of 17%. In regards to nouns with regular endings on test #4, each question was worth 7% instead of 8% as in the other tests. This mistake might have had some effect on results regarding irregular endings but little effect on the overall results regarding nouns with regular endings. This also, was not very apparent in the results after the intervention was introduced because the participants over generalized the formula on the irregular nouns and scored very low in percentage.

6.1.3 Interruptions in the study

Another important issue was that this study took more time than anticipated due to various unexpected issues. It started out being affected by the flu season which was why the first measurements in the multi-baseline design did not all occur on the same day. There were also other occurrences which caused school to be canceled or the participants to be absent. These holidays or interruptions were sometimes several days long and by far most numerous for participant 3. These interruptions may have affected the participant’s rate of learning.

6.2. Baseline tests and grammatical abilities

This study looked at using a teaching method designed for second language learners and applied it to three Icelandic elementary school children with SLI. This made it
important to look at what qualities these children with SLI might have in common with second language learners. Swedish research has suggested that individuals with SLI and second language learners have common traits when looking at grammatical abilities (Håkansson, 2001). The participants in this study showed less than 50% accuracy in determining the gender of all the various types of nouns which indicates that their ability to categorize gender is only a bit above chance level. These random results could be said to be approximately what would be expected from individuals that have little experience with the language and simply guess randomly about the gender of Icelandic nouns. This could potentially point to such similarities between the participants in this study and second language learners.

When looking at these results it is important to consider that some words might have been easier or more difficult than others for the participants due to the pictures used with them. For example, on test 5 both participants 2 and 3 answered correctly for the words *refur*/fox, *kinn*/cheek and wrong for the word *kvef*/sinus-cold. This might be due to the pictures used with these nouns being especially feminine or masculine in appearance and the pictures influenced how the participants answered.

6.3 Participant 3 and the importance of generalization in learning
Previous research has emphasized the importance of teaching generalization of language skills to children with autism and SLI (McHugh & Leed, 2008). In addition, it has also been shown in previous studies that techniques structured by applied behavioral analysis can be successfully used to teach children with autism new skills such as rule-governed behavior (Tarbox, et al. 2011). Tarbox et al. showed that newly learned skills regarding rule governed behavior can be generalized to other environments. This was also the case in this study with participant 3 who was diagnosed with SLI. Here this participant learned a new rule about grammar. When this skill did not generalize into the form of a written test, then behavioral analysis was successfully applied through programming common stimuli (Stokes & Baer, 1977) to enhance generalization of this new knowledge to the form of a written test. This study could be said to be a reminder about the importance of teaching generalization to children with special needs as previous research has shown (McHugh & Reed, 2008).
6.4 The word stærðfræði/ math

The word stærðfræði/ math is a noun with an irregular ending that was in all versions of the written test to assess how the teaching method affected participants’ categorization of this irregular noun. None of the participants consistently categorized this noun correctly in the baseline tests. Then after intervention B3 only participants 1 and 2 were able to apply the lesson and answer the written test correctly. Then, on the following day the participants were tested without reviewing the previous days lessons, only participant 2 was successful in recalling the correct gender for this irregular noun. This showed evidence for a need for more comprehensive instruction to teach the gender of nouns with irregular endings.

Participant 3 again had issues with generalization of learned skills from this flashcard exercise to the test in written form. Despite participant 3’s success in categorizing the word stærðfræði/ math correctly in the flashcard exercises, he was unable to correctly categorize the gender of this particular word in the written test. This applied both directly after the lesson and also on the following day. However, after participant 3 took the final test in the study, a flashcard exercise was conducted. Here participant 3 correctly identified the gender of the word stærðfræði/ math, which may be an indication that information from the proceeding day’s lesson was recalled when presented in flashcard form.

6.5 Discussing the results

All three participants increased in percentage of correct categorization of the gender of nouns with regular endings. This increase was seen with participants 1 and 2 after intervention B1, and participant 3 showed a similar increase after intervention B2. This increase in correct categorization of regular nouns was caused by the participants’ use of the formula. However, a decrease in correct categorization of irregular nouns was also observed. This was most likely due to over-use of the formula, applying it to both nouns with regular endings and nouns with irregular endings. The lack of response to intervention B1 of participant 3 was believed to have been caused by difficulties with generalizing the information from the flashcard exercises to the form of a written exercise. This issue in language learning of generalizing learned knowledge to other forms and environments is a known problematic issue for children with autism as was mentioned by McHugh and Reed (2008). It is obviously a very important issue to address when designing grammar
teaching techniques for children with special needs. In this study, it was successfully addressed by programming common stimuli (Stokes & Baer, 1977), i.e. the written part of the exercises.

When looking at the baseline and the bar graph in figure 3, the data indicates that the participants originally had little more than random abilities in identifying the gender of nouns. These results could potentially be compared to second language learners as described in the research of Håkansson (2001). Håkansson found similarities in the grammar capabilities of children with SLI and second language learners. The results after the intervention for regular nouns were similar for all three of the participants. They all eventually gained the ability to categorize gender in a large percentage of nouns. However, the percentage of correct answers for nouns with irregular endings went down which was likely due to overgeneralization of the formula.

One could perhaps question whether it was beneficial to use such a formula that is known to be incomplete and caused the participants to answer incorrectly for nouns with irregular endings. However, if one looks at the research of Ásta Svavarsdóttir, the total percentage of Icelandic nouns that can be calculated correctly through the use of this formula is 59.22% (Ásta Svavarsdóttir, 1993). This formula is used for teaching second language learners at the University of Iceland because it gives them a basis from which to start the process of building a structure for Icelandic grammar. It could be argued that an incomplete method like this is much better than randomly guessing about gender in an unsystematic manner. However, it also shows a need for continuing to teach the gender of nouns with irregular endings. This can potentially be developed through introducing more individual irregular nouns and gradually learning about their genders and their declensions.

6.6 Conclusion
This current study looked at whether it is possible to teach elementary school children with autism and SLI to identify the gender of nouns through applying the principles of applied behavioral analysis to a lesson that was designed to teach second language learners. It is very important to emphasize that this is a very small study with only 3 participants. The participants in this study should by no means be thought of as representative of all people with SLI nor representative of the typical language skills.
of Icelandic children with SLI. However, the repeated measurements show that the categorization of gender of nouns with regular endings improved after intervention B1 or B2 for all participants. These findings suggest beneficial effects of the teaching method but further research is needed to show whether these results will be replicated.

The results showed learning in all three of the participants because they all eventually mastered using the formula in both the flashcard and the written exercises. Plus they all showed potential for learning irregular words when introduced to the word stærðfræði math in the flashcard exercises. This process of learning irregular words is often a more difficult task for second language learners than learning the regular forms as described by María Anna Garðarsdóttir and Sigríður Dagný Þorvaldsdóttir (2012). Because individuals with SLI seem to lack in grammatical abilities as do second language learners, this methodological, step by step process could possibly offer help for these individuals to gradually build an understanding for the structure of the Icelandic language. However, this study can not make any claims about this method being more suitable than any other traditional teaching methods because it was not a comparative study.

This study showed evidence that language structure and grammatical principles can potentially be taught through applying the principles of behavioral analysis as according to Greer and Ross (2008). Teaching grammatical rules through behavior analysis may be a beneficial solution for children with autism and SLI in a similar way as shown in other studies that have successfully used behavior analysis to teach communication (Vismara, & Rogers, 2010) and other types of behavior such as rule-governed behavior to children with autism (Tarbox, et al. 2011). Also it showed evidence for a need to teach generalization of newly learned skills into other environments.

Using a method that was individualized as is found in behavioral analysis was important for participants in this study. All 3 participants in this study learned at different rates and responded slightly different to teaching techniques. If these 3 participants had been taught in a group setting, it would have been difficult to address their individual needs. Obviously, more research about Icelandic teaching methods and SLI are needed before any larger scale conclusions can be made. If Hákansson (2001) is correct and SLI manifests differently in different languages, then it is clear that research about how SLI manifests in Icelandic will be important. It will also be
necessary to develop Icelandic teaching methods that address the findings about SLI and autism in Iceland.

The lack of research and information regarding grammatical abilities in autism and SLI is overwhelming, especially when previous research shows communication and deficits in grammar ability is commonplace in so many children with a diagnosis on the autism spectrum (Tager-Flusber & Joseph 2003; Eigsti, Bennetto & Dadlani, 2006). There is a definite need for answers, and a need for solutions in how to best help these children. Obviously, children with a diagnosis on the autism spectrum and children with SLI in all nations have the right to a suitable education (United Nations Convention on the rights of the child, 1989).
References


Lög um framhaldsskóla nr. 2008/92.

Lög um grunnskóla nr. 2008/91.


Reglugerð um nemendur með sérþarfir í grunnskóla nr. 585/2010.


Appendix A. Parental permission letter

Kæru foreldrar/forráðamenn

Mosfellsbæ febrúar 2013

Ég heiti Karen Kristín Ralston og er BA nemi í Þroskaþjálfun við Háskóla Íslands. Ég er að fara að vinna að BA lokaverkefní mínú undir handleiðslu dr. Önnu-Lindar Pétursdóttur dósents á menntavisindasviði HÍ. Markmiðið með lokaverkefninu mínu er að rannsaka nýja þjálfunaraðferð í málfæði fyrir börn sem greind eru með málhömlun (og einhverfu). Þjálfunaraðferðin byggir á kennslaðferð frá Íslensku- og menningardeild Háskóla Íslands.

Tilgangur þessa bréfs er að óska eftir samþykki fyrir þátttöku barnsins ykkar í rannsókninni.

Þessi rannsókn fer fram í nokkrum kennsla- eða þjálfunartímum sem eru u.þ.b. 10-40 mínútur að lengd. Í fyrstu skiptin fer fram mat en síðan fer fram einstaklingsmiðuð kennsla í nokkur skipti. Unnið verður einstaklingslega með hverjum þátttakanda í rólugu umhverfi með því að skoða myndir og að ræða meginreglur er varða kyn nafnorða í Íslensku. Þátttakendurnir fá þjálfun í að læra slíkar meginreglur með því að flokka spjöld, að lesa, skoða og ræða á þurrungnafnorðar meginreglur um kyn nafnorða í Íslensku. Áætlað er að kennslunni ljúki þegar hver þátttakandi hefur náð góðri fé Har í að greina kyn nafnorða. Rannsóknin hefur verið tilkynnt til Persónuverndar og fengist hefur samþykki fyrir rannsókninni þar og hjá Skóla- og frístundasviði Reykjavíkur/Fræðsluskiðstofu Garðabæjar

Allar upplýsingar sem safnað verður um þátttakendur verða meðhöndlæðaðar samtímt reglum um trúnað og nafnleynd og farið að Íslenskum lögum varðandi persónuvernd, vinnslu og eyðingu frumgagna. Rannsóknargögn verða varðveitt á óruggum stað og gögnunum eytt að rannsókn lokinni. Fyllsta trúnaðar er heitið við þátttakendur rannsóknarinnar. Þegar niðurstöður rannsóknar verða kynntar verður þess gætt að þar verði ekki rekjanlegur til einstakla þátttakenda. Þátttakendum er heimilt að hefna eða hættu við þátttöku í þessari rannsókn hvenær sem er og án nokkurra skilyrða.

Ef einhverjar spurningar vakna varðandi rannsóknina má hafa samband því okkur

Karen Kristín Ralston, netfang: kkr3@hi.is sími 699-7086
Anna-Lind Pétursdóttir, netfang: annalind@hi.is sími 694-5335

Staður______________________________ Dagsetning___________
Ég, ____________________________ (undirskrift foreldris/forráðamanns)
samþykki hér með að barnið mitt ___________________________ taki þátt í rannsókn Karenar
Appendix B. Nouns used on flashcards

<table>
<thead>
<tr>
<th>Masculine nouns</th>
<th>Feminine nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>hestur</td>
<td>jökull</td>
</tr>
<tr>
<td>hundur</td>
<td>kjóll</td>
</tr>
<tr>
<td>vaskur</td>
<td>bjöll</td>
</tr>
<tr>
<td>fiskur</td>
<td>gaffall</td>
</tr>
<tr>
<td>blýantur</td>
<td>kjóll</td>
</tr>
<tr>
<td>pottur</td>
<td>lykill</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neuter nouns</th>
<th>Feminine nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>borð</td>
<td>úlpa</td>
</tr>
<tr>
<td>sjónvarp</td>
<td>taska</td>
</tr>
<tr>
<td>blað</td>
<td>kisa</td>
</tr>
<tr>
<td>lamb</td>
<td>appelsína</td>
</tr>
<tr>
<td>hús</td>
<td>stelpa</td>
</tr>
<tr>
<td>blóm</td>
<td>sápa</td>
</tr>
<tr>
<td>hjól</td>
<td>byssa</td>
</tr>
<tr>
<td>nef</td>
<td>kaka</td>
</tr>
<tr>
<td>ljós</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C. 5 versions of the test

Test 1

**Teg 1. Próf#**  **Pátttakandi #**.

**Dags:** / 2013 **Grunnlína / Eftir inngrip.**

**bíll**

hann  hún  það

---

**1. varalitur**

hann  hún  það

---

**2. umslag**

hann  hún  það
3. banani

hann hún það

4. skóli

hann hún það

5. skjaldbaka

hann hún það

6. ketill

hann hún það
7. kjúklingur

hann  hún  það

8. sinnep

hann  hún  það

9. sítróna

hann  hún  það

10. stærðfræði

1+1=2

hann  hún  það
11. skel

hann  hún  það

12. ljósapería

hann  hún  það

13. hilla

hann  hún  það

14. flugvél

hann  hún  það

15. hönd

hann  hún  það
16. smjör

17. epli

18. gras

19. bein
20. ljón

hann  hún  það
Teg 2. Próf#                  Péáttakandi #                   .

Dags: /    2013     Grunnlína / Eftir inngrip.

________________________________________________________________________

hestur

hann     hún     það

________________________________________________________________________

1. teppi

hann     hún     það

________________________________________________________________________

2. skógur

hann     hún     það
3. net
hann hún það

4. risaeðla
hann hún það

5. vettlingur
hann hún það

6. gulróð
hann hún það

7. kirkja
hann hún það
8. rúm
hann  hún  það

9. stigi
hann  hún  það

10. slanga
hann  hún  það

11. sporjárn
hann  hún  það
12. mark
hann        hún        það

13. geit
hann        hún        það

14. regnhlíf
hann        hún        það

15. kastali
hann        hún        það
16. snigill

hann       hún       það

17. ber

hann       hún       það

18. stærðfræði

1+1=2

hann       hún       það
19.tré

hann hún það

20. gardína

hann hún það
Test 3

Teg 3. Próf#  Pátttakandi #

Dags: / 2013 Grunnlína / Eftir inngrip.

kaka

hann  hún  það

1. kvöld

hann  hún  það

2. tölva

hann  hún  það
3. dýragarður

4. nál

5. sundlaug

6. köngull
7. gata

hann    hún    það

8. skip

hann    hún    það

9. auga

hann    hún    það

10. stjarna

hann    hún    það

11. gluggi

hann    hún    það
12. höfuð

hann       hún       það

13. stærðfræði

1+1=2

hann       hún       það

14. svanur

hann       hún       það

15. gler

hann       hún       það

16. veski

hann       hún       það
17. mús

hann  hún  það

18. hálsmen

hann  hún  það

19. fáni

hann  hún  það

20. belja

hann  hún  það
Test 4

**Teg 4. Próf#**  
**Pátttakandi #**

**Dags: / 2013**  
**Grunnlína / Eftir inngrip.**

**bolti**

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<thead>
<tr>
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<th>það</th>
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1. **golf**

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2. **kanna**

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<th>það</th>
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3. **enni**

<table>
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<tr>
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<th>hún</th>
<th>það</th>
</tr>
</thead>
</table>
4. sokkur

hann  hún  það

5. eyra

hann  hún  það

6. ský

hann  hún  það

7. dúkka

hann  hún  það
8. tönn

9. krít

10. stytta

11. bátur
12. hani

13. stærðfræði

1+1=2

14. reiknivél

15. hné

16. engill
17. þak

hann    hún    það

18. kál

hann    hún    það

19. hárbursti

hann    hún    það

20. veður

hann    hún    það
Test 5

**Teg 5. Próf#**  **Pátttakandi #**

**Dags:**  /  **2013**  **Grunnlína / Eftir inngrip.**

**húfa**

|hann | hún | það|

**1. afmæli**

|hann | hún | það|

**2. rúta**

|hann | hún | það|
3. garn

hann hún það

4. kvef

hann hún það

5. póstur

hann hún það

6. tunga

hann hún það
7. spegill

[Image of a mirror]

hann  hún  það

8. skíði

[Image of a skier]

hann  hún  það

9. bréf

[Image of a letter]

hann  hún  það

10. flauta

[Image of a pipe]

hann  hún  það
11. máni

hann  hún  það

12. rigning

hann  hún  það

13. refur

hann  hún  það

14. dagatal

hann  hún  það

15. kassi

hann  hún  það

16. beinagreind
17. stæröfræði

1+1=2

18. ryksuga

19. málverk
20. kinn

hann   hún   það