Ritrýnd grein birt 7. september 2018

Exchanging curriculum ideas for 21st century education:

Australian 'technologies' and Icelandic 'innovation education'

Svanborg R. Jónsdóttir

► Abstract ► Um höfund ► About the author ► Heimildir

Creative thinking and creative action are considered important competencies in the world today. In Iceland, creativity was presented as one of six fundamental issues in education in 2011. One approach to enhance creative thinking and creative action competencies has been to use the methods of innovation and entrepreneurial education, which have been developing in Iceland and other countries over the last 20 years. Australia has developed a curricular area called 'Technologies' which is in many ways similar to parts of innovation education in Iceland. In this article I present my research on how teachers in one primary school in Brisbane, Australia, implement elements of innovation education in their students' school work and how they categorize such education. The research question I seek to answer is: How does innovation education, as categorized in Iceland, emerge in school practice in one Australian primary school?

This paper describes a qualitative case study of Northgate State School in Brisbane, Australia. Field visits and seven interviews were carried out in September 2014. Before the interviews the author gave a presentation for the teachers about innovation education (IE) as it is practiced in Iceland. The findings show that many elements of IE are present in the practice of the school. The national curriculum, state curriculum (Curriculum to classroom: C2C), school culture, school principal, and professional theories of the teachers all influence how and where IE emerges in the curriculum in practice.

Key words: Innovation education, creativity, creative work, curriculum, Technologies education

Introduction

All over the world educational researchers and practitioners are acknowledging the importance of creativity, creative thinking, and creative action. Leaders in both the public and private sectors are increasingly emphasizing the role of creativity in increasing prosperity and tackling the complex human and natural problems of the 21st century.

Innovation and entrepreneurial education (IEE) has been developing in Iceland and other places in the world over the last 20 years or so. Creative thinking and creative action are considered important competencies in modern societies, and are increasingly seen as essential to active participation – whether in the workplace or socially – and to meeting the demands of sustaina-

bility in a constructive way. Such competencies have been enhanced through the methods of innovation and entrepreneurial education, among others (Jónsdóttir & Gunnarsdóttir, 2017).

This kind of learning is commonly called 'enterprise education', but in Iceland innovation education (IE) is divided into enterprise education during compulsory school years (6-16 years old) and entrepreneurial education for the upper-secondary level (16-20 years old), although 'innovation and entrepreneurial education' is often used regardless of school level (Jónsdóttir & Macdonald, 2013). Similar areas of teaching and learning are categorised under different educational concepts such as enterprise education, technology education, or design and technology. Australian educators have developed a curricular area called Technologies which is in many ways similar to parts of IE. In this article I present my research on how teachers in one primary school in Brisbane, Australia implement elements of IE in their students' school work and how they categorize such education. The research question I seek to answer is: How does innovation education as categorized in Iceland emerge in school practice in one Australian primary school?

I had the opportunity to visit Northgate State School (NSS) in September 2014. I am a specialist in what is in Iceland termed Innovation Education (IE) or Innovation and Entrepreneurial Education (IEE). The purpose of my visit was to give a lecture about Innovation Education to staff at Northgate SS and to find out where elements of IE are located in the practice of NSS and thus to exchange and discuss curriculum ideas and practice in both countries. I visited the school for two days and observed teaching (mainly Prep A, the youngest students) and conducted interviews with teachers about how they worked with IE within the school.

This paper describes a qualitative case study of one school. Field visits and seven interviews were conducted in September 2014. I hope this research sheds some light on how IE is practised and what factors influence the development of this kind of education.

Educational curricula in the 21st century

Curricula in different places in the world in recent decades have been taking into account the new conditions and demands of modern times, with curriculum makers trying to foresee what kind of education will be needed in the near future. The Icelandic official curriculum for compulsory education in 2011 was one such effort to present a modern and future-looking curriculum. In this section I present IEE as it has developed in Iceland in parallel with similar areas of learning in other countries, with close attention to the Australian curriculum. Next, I present some curriculum concepts that can help to analyse and understand the findings. I end the section by presenting the research goal and research question.

Innnovation and entrepreneurial education

IEE has been developing as a learning area or school subject since around 1990 (Gunnarsdóttir, 2013; Jónsdóttir, 2007b; Jónsdóttir & Gunnarsdóttir, 2017; Jónsdóttir, Page, Thorsteinsson, & Nicolescu, 2008;). The subject 'innovation education' was first presented in the curriculum for Icelandic compulsory schools in 1999, and has appeared in the upper-secondary level curricula as 'entrepreneurship education' since around that time. In Iceland innovation education has garnered more attention at compulsory level, and entrepreneurship or entrepreneurial education at upper secondary level (Jónsdóttir, 2007a; Jónsdóttir, 2013; Jónsdóttir, Þórólfsson, Karlsdóttir, & Finnbogason, 2014). In IE the main aim is to improve students´ social responsibility through practising the fundamental elements of the subject (Thorsteinsson, 2012). IE often requires a redefinition of the teachers´ participation as their role is not to judge student ideas but rather to support them and help find technical solutions to the problems and functionality of the students´ designs (Thorsteinsson, 2013). IEE is about enhancing students' creative thinking and competence by engaging them in finding and analysing needs and practising finding solutions to meet

them (Gunnarsdóttir, 2013; Jónsdóttir, 2013; Jónsdóttir & Gunnarsdóttir, 2017; Thorsteinsson, 2013). The ways in which inventors think and work are taught to students, who practise those approaches (Jónsdóttir, 2007b). There is also an emphasis on increasing student agency, as they gain opportunities to produce or adapt their ideas to their local community. The objective of IEE is to cultivate innovation and entrepreneurial action (Jónsdóttir, 2011).

Entrepreneurship education

The area of learning, or school subject, enterpreneurship education has been developing elsewhere as well, and can be seen in the educational policies of different nations and international organisations. Entrepreneurship education is one of the responses in education that reject traditional ideas about schools, where officially approved knowledge is transmitted from texts and teachers to learners (Jónsdóttir, Þórólfsson, Finnbogason & Karlsdóttir, 2013). Entrepreneurial education, enterprise education and entrepreneurship education are all related concepts and can be seen as education that enhances entrepreneurship in people. In entrepreneurship education learners learn to become entrepreneurs or entrepreneurial thinkers through real life experiences often through launching a small business or school-based enterprise (OECD, 2009). Entrepreneurship education is commonly linked to business projects but recent European policy on entrepreneurship education emphasises that EE is also about developing personal attributes and horizontal skills like creativity, initiative, and self-confidence, among others (Bacigalupo, Kampylis, Punie, & Van den Brande, 2016; Commission of the European communities, 2006). The Nordic Council of Ministers and the European Union have developed a general policy for the area, and considerable developmental work has come about within OECD (Nordic Council of Ministers, 2008; OECD, 2010). OECD (2009) describes entrepreneurship education as education 'that is concerned with the inculcation of a range of skills and attributes, including the ability to think creatively, to work in teams, to manage risk and handle uncertainty' (OECD, 2009, pg. 5). In Iceland innovation education and entrepreneurial education are seen as two sides of the same coin, as the creative/innovative part and the action/entrepreneurial part strengthen each other (Jónsdóttir, 2008; Jónsdóttir & Macdonald, 2013).

Innovation education and similar areas

Recently IE has been analysed internationally and acknowledged as a specific part of education, as can be seen (among other places) in the publication of the first international handbook on IE: The Routledge International Handbook of Innovation Education (Shavinina, 2013). IE is not practised in all compulsory schools in Iceland, but still there are some schools that engage in IE as a part of their curricula (around 10% in 2005, according to Jónsdóttir, 2007b).

IE is in many ways similar to technology education in other countries, and both have been developing as special subjects for over two decades. In both areas of learning, understanding the interaction between humans and their environment is emphasized, together with creativity and problem-solving skills. Implementing technology education or crafts, design and technology (CDT) has been a struggle in many countries (Bungum, 2006; Jones, 2006; De Vries, 2006). In several countries the development has been difficult and even recursive, though it has taken root firmly in others such as New Zealand and the USA (de Vries, 2006). Switzerland, Austria and some of the Scandinavian countries, have developed a craft-oriented technology education. Technology education in the United States has made significant progress in the past 20 years at middle and high school levels (Engstrom, 2006). Successful programmes in elementary school technology education (ESTE) have been offered, although curriculum resources are still thin (Engstrom, 2006). In Iceland, crafts subjects are taught as independent subjects, design and crafts and textiles education, and also as IE in some schools but have not taken root generally (Jónsdóttir, 2007b).

Australian 'Technologies' (ACARA, 2012b) are comprised of 'Design and Technologies' and 'Digital Technologies':

> The Australian Curriculum: Technologies will shape the future of Technologies learning in schools, ensuring that all students benefit from learning about and working with the traditional, contemporary and emerging technologies that shape the world in which we live. The Technologies learning area draws together the distinct but related subjects of Design and Technologies and Digital Technologies and includes the range of technologies currently addressed by state and territory curricula. (ACARA, 2012b, pg. 3)

The curriculum suggests integrating technologies education with other areas of learning. One of the main aims of the technologies curriculum is:

> To develop active and informed citizens and consumers. It enables students to become confident, creative, ethical, enterprising, environmentally and socially responsible innovators. Students will develop the technologies knowledge, understanding and skills to engage purposefully in the process of creating preferred futures. (ACARA, 2012b, pg. 7)

The Australian technologies curriculum can be seen as aiming for similar competencies for IE as were presented in the Icelandic compulsory school curriculum in 1999 and 2007 (the chapter on Innovation and the utilisation of knowledge) (Jónsdóttir, 2011). Both emphasise focusing on dual personal and communal perspectives when thinking about, acting on, and solving problems, moving 'progressively from individual interests to problems of wider concern' (ACARA; 2012b, pg. 17).

As these areas of learning have gained considerable acknowledgement, being seen to enhance important competencies, but still with limited integration in Icelandic schools, I was curious to learn about in what form IE or similar areas were practised in other countries. This research stems from an opportunity I received in September 2014 to present about IE as it is practised in Iceland, in a primary school in Brisbane and take interviews with teachers in the school about where IE is located in their curriculum and how it is practised in the school. My presentation was intended as a foundation for the interviews with the teachers so they could identify what they considered to be the same or similar to IE in their school.

The Australian national curriculum in 2012 – translated into C2C

The education systems in Australia are under the control of State Governments; the Australian Curriculum was developed by the Federal Government to standardize education throughout Australia. In my interviews and talks with the teachers and principal, I soon became aware of the influence of the national curriculum. They were all very much aware that Australia issued a new national curriculum in 2012 that was meant to lay out a blueprint for all compulsory teaching in the whole country (ACARA, 2012a). It was designed to provide a framework for a progression and continuum in education that was the same or similar in all schools throughout Australia. Thus the new curriculum was meant to ensure that students anywhere in Australia could move to a new school, in any state, and continue where they had left off in their former school.

The new curriculum in 2012 was a lot to take in for many teachers and headmasters, and each state in Australia responded to the challenge of translating it from the main national document into practice by developing their own interpretation and suggestions in a state issued document. In Queensland this resource was called Curriculum into the Classroom (C2C), and was meant to be a bridge between the classroom practice and the national curriculum (Department of Education and Training, 2015). The purpose of the C2C is presented on a website with materials for teachers and parents:

> The State Schools Division is supporting Queensland state school teachers to implement the Australian Curriculum through the development of the *Curriculum into the Classroom* (C2C) resource, which delivers a comprehensive set of whole-school and classroom planning materials for single level and multi-level classes, students with disability and for students who study through the schools of distance education. A modified set of the C2C materials is also available to Queensland independent and Catholic schools via Scootle, a password protected website. (Department of Education and Training, 2015)

Designed as a starting point for school curriculum planning, C2C is essentially a digital resource that can be adopted or adapted to meet individual student learning needs and to suit local school contexts. C2C materials are regularly reviewed and refined to align with changes to the Australian Curriculum and in response to feedback from schools and stakeholders.

Putting the formal curriculum into practice

Those who have never taught in school may think it is a simple matter to put the formal curriculum into practice. The formal curriculum usually reflects what is considered important in each society to present to the young and depicts the governing ideas and ideals in that society on what education is meant to bring about (Geirsdóttir, 1998). But there is more influencing school practice than the formal curriculum, and there are more curricula involved than just the formal one.

Goodlad et al. (1979) identified four other curricula in addition to the formal that can be identified if you look closely and from different perspectives: the ideological curriculum, the perceived curriculum, the operational curriculum, and the experienced curriculum. The ideological curriculum refers to the ideas and ideals on which the formal curriculum is founded, and includes where we want to head with education and what we consider preferable and best. The formal curriculum is issued by the government and is usually in printed or written form. The perceived curriculum is how interested parties (among them parents and teachers) interpret the formal curriculum. The operational curriculum is the curriculum teachers actually perform in school practice, which I will call here the practised curriculum. Finally, Goodlad et al. (1979) identify the experienced curriculum as what students experience as the reality in schools – in other words, how they experience the practised curriculum. This complex view of the curriculum allows us to consider more influences on the practised curriculum than merely the simple mechanics of putting the formal curriculum into practice.

One often overlooked influence on how the curriculum emerges in practice is what has been identified as teachers' professional working theory (PWT). PWT refers to a professional understanding of what your work is about and what you want it to be about. It evolves through the constant interplay of professional knowledge, practical experience, reflection, and ethical or moral principles (Dalmau & Guðjónsdóttir, 2017). It is an often implicit notion of who you want to be as a teacher and what you think is important in education, and has formed through your knowledge and experience (Dalmau & Guðjónsdóttir, 2017; Handal & Lauvås, 1982). Such understandings or theories are also contextual, as teachers are often influenced by the conditions in which they work (Connelly, Clandinin, & He, 1997; Sanders & McCutcheon, 1986). Such practical theories of teaching include ideas and visions that provide teachers with reasons for acting in practice, and choosing teaching activities and curriculum materials in order to do their job well (Sanders & McCutcheon, 1986). PWT is often subconscious, but it emerges and can be identified as teachers talk about their work and how they do it.

Research goal and research question

The main goal of this research is to find out how teachers in one primary school in Australia fit IE, as analysed in Iceland, into their students' learning and how they categorise such education.

I also look for factors that influence how they practise their teaching. The research question is: How does innovation education emerge in the practice of one primary school in Australia?

Methods

This research is a case study of IE (as it is called in Iceland) in a primary school in Australia. A case study entails detailed research into a case or issue as it appears in its normal situation and seen from the points of view of the participants (Bogdan & Biklen, 2003; Gall, Borg, & Gall, 1996). A case study can be descriptive, exploratory, explanatory, or a mixture of those three (Yin, 2009). In this research I endeavour to draw a picture that integrates these three approaches by describing culture, situations, and people (descriptive); looking into conditions and practices of education that have not gained a durable space (exploratory); and seeking and drawing out influences, causes, and interactions (explanatory). Choosing this method to report what I found opens up a way to describe the school and the people without using pseudonyms – names are used here with permission. I wrote this article in close collaboration with the participants and wanted to show them my respect and consideration by telling the story in English and also using their correct names. I recognise the various ways personal experience and views influence the research process (Ellis, Adams & Bochner, 2010) and have, therefore, as the author chosen to be clearly visible. This research was built on my personal and professional interests and connections. Thus I use the first person in my narrative (Day, 2002; Dyson, 2007) and invite the readers to join me on a journey to find out how similar curriculum ideas emerge in two continents.

The research design draws from qualitative research methods. Qualitative methods are pertinent to this project, as they work well to gain a deeper understanding of a research issue and to uncover the meaning people who experience it give to it and how they make sense of it (Denzin & Lincoln, 2005). The aim is to understand the meaning of a particular social phenomenon as experienced by the people themselves. Qualitative research also emphazises understanding the social and interactive nature of the world and the reality we experience (Bogdan & Biklen, 2003).

Data

I gathered the data during a two day visit to the NSS and additionally conducted a two-hour interview with one teacher on a third occasion. The data consisted of:

1. A field visit to the school over two days focusing on:
    a. Looking into the situation and conditions in the school
    b. Giving a presentation about IE in Iceland and responding to questions
    c. Observing lessons and free periods of the youngest children (Preparatory class: Prep.). Noted in my research journal
    d. Photographs of school work, classrooms, projects and lesson plans
2. Interviews with six teachers conducted at the school and the seventh in a private location. Citations to teacher interviews are marked I1 – I7 (interviews 1 – 7).

Participants

The headmaster, Carol Scriven, gave me permission to visit the school and interview the teachers. The participants in the research were seven teachers at Northgate State School in Brisbane. All seven teachers attended a presentation I gave about IE in Iceland so they were able to connect with what I call IE and give me information about where and how such education is practised in their teaching. All of them gave consent for me to interview them and record the interviews.

I interviewed two male and five female teachers. All interviews were conducted in the school on the second day of my visit, except one that was conducted in a private location (for reasons of convenience) at the interviewee's request.

Ethical issues

One of the teachers is a good friend of mine from Iceland, and she was one of the reasons I chose this school. She has worked in teaching for nearly 30 years and she mediated my visit to the school. I was aware of my positive attitude towards her and her work and realize that it might colour my view of any shortcomings I would otherwise see more clearly. Even though my research was not about assessing the quality of her teaching or that of her colleagues teaching, but rather to focus on a specific part of their practice, some biases might come to light, and therefore I took care not to turn a blind eye to such information should it present itself.

Ethical issues in this research were mainly about ensuring that those who participate are not harmed in any way and remain unrecognizable if controversial matters arose. As nothing controversial emerged in the research process, nor anything that was seen as demeaning or harmful to the persons who took part, I got permission to use the real names of the school, the principal and the teachers. One child appears in a picture of one of the tasks described; that child's features are blurred and a pseudonym used to preserve anonymity.

Analysis of data

All interviews were recorded and transcribed. I analysed data using the methods of grounded theory in the first phases of analysis (inductive approach). I first read all interviews and marked with colour any sentences or paragraphs of interest. I jotted down some of my initial thinking with researcher's comments within parentheses like this: (AR: my comment directly into the manuscript) and at the end I listed some comments gathering my first impression of each interview. Then I read each transcript again and coded the coloured paragraphs using words like structure, creative, fun, respect, caring, etc. During the third or fourth reading I started to gather codes into categories or themes (Creswell, 2003) to try to see whether the story was coming together and I was gaining a deeper understanding of what the data held within. In the latter parts of analysis, when I started to write up the findings, I looked at the data and the emerging story in the light of curriculum theories and research on innovation education and technology education (deductive approach). But mainly my theoretical framework helped me to connect issues in the findings, contextualize them, and discuss them. The main themes I used to sort the findings were: The NSS school characteristics, influences of official curricula, influences within the school and personal and professional influences. These were written up as two overall categories presented as the main the findings: Northgate State School and Professional working theory.

The emergence of innovation education in a Brisbane primary school

In this section I present my findings. I will first describe the school as I saw it, then describe the influence of the national curriculum on the teachers' work, and finally locate IE in the practised curriculum according to the teachers' descriptions.

Northgate State School (NSS)

I rode to the school with Sigga Ingvadóttir, who teaches Preparatory (prep) class. It was sunny and clear as we drove from Stafford for 22 minutes to Northgate State School. The school is housed in closely positioned one- and two-storey buildings, with the main building forming a

U-shape. We arrived around 7:30am and the principal and some other staff were already there. As we walked from the car to the Prep classroom I heard birds singing and Ian the caretaker greeted Sigga and they exchanged friendly greetings (Research journal, September 20. 2014).

Sigga explained to me that their work in the school was built on the national curriculum from 2012. The Queensland school authorities interpreted and presented the national curriculum and created the C2C as a kind of guide to explain how the aims and goals of the national curriculum can be achieved, and a resource to help teachers implement the curriculum in their practice. Carol, the principal, concurred with Sigga's explanation.

School ethos and organization

The working atmosphere in the school came across as supportive and ambitious to do good work. Teachers expressed the value of other staff, stating that they appreciated the good work they all did and that the quality and dedication of librarians, cleaners, caretakers, and support staff were a part of making NSS a good school. The teachers I spoke to described the principal as a leader in giving quality education and setting the bar high for the teachers' continuing education. The low turnover of teachers at the NSS helps to confirm the constructive atmosphere in the school.

Overall what I observed was well-organized schoolwork and care for the well-being and learning of students. I saw clear indicators of good organization. School rules emphasize the safety and well-being of children. Long periods were scheduled for playing outside; for example, in the 'Get Active' period from 8.30-9.00 all children took part in organized games and activities. Groups were deliberately arranged to involve all year levels. In each of the organized games and activities cooperation and team- and community-building were emphasised. Parents were encouraged to join in and some participated. All children seemed to be active and took part in different activities during that period.

The students seemed well aware of rules and what was expected of them. They were expected to have hats on at all times while outside, as the sun in Australia can be dangerous, and teachers reminded them if they forgot. They were also expected to play in designated areas outside, so that at all times they could be located according to their age group. When they had to use the toilet during lesson time they were always accompanied by another child. The rules were all meant to keep them safe and did not seem to be unfairly restrictive.

Figure 1 – Good organization and visible setup in the Prep classroom

The lessons I observed in Prep were well organized, and divided into shorter periods of different tasks around practising reading, writing, and working with numbers. Lots of materials, tools, and student work were well organized and presented in the Prep classroom (see Figure 1), easily visible and located where students could reach them. I witnessed some nice traditions such as using jingles as a way to remember and to do what otherwise might be a boring task, such as roll call. When the bell rang for free periods, a song played at moderate volume on the computer in the corner of each classroom all over the school, as a soft indicator of the end of the lesson.

Locating IE in NSS

When I had scrutinized my data I concluded that IE in NSS is mainly located within science and technology tasks such as the "Boat project" in Prep classes. However, I also noticed some examples of working in the IE spirit within different projects assigned by some teachers -- e.g., using brainstorming and letting students choose what tasks to work on and how the items they were developing should look. Michael (I6) identified IE as being the same or similar as technology in their school.

Technology education

All seven teachers identified elements of IE as I had presented it to them, and said they worked with such processes and competencies in what they call technology education. These elements would usually be present in themes or specific tasks that integrated technology and skills and competencies from different learning areas. For example, the teachers would give the children the task of designing and making a boat as part of a theme about the ocean (I1, I7). Easter hat design and creation is another example of a design-technology task they do each term. These

design tasks are clearly framed design processes with four steps: 1) get acquainted with the task; 2) design; 3) create (make); 4) evaluate (like, change, use) and show it off. Diane described how her kids worked on the hat design.

> It's not an open-ended task like yours are; it's more of a directed learning task. And we're not looking at what we need or anything like that. They're actually given the task sheets so that they have to come up with their design, we discuss the process, discuss their options. Discuss what is a valuable term to use, and special things; discuss what shapes they can use and all that sort of thing, and they have to create it and then they look at what they liked about it, things they might change, and then they actually wear it for the Easter hat parade. (I1)

Such a task would take three to four 40-45 minute sessions. Then next term there is another design and technology task, usually boat design.

Moving from thematic-based teaching

The Australian national curriculum had recently changed from a thematic-based curriculum to a subject-based curriculum (I7). Sigga explained the change:

> Up until the introduction of the Australian Curriculum, curriculum development had been the individual responsibility of each State and Territory government. It was up to each school to develop their specific curriculum documents but it was largely left to individual classroom teachers to plan and implement the lessons. In these matters teachers often had complete autonomy. In Queensland the preparatory year had also been introduced to primary State Schools in 2006/7, replacing the old Pre-School system. The Prep curriculum was slightly more directed than the Pre-School curriculum had been but still based on theories around Early Childhood Education. (I7)

Sigga said that the Australian Curriculum brought a lot of changes and that the most 'radical' was the move away from personal school- and teacher-based ideology often involving freewheeling learning around a theme, to a highly structured and subject-based curriculum.

The C2C was the Queensland resource document intended for implementation of the Australian curriculum into Queensland schools. This did not sit well with all teachers. The document was highly structured and the content extensive, making it an onerous read. Many were dissatisfied with the lack of accommodation of personal styles or ideologies in formulating lesson plans and teaching (I7).

This was of concern to many new teachers, who felt they had to faithfully follow the C2C in its entirety. Due to its extensive content, planning and teaching became rote and stressful with little teacher satisfaction. Sigga added:

> On the other hand, established teachers like myself were able to plan a learning programme which fully acknowledged the Australian Curriculum and the C2C but which could be embedded in a variety of 'older' teaching approaches. (I7)

This change was quite a big challenge for many teachers, especially the new or newly graduated who had been educated for teaching subjects (I7). Integration of subjects and different kinds of learning through larger or smaller projects was suggested as a way to accommodate the C2C, and was how the staff in NG School went about working towards the aims of the curriculum.

The teachers described the IE-intensive projects students worked on as integrative projects where different skills and subjects were practised and utilized. These projects provided opportunities for teachers and students to incorporate arts, science, technology, English, literacy, design and crafts.

The teachers emphasised that these projects offered outlets for artistry and personal expression. Diane talked about the projects such as the boat project and the Easter Hat as giving opportunities for artistic expression, reading and writing through their retelling of their project (see for example image x). She and other teachers said the boat project included science, as the students had to find out what makes boats float and what kinds of materials were suitable for making them water resistant (I1, I2, I3, I4, I5, I7). Technology and crafts were incorporated as they built the boat and did experiments with it on water.

Enhancing creativity

Methods to enhance creativity are used in teaching and learning in the school within different subjects or as part of projects such as brainstorming with students (I2). Megan explained how the children got opportunities in the design projects to exercise their creativity:

> They use some of that creativity in order to create something for a purpose like the innovation and design technology. There's often open tasks where they can express their creativity. They take something and apply some knowledge that they've already received. They use what they know from something they have been working on in class and then they, you see that come, you know, come about in their actual own designs or creations. (I3)

Megan also pointed out that the teachers aim to help the children acquire the disposition that they are creative thinkers through these projects and the tasks they include:

> We're developing dispositions in how they learn, is a big emphasis in this classroom, how they approach tasks as well, becoming problem solving thinkers, getting to solve their own problems. And they come a long way from when they step into the classroom to now, which is when they're quite able to …approach things more individually and on their own rather than what others are doing, and I guess that's the creative thinking. (I3)

She confirmed having seen how the children had strengthened their competence to solve problems by applying creative thinking. Chris reflected on her own teaching and was aware that she could possibly be more supportive of the children's creativity in the technology design tasks:

> What I take from your session the most yesterday was that I feel that I perhaps guide the students too much. In the beginning phase, there needs to be more time for them to express their creativity.
>
> It is difficult within the constraints of the curriculum, to give them that time. However, just listening yesterday, I know that I could if I looked ahead and really planned myself I could see where it could fit in to geography or science or art, you know I could find a way – to do it. In what I would say in a better way where the children have more ownership over what their task is. We tend to give them the task, however, then the creativity comes within how they decide to enact or, you know, design and create, but I still feel that there could be a little bit more ownership if they design the task. (I4)

She feels that if the ownership is in the children's hands there is more likelihood of creative work which is similar to the emphasis in IE/IEE on self-direction and action.

Freedom and control – student choice, student agency

As the teachers described the different design tasks in the school they indicated that the tasks were usually decided upon by the teacher (usually rooted in the aims of the curriculum), but often students could choose how they went about their work and what the outcome would look like.

Rob described the process:

> It's really decided by the teachers, this is what they are going to do. But then they can choose how they want to do it or even modify what the outcome might be. As long as they have the parameters - they can work within a certain, certain border. Yeah, you'll leave it up to them. (Rob, I2)

Linda described how she and the other teachers had been working with the children on a garden theme that grew out of and alongside the initial underwater theme. The children had made a miniature garden in boxes in the hallway as part of learning about plants and what they need to grow. The children had to do research on growing plants and gardening, and they had to write out a plan about how to go about doing the mini-garden. They made a list of which plants they wanted to grow and collected bins and boxes from home to grow them in. They put the soil in the boxes and planted or sowed what they wanted to grow. When the plants had started growing the children measured their growth and documented the progress. Later they would have an assembly where they would present their gardens, and in order to do that they had to design and make posters to encourage people to come look at their garden. Linda mentioned that she noticed the children were more engaged and interested than often before. They had been given more agency, as they were actively involved in self-directed and experiential learning. As Linda described her understanding of what the work on the garden meant for the children:

> They had more involvement and more say, a bit of voice in what they wanted to learn. I like that, I think that's really good, and I think they benefit more from it, they are more involved in their learning, they…you know, take ownership of their own learning. (I5)

Reflection as part of the process

One part of the Icelandic version of IEE that is not as ingrained in the design process as in NSS, is reflection. The teachers in Northgate School described the design process as a four-step process where the last step was reflection (I1, I5, I6, I7). By the end of the process, when the students had made the item they had designed, they were meant to evaluate its quality. They were asked to look at it carefully and find out what they liked about it, whether the materials were suitable, and what they would change the next time they made such a thing; and describe how well it worked. At the end of the project the students would fill out a report depicting the design, including a picture of the item and the reflection, as a kind of self-evaluation (see Figure 2).

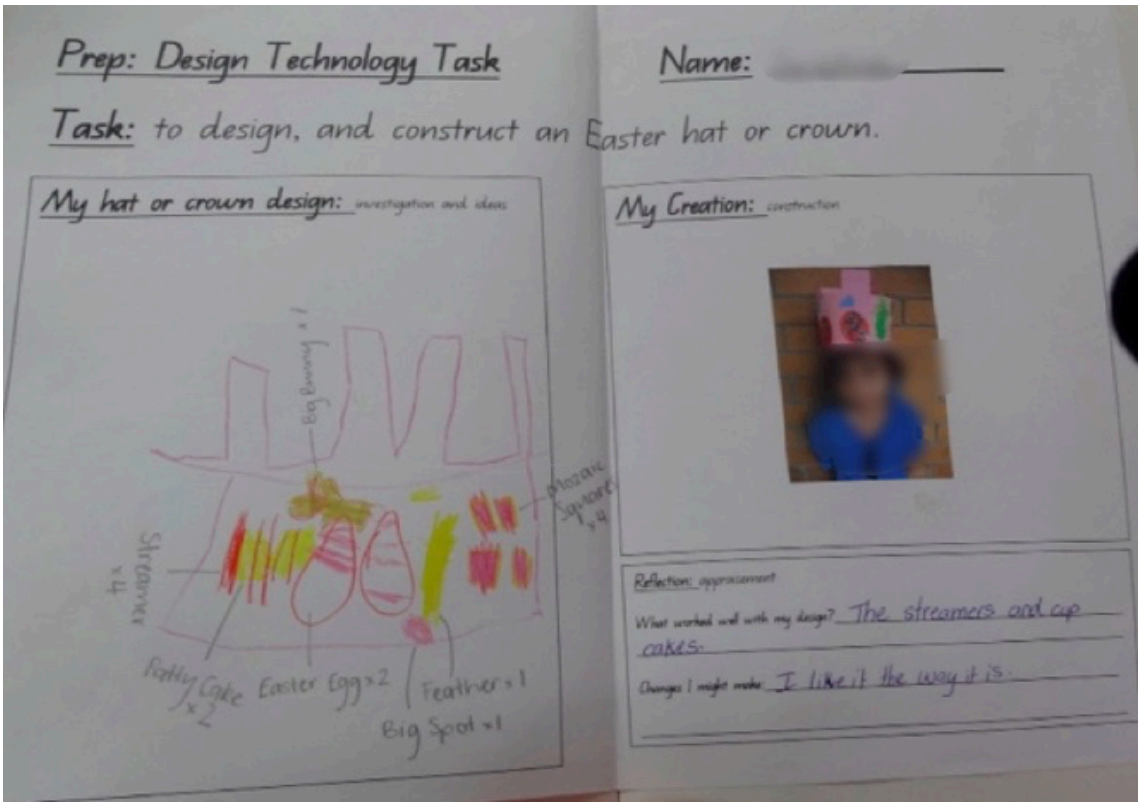

Figure 2 – The Technology task report – Easter hat design

These student reflections were not deep or comprehensive, which is understandable for their young age. But this part of the design process seemed to be a good start to exercise and cultivate an important competency -- to be able to look back at one's work and evaluate its strengths and weaknesses.

Professional working theory

At some point, all the teachers mentioned that the C2C provided the foundation for their work. It could also be sensed that the school ethos, ambition for doing good work, and the support of the principal influenced how they worked. The curriculum (if we call the C2C the ´active curriculum´) was their guiding light in practising what both I and they identified as IE. It was also clear that the professional working theory of each teacher had a strong influence.

Sigga was the veteran in the teacher group I talked to. She was confident in her teaching and did not find it an overwhelming challenge to adhere to the new curriculum. Her education and her experience with teaching gave her confidence to see that the curriculum could be practised with what she knew, although it demanded changing from subject focus to thematic teaching:

> For newly graduated teachers they actually are totally bound in that and find it very difficult to move out of out of that kind of teaching.With teachers that have been around for a long time and are really skilled in the old ways we can actually marry a lot of ways of teaching and getting the learning outcomes that we are accountable for. … and so if I think about myself I would say that it's certainly part of my flora of teaching, the way I teach. (I7)

This indicates that Sigga was aware of her professional working theory -- her "flora of teaching." She has a strong belief that she could influence children for the good, helping them become

independent and creative learners; and that her professionalism would help her do that regardless of which curriculum is in place.

It could be seen that Linda was still developing her PWT, but she seemed to lean towards wanting to work through inventive avenues such as outdoor education and explore the ways of IE:

> Since I am in the first year I think I wanted to feel comfortable in my own environment first and then once that happens I think I'd be willing to venture out of it more and explore the out… you know, the surroundings of the school, so I think that's something, the next step. (I5)

She also found it important that children exercise their creativity through problem-solving and other creative activities. She has discovered that creative work and knowing the children and having good relationships with them is vital for keeping them in school and loving learning:

> If they don´t get an opportunity to be creative then they're going to lose… they will lose the joy of school, and you know, and I think that's one big thing I've noticed is building relationships is the key thing for these kids wanting to even come to school. If you don't have a relationship with the child they're not going to want to learn, and I've noticed that big difference in some of the children's learning, particularly from the boys who have learning difficulties, particularly writing, weren't happy about coming to school but we've built a relationship and you know I've…they've just improved so much, like, you know. (I5)

Megan was interested in working in the resources IE offered, but as a student teacher she was understandably still forming her own PWT. She mentioned that the C2C was still her main resource and guide in teaching:

> I've just been going to the C2C, to get a lot of that, I probably, that's probably because of experience, or lack of experience in a classroom and knowing and trying to meet those demands as well in a way, because you do need to meet the C2C demands. And then… but because that's sort of my biggest thing that I've been working with, my biggest resource. I feel as if I can't draw a lot of other things and make it more my own. (I3)

And she realizes that gradually as she gains experience in teaching, she can do more planning and practising the way her PWT guides her:

> …but I think when I do get out and develop it more, and able to plan big… of the whole classroom and draw on other experience and stuff, I will be more open to developing it a bit differently to what the C2C does, and I think the C2C sometimes has room for these kinds of those sorts of things like innovation education deals with, but sometimes it doesn't, and ideally it does have time for it, but then by the time you get through everything else that you're meant to do there´s not much time. (I7)

Although Michael had only been teaching for five years he felt that he had mastered the balance of using the guidance of the C2C, the different needs of the children, and his own way of doing things (I6). I could see that each teacher's PWT was one of the elements that guided the way they handled the C2C in practice, including how approaches and themes like IE emerged in their school work -- although I did not delve into what precisely was the core of their PWT.

Discussion

The findings described above provide insights into how teachers in one Australian primary school worked with innovation education as the curriculum area is defined in Iceland. While many of the elements of IE were present in the 'experienced' curriculum (Goodlad et al., 1979),

they surfaced in fragments rather than as a holistic pedagogy as is emphasized in IE (Jónsdóttir & Gunnarsdóttir, 2017). I conclude that it is likely to be the same or similar in other Australian schools that follow the national curriculum from 2012. However, it is not reliable to extrapolate from one small case, and it was not my intention to do so. Likewise, in Iceland IE is practised in different ways and only a minority of compulsory schools implement it as a subject or a holistic procedure for learning (Jónsdóttir, 2011).

In Northgate State School the aims and approaches of IE were mainly identified within projects rooted in the curriculum of Technologies. However, the teachers often used approaches that were similar to or the same as IE, such as using brainstorming or offering learners choices in other areas of learning and other subjects in order to enhance their creativity and agency.

I identified different influences on the way the teachers worked and what kind of school I saw. What I saw was a vibrant and well-organized school with positive staff engagement that showed care and ambition for their students. The main influences on how they worked were, as I could detect: the school atmosphere, principal support and management, the national curriculum or more precisely the C2C, and finally the professional working theory of the teachers. The PWT was not necessarily very clear or specifically articulated as their working theory (Dalmau & Guðjónsdóttir, 2017), but it emerged in their talk and was well developed with those with the most experience in teaching, such as Sigga and Rob. However, the younger teachers also seemed to be gaining a strong sense of what they wanted to stand for as teachers in primary school.

I did not have the opportunity to dive into the experienced curriculum; to talk to the students about how they experienced the IE the teachers described. But I was able to see how the teachers interpreted the curriculum (the 'perceived' curriculum) and how that emerged as their practised curriculum (the 'operational' curriculum) (Goodlad et al., 1979). I could see that how they interpreted the formal curriculum was influenced by their PWT; the ethos and management of the school, in turn, supported or provided a framework for putting into practice their own ideals and the aims of the curriculum. IE affords an ideological curriculum suited to 21st century education, but those ideals still have some way to go to become a holistic part of the practised curriculum. This is not surprising, as ideals compete for space in the formal curriculum and in the practised one. But my hope is that PWT of teachers and the need for a modern curriculum will help to inform and influence school curricula towards implementing the ideals of IE more clearly in practice in all parts of the globe.

Postscript

I would like to end this article about my visit to Northgate State School by citing principal Carol Scriven's words after she had read and commented on the article, as her words describe the development in the school since my visit in autumn 2014.

> It was wonderful and a pleasure to read and reflect on where we were heading in 2014 and to now see the changes which have also occurred in a short space of only 3 more years.
>
> We have developed our own Pedagogical Framework for planning, teaching and assessing the curriculum. We have a professional coach, John Fleming, who is the Deputy Director of the national body for Teacher Education, AITSL, who visits once each term and observes each teacher and provides professional feedback and goal setting for their growth, as well as for our school's direction. This has seen the development of greater consistency of teaching practices and also enhanced teacher professional collaboration, for continuity of student learning, from one year level to the next.

In addition the children's achievement has been recognised in 2016, with a letter of recognition for significant growth in achievement, as measured by the National Testing regime, called NAPLAN. This year again saw growth in some areas above State and National levels of achievement. In 2016 we were selected to participate in the NAPLA-NONLINE Trial – moving from paper testing to a digital platform. In 2017 our students have now trialled the newest platform and have been engaged in feedback to the system regarding the effectiveness of the online platform.

The teachers are a wonderful group and a key factor in that they strive their best each and every day for our students and school. This year we have formed a STEM group (Science, Technology, Engineering and Maths) and continued to work through the Design Thinking Problem Solving approach. We believe that this can be utilised in any Learning Area, as well as integrated. We now have all year levels utilising Scratch, Scratch Junior, Dash Robots for coding. A staff member participated in the United States to explore the Makey Makey technologies. The STEM team developed a school wide Stem Ekka (Exhibition) designing a range of investigative challenges to utilise the Design Thinking Process. Senior students proudly guided our Early Years students.

We are excited about the future and have more next steps planned for 2018 and beyond. In all we do we strive to craft a way which will maintain staff engagement, opportunity for success and learning time to uptake the new challenges. Extra curriculum support and coaching through new roles (Head of Curriculum, Master Teacher, Literacy Coach and perhaps STEM Coach in 2018) have been vital to the extra development. Ultimately the tone, trust and respectful relationships developed over time are also contributing elements which cannot be always measured. We are a united team and I am proud am privileged to lead in such a highly motivated, collaborative learning community.

Kind regards, Carol.

From the author:

Thank you to the NSS staff and students for allowing me to take a look at your school work. And a special thanks to the principal, Carol Scriven, who saw opportunities in my visit and allowed the flexibility and support to make it happen.

I want to thank the University of Iceland's School of Education for granting me research leave in autumn 2014 and funding my travel to Australia. I also want to thank the UI Research Fund for supporting the research presented here.

Námskrárhugmyndir í tveimur heimsálfum í anda menntunar á 21 öldinni: Tæknimennt í Ástralíu og nýsköpunarmennt á Íslandi

Sköpun, skapandi hugsun og skapandi starfsemi er talin mikilvæg hæfni í heimi nútímans. Sköpun var kynnt sem einn af sex grunnþáttum menntunar á Íslandi árið 2011. Ein af þeim leiðum sem notuð hefur verið til að efla skapandi hugsun og getu til skapandi aðgerða er að nota nálgun nýsköpunar- og frumkvöðlamenntar. Nýsköpunar- og frumkvöðlamennt hefur verið að þróast á Íslandi og víðar í heiminum síðastliðin 20 ár. Á Íslandi er gjarnan talað um nýsköpunarmennt þegar átt er við námssviðið í grunnskóla, frumkvöðlamennt í framhaldsskóla en nýsköpunar- og frumkvöðlamennt án tillits til skólastigs. Svipuð námssvið hafa þróast í menntun í öðrum löndum. Í Ástralíu var þróað námssviðið „tæknimennt" (e. technologies) sem er að mörgu leyti svipað eða eins og sumir hlutar nýsköpunarmenntar.

Í þessari grein kynni ég rannsókn mína á því hvernig kennarar í einum grunnskóla í Brisbane í Ástralíu vinna með nýsköpunarmennt í námi nemenda sinna og hvernig þeir skilgreina þann þátt í menntun. Rannsóknarspurningin sem ég leita svara við er: Hvernig birtist nýsköpunarmennt eins og hún er skilgreind á Íslandi í skólastarfi í einum áströlskum grunnskóla?

Í greininni er lýst tilfellisrannsókn (e. case study) í einum skóla, unninni með aðferðum eigindlegra rannsókna. Farið var í vettvangsheimsókn og tekin sjö viðtöl við kennara í grunnskóla í Brisbane í Ástralíu í september 2014. Skólinn Northgate State School er ríkisskóli og nær yfir yngra stig grunnskóla, barnaskóla (e. primary school). Einnig var rætt við skólastjórann og haldin kynning fyrir hóp kennara í skólanum um nýsköpunarmennt eins og hún er kennd á Íslandi. Viðtölin voru tekin daginn eftir kynninguna og kennararnir voru spurðir hvar þeir sæju nýsköpunarmennt birtast í sinni kennslu og á hvaða námskrárgrunni sú kennsla væri byggð.

Niðurstöðurnar sýndu að margir þættir nýsköpunarmenntar eru til staðar í starfinu í skólanum. Enn fremur kom í ljós að námskrá Queensland-ríkisins sem í daglegu tali er kölluð C2C (Curriculum to classroom) og er túlkun ríkisins á aðalnámskrá Ástralíu leggur grunninn að kennslu í tæknimennt sem og annarri kennslu. Einnig mátti greina að menning skólans, stuðningur skólastjórans og starfskenning kennaranna hefur áhrif á það hvar og hvernig nýsköpunarmennt birtist í námskránni í framkvæmd (e. practiced curriculum).

Í áströlsku tæknimenntarnámskránni er kynnt stýrt sköpunarferli þar sem kennarar eiga að leggja fyrir tiltekið vandamál eða viðfangsefni sem nemendur eiga að leysa. Í Northgate State School fylgja kennarar þessu ferli sem að mörgu leyti líkist grunnferli nýsköpunarmenntar eins og námssviðið er skilgreint á Íslandi. Segja má að ígrundun og sjálfsmat nemenda í lok verkefnis hjá áströlsku kennurunum sé viðbót sem ekki hefur verið sniðin inn í ferlið í nýsköpunarmennt á Íslandi á sama hátt. Í Northgate State School mátti sjá að markmið og nálgun nýsköpunarmenntar birtust aðallega í heildstæðum verkefnum sem áttu rót sína að rekja til tæknimenntanámskrárinnar. Þar að auki nýttu kennararnir oft aðferðir og nálganir sem voru eins eða líkar aðferðum nýsköpunarmenntar, svo sem hugarflug eða að bjóða nemendum val um verkefni og útfærslur, innan annarra námsgreina, til þess að ýta undir atbeina þeirra og sköpun.

Efnisorð: Nýsköpunarmennt, sköpun, skapandi starf, námskrá, tæknimennt

About the author

Svanborg R. Jónsdóttir (svanjons@hi.is) is an associate (docent) professor at the School of Education University of Iceland. She completed a B.Ed.-degree at the Iceland University of Education in 1978, an M.A. degree in pedagogy from the University of Iceland and a Ph.D . from the University of Iceland, School of Education in 2011. Her thesis is titled The location of innovation education in Icelandic compulsory schools. Her res-earch fields are innovation and entrepreneurial education, curriculum development, creativity in education, school change and teacher education.

Um höfund

Svanborg R. Jónsdóttir (svanjons@hi.is) er dósent við Menntavísindasvið Háskóla Íslands. Hún lauk B .Ed.--prófi frá Kennaraháskóla Íslands 1978 með íslensku og dönsku sem aðalgreinar og M.A.-prófi í uppeld-is- og menntunarfræðum frá Háskóla Íslands 2005 með áherslu á nýsköpunarmennt. Árið 2011 lauk hún doktorsnámi frá Menntavísindasviði Háskóla Íslands og er titill doktorsritgerðar hennar The location of innovation education in Icelandic compulsory schools. Rannsóknir hennar er u á sviði nýsköpunar- og frumkvöðlamenntar, námskrárfræða, skapandi skólastarfs, breytingastarfs í skólum og kennaramenntunar.

References

ACARA (Australian Curriculum Assessment and Reporting Authority). (2012a). *The shape of the Australian curriculum: Version 3.* Sidney: Author.

ACARA (Australian Curriculum, Assessment and Reporting Authority). (2012b). *Draft Shape of the Australian Curriculum: Technologies.* Sydney: Author.

Bacigalupo, M., Kampylis, P., Punie, Y. & Van den Brande, G. (2016). EntreComp: The Entrepreneurship Competence Framework. Luxembourg: Publication Office of the European Union. doi:10.2791/593884

Bogdan, R. C. & Biklen, S. K. (2003). *Qualitative research for education. An introduction to theory and methods* (4. ed.). Boston: Allyn and Bacon.

Bungum, B. (2006). Transferring and transforming technology education: A study of Norwegian teachers' perceptions of ideas from design & technology. *International Journal of Technology and Design Education, 16*(1), 31-42.

Commission of the European communities. (2006). Communication from the commission to the council, the European parlaiment , the economic and social committee and the committee of the regions. Putting knowledge into practice: A broad-based innovation strategy for the EU. Brussels.

Connelly, F. M, Clandinin, D. J., He. M. F. (1997) Teachers' personal practical knowledge on the professional knowledge landscape. *Teaching and Teacher Education*, *13*(7), 665-674.

Creswell, J. W. (2003). Research design. *Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks: Sage.

Dalmau, M. & Guðjónsdóttir, H. (2017). From the beginning to the future: Professional working theory emerging. In M. C. Dalmau, H. Guðjónsdóttir & D. Tidwell (Eds.), *Taking a fresh look at education: Framing professional learning in education through self-study* (pp. 129-148). Rotterdam: Sense Publishers.

Day, E. (2002). Me, My*self and I: Personal and professional re-constructions in ethnographic research. Forum Qualitative Sozialforschung / Forum: *Qualitative Social Research, 3*(3), Art. 11, http://nbn-resolving.de/urn:nbn:de:0114-fqs0203117.

Denzin, N. K. & Lincoln, Y. S. (2005). Introduction: The discipline and practice of qualitative research. In N. K. Denzin & Y S. Lincoln (Eds.), *The Sage handbook of qualitative research* (3 ed., pp. 1-32). London: Sage Publications, Inc.

Department of Education and Training. (2015). *Curriculum into the Classroom (C2C). Education, 2017*. Retrieved from http://education.qld.gov.au/c2c/

de Vries, M. J. (2006). *Teaching about technology. An introduction to the philosophy of technology for non-philosophers*. Dordrecht: Springer.

Dyson, M. (2007). My story in a profession of stories: Auto ethnography - an empowering methodology for educators. *Australian Journal of Teacher Education, 32*(1) 36-48. Retrieved from http://dx.doi.org/10.14221/ajte.2007v32n1.3

Ellis, C., Adams, T. E. & Bochner, A. P. (2010). Autoethnography: An Overview. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 12*(1), Art. 10, Retrieved from http://nbn-resolving.de/urn:nbn:de:0114-fqs1101108Eng-strom, D. E. (2006). Changes and progress in elementary technology education. In M. J. de Vries & I. Mottier (Eds.), *International handbook of technology educatio*n (pp. 83-93): New York: Sense.

Gall, M. D., Borg, W. R. & Gall, J. P. (1996). *Educational research: An introduction* (Sixth ed.). White Plains: Longman.

Geirsdóttir, G. (1998). Gróska í námskrárumræðu. *Ný menntamál, 16*(1), 6-12.

Goodlad, J. I., Ammons, M. P., Buchanan, E. A., Griffin, G. A., Hill, H. W., Iwanska, A., et al. (1979). *Curriculum inquiry. The study of curriculum practice*. New York: McGraw-Hill Book Company.

Gunnarsdóttir. R. (2013). Innovation education: Defining the phenomenon. In L. Shavininia (Ed.), *The Routledge international handbook of innovation education* (pp. 17-28). London: Routledge.

Handal, G., & Lauvås. P. (1982). *På egna villkor. En* strategi för handledning [On own terms. A strategy for supervision]. Lund: Studentlitteratur.

Jones, A. (2006). The developing field of technology education in New Zealand: the last twenty years. In M. J. De Vries & I. Mottier (Eds.), *International handbook of technology education. Reviewing the past twenty years* (pp. 197-211). Rotterdam: Sense Publishers.

Jónsdóttir, S. R. (2007a). *Analysis of entrepreneurship education in vocational education and training in Iceland*. Reykjavík: Leonardo National Agency, Iceland.

Jónsdóttir, S. R. (2007b). Nýsköpunarmennt í íslenskum grunnskólum [Innovation education in Icelandic primary schools]. *Uppeldi og menntun, 16*(1), 53-71.

Jónsdóttir, S. R. (2008). Two sides of the same coin: Innovation education and entrepreneurial education in Iceland. *Bulletin of Institute of Vocational and Technical Education,* (5), 109-118.

Jónsdóttir. S. R. (2011). *The location of innovation education in Icelandic compulsory schools* (unpublished doctoral thesis). Háskóli Íslands, Reykjavík.

Jónsdóttir. S. R. (2013). *Staða nýsköpunar- og frumkvöðlamenntar á framhaldsskólastigi á* Íslandi *og mat á* þörf *skóla og vinnumarkaðar fyrir fólk með slíka menntun* [The status of innovation and entrepreneurial education in Icelandic upper secondary schools and an assessment of the need of schools and labour market for individuals with this kind of education]. Reykjavík: Nýsköpunarmiðstöð Íslands.

Jónsdóttir, S. R. & Gunnarsdóttir, R. (2017). *The road to independence: Emancipatory pedagogy.* Rotterdam: Sense.

Jónsdóttir, S. R. & Macdonald, A. (2013). Settings and pedagogy in innovation education. In L.V. Shavinina (Ed.), *The Routledge international handbook of innovation education* (pp. 273-287). London: Routledge.

Jónsdóttir, S. R., Page, T., Thorsteinsson, G. & Nicolescu, A. (2008). An investigation into the development of innovation education as a new subject in secondary school education. *Cognition, Brain, Behavior. An Interdisciplinary Journal, 12*(4), 453–46.

Jónsdóttir, S. R., Þórólfsson, Þ., Finnbogason, G. E. & Karlsdóttir, J. (2013). Rætur nýsköpunar- og frumkvöðlamenntar í íslenskum námskrám og skólamálaumræðu [The origin of innovation and entrepreneurial education in Icelandic curricula and educational debate]. *Netla - Veftímarit um uppeldi og menntun. Sérrit 2013 – Fagið og fræðin.* Retrieved from http://netla.hi.is/serrit/2013/fagid_og_fraedin/006.pdf

Jónsdóttir, S. R., Þórólfsson, M, Karlsdóttir, J. & Finnbogason, G. E. (2014). Að uppfæra Ísland: Sýn stjórnenda íslenskra framhaldsskóla á nýsköpunar- og frumkvöðlamennt og framkvæmd námssviðsins í námskrárfræðilegu ljósi [The updating of Iceland: The perspective of Icelandic secondary school principals of innovation and entrepreneurial education and its implementation in light of curricular studies]. *Netla - Veftímarit um uppeldi og menntun*. Retrieved from http://netla.hi.is/greinar/2014/ryn/011.pdf

Nordic Council of Ministers. (2008). *Education, creativity and entrepreneurship in an era of global change: Programme for the Icelandic presidency of the Nordic Council of Ministers in research, culture and education*. Copenhagen: Author.

OECD. (2009). *Evaluation of programmes concerning education for entrepreneurship: Report by the OECD working party on SMEs and entrepreneurship*: OECD working party on SMEs and entrepreneurship.

OECD. (2010). *Ministerial report on the OECD Innovation Strategy. Innovation to strengthen growth and address global and social challenges: Key findings*. Paris: Author.

Sanders, D. & G. McCutcheon. (1986). The development of practical theories of teaching. *Journal of Curriculum and Supervision, 2*(1), 50-67.

Shavinina, L.V. (2013). *The international handbook on innovation*. Amsterdam: Elsevier Science.

Thorsteinsson, G. (2012). Innovation Education to improve social responsibility through general education. *Tiltai, Bridges-Brucken, 4*(61), 71-78.

Thorsteinsson, G. (2013). Ideation training via innovation education to improve students' ethical maturation and social responsibility. *i-manager's Journal on Educational Psychology, 6*(4), 1-7.

Yin, R. K. (2009). *Case study research: design and methods* (4 ed.). Thousand Oaks: Sage

Svanborg R. Jónsdóttir. (2018).
Exchanging curriculum ideas for 21st century education: Australian ‚technologies' and Icelandic ‚innovation education'
Netla – Veftímarit um uppeldi og menntun. Menntavísindasvið Háskóla Íslands.
Sótt af http://netla.hi.is/greinar/2018/ryn/07
DOI: https://doi.org/10.24270/netla.2018.7