A survey on students design decisions in Design and Craft education in Icelandic schools

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The research project was carried out in the Icelandic elementary school, in 2009–10. It explored the role of teachers and their understanding for the importance of students' autonomy in decision-making when they are at age 12–14. The project examined the congruity between decision-making opportunities included in national curricula and how teachers understand the relationship between such curricula and practice. Data was collected through semi-structured interviews with teachers in Icelandic elementary schools and from the researchers' reviews of the national curricula. Findings were compared and conclusions drawn. This study articulates teachers understanding of their practice. The article considers some possible improvements to practice in design decision-making within the Icelandic Design and Craft education.

Keywords: method, sloyd, design and craft, interviews, phenomenography

Background and theoretical perspective

National curricula for general education, in many countries, aim to increase children's ability to make their own decisions (Davis, 2004). Design and craft education as part of general education in many countries, offers decision-making opportunities through designing and making activities, which can enhance students' skilfulness in making their own decisions in daily life. Despite the importance of the improvement of decision-making skills in young children, few research studies have identified the importance of the teachers' role in guiding children. The current study explores the beliefs and attitudes of design and craft teachers' from Iceland about their practice with children while taking design decisions. The research is at an initial stage and may lead to a wider study of practice in this area. The article presents findings concerning teachers' understanding and attitudes towards their capability to support the development of students' design decision-making skills. Research outcomes concerning teachers' reports of their implementation of curriculum in order to increase students' skills are also given. As the foundation for an action research programme, this study was conducted to establish a starting point founded on current best practice. It is

important to understand how the national curriculum and practical issues may affect teachers' ideas about decision-making. The article firstly explores the theoretical background about decision-making, and then looks at the specific model for design and craft education, a technological subject in Iceland. The objectives in the different curricula are reviewed and the methodology for the enquiry is described. The outcomes of interviews with teachers are then reported and discussed. Decision-making refers to choosing between possible alternatives and this process is part of everyday activities. In design and craft many activities include alternative choices that might affect the outcome (Jimenez-Aleixandre & Pereiro-Munoz, 2002). Kortland (1996) identified rational decisions as reasoned choices, built on criteria that are not formulated from the beginning, but developed in interaction with the evaluation of the choices available.

Many research outcomes relevant to decision-making come from the area of cognitive development (Sternberg, 1996; Birnbaum, 1998; Baron, 2000) or the areas of operational research, economics and management (Bazerman, 2005; Gibson et. al., 1997). In the field of educational research, decision-making strategies have only recently gained significant attention, with most of the studies related to science education (Patronis et. al. 1999; Kolstø, 2001). In design and technology focused education, there exist few studies concerning decision making (Davies, 2004; Coles & Norman, 2005, Mettas & Constantinou, 2006a; Welch, Barlex & O'Donell, 2006). Davies (2004) argues that children's design decisions play an important role in developing their understanding of the relationship between technology and society. Coles & Norman (2005) suggests that values have an important role in design decision-making. Mettas & Constantinou (2006b) explore the development of decision-making skills of pre-service teachers through a Technology Fair project. Welch, Barlex & O'Donell (2006) investigated elementary students' beliefs about designers and designing with an emphasis on design decisions. In design and craft decisions are required almost at every step of designing; when we are evaluating alternative solutions or we are selecting from the range of appropriate materials we have to make decisions quickly and effectively (Davies, 2004). Such decisions relate to the kind of materials and processes to use, the kind of artifact they produce, whether their proposed solution involves hazardous processes, or will have features that might be dangerous for the user of the product (Middleton, 2005). During the development of the solution, values are an inescapable, if not always an overt part of the learning activities (Coles & Norman, 2005). Decisions could be affected by preferences, opinions, emotions, cultural characteristics etc, and therefore technological activities can rarely be entirely free of value judgments. Very frequently technological decisions are not straightforward, i.e. there is no option that fulfills all the requirements better

than others. For example, Prime (1993, p. 32) argues that: 'Technology often poses real ethical dilemmas in which there are no obvious right answers or altogether satisfactory solutions. In such cases the challenge is to weigh all relevant contextual factors and to be guided by the values deemed to be more important in that situation.' Kimbell et al. (1996, p. 25) pointed out that in technology education programs, "little attention has been given to the discursive practices of justifying trade-offs, arguing for selection among alternative acceptable solutions, or persuading collaborators to contribute to a specific line of work". Therefore there is a need to investigate in more depth how children actually take their design decisions and how teachers support them during that process.

Data collection and empirical investigation

The Icelandic 'Craft' subject was re-established as a new technological subject in 1999, based on a rationale for technological literacy, innovation and design. The new subject 'Design and Craft' was influenced by the national curricula of New Zealand, Canada and England and a specific Icelandic model for Innovation Education. Design and Craft education is compulsory for all grades 1–8 (ages 6–13), but optional for grades 9–10 (ages14–15). In the subject students base their ideation on authentic problems and design and make their artefacts from resistant materials and they design systems based on electric/electronic circuits, mechanisms, pneumatics and structures.
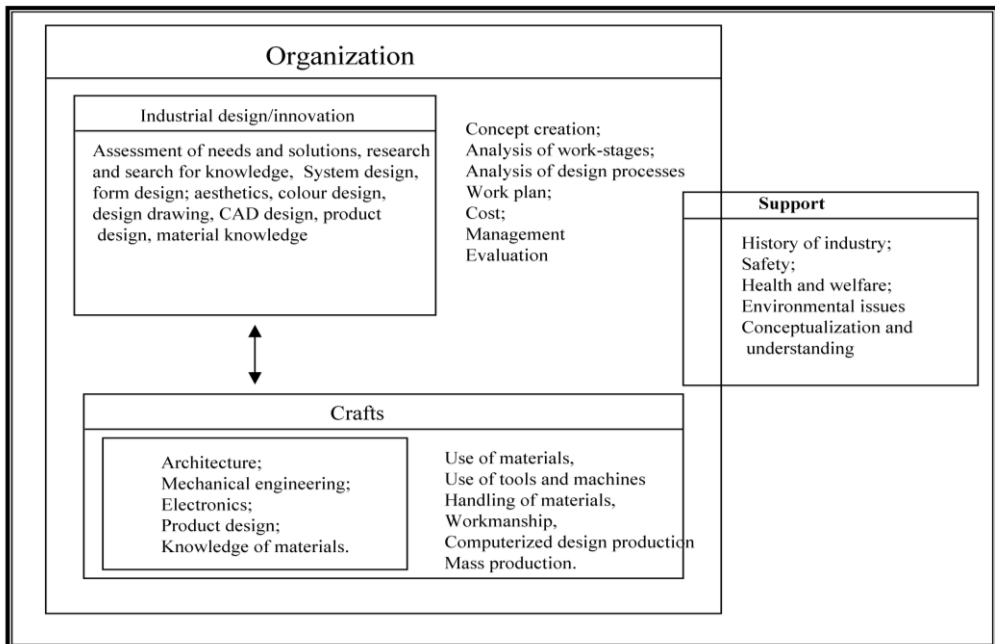

Figure 1. The figure shows the infrastructure of Design and Craft in Iceland

The research questions of the study were:

1. What decision-making opportunities are included in design and craft curricula in Iceland?

2. What decision-making opportunities do teachers in Iceland give to children when working on design and craft activities?

Methods and analysis

The study was carried out in two phases. The first phase included the review of the design and craft curriculum and the second phase included interviews with six teachers in order to shed further light on some areas of practice. These semi-structure interviews were designed to explore issues like teachers' implementation of national curricula, the effect of books and other sources of information on children's design decisionmaking, and the ability of children to set criteria for evaluation and to transfer skills to other areas of life. The semi-structured interviews were conducted in 7 Icelandic elimentary schools and analysed by the researchers in the light of the national curriculum for design and craft.

A common schedule was constructed for the interviews based on literature review and observations of documents from the teachers' classes. The aim was to explore the attitudes and strategies that under-pinned their practice. The interviews were recorded on a digital recorder and transferred to a computer, in order to facilitate the process of analysis. Recording interviews can potentially make the respondents less relaxed, but has the advantage of preserving a more complete record of the interview than would be possible when taking notes (Smith, 1995; Willig, 2001). The research was conducted through a phenomenographic approach because of its appropriateness to the investigation of a phenomenon such as decision-making. Phenomenography aims to describe, analyse and understand the ways in which people experience aspects of the world around them. The point of departure that sets apart this approach from many others, is the principle that phenomenography seeks to investigate neither the phenomenon, nor the people who experience the phenomenon, but the relation between the two. The results of a phenomenographic study are presented as a description of all of the possible conceptions that a specific group can have about a particular phenomenon (Marton & Booth, 1997), in this case children's decision making capabilities in design and craft classes.

The authors conducted semi-structured interviews with openended questions with seven individual teachers. Four of the selected teachers were in the early stages of their career with sufficient experience to understand current practice in this area,

but still formulating their own perspectives. This was considered to be the group most likely to reveal both current practice and those areas of it that were less securely based.

Presentation of results

Two major outcomes emerged from the research are related with the decision-making opportunities within the design and craft curricula in Iceland and the major findings from the interviews with teachers. Design and craft in the curricula in Iceland. The role of technological knowledge plays a more significant role curriculum and the focus on design opportunities and innovation. Some representative objectives for each level were selected and presented in the following tables in order to indicate the different requirements.

Table 1. Objectives from the Icelandic National Curriculum

12 years old	13 years old	14 years old
Be able to work independently through a design process.	Think about the value of artistic outlook in their design when they make their choices.	Take ergonomic issues into account when they make their design decisions.
Identify needs and problems in their environment before taking their design decision.	Define a need and establish a main concept and develop it by focusing in its functionality and usefulness in the society.	Work though a design process based on own specific concept. They should be able to discuss their work with their co-students when making their design decisions.
Base their design decision on solving a need and design an artifact to show the outcome.	Identify needs and problems in society though own observation before choosing their solution.	Show initiative and be autonomous in their design work. They also have to be able to seek for and apply knowledge by using ICT.
Make their own design drawings in order to come to a decisions about possible solutions.	Show their chosen solution in a form of an artifact made from solid material.	Take sustainability into account in their design decisions.
Base their design choices on technical solutions and focus on the artifacts functionality.	Make design drawing of his/her solutions when making their choices.	Evaluate their design and be able to argue about its quality.

The interviews were analysed with the phenomenographic approach developed by Marton (1981). Phenomenographic interviews are typically tape recorded and

transcribed verbatim, making the transcripts the focus of the analysis. Phenomenographic analysis is often described as a process of 'discovery' (Hasselgren & Beach, 1997), in the sense that the set of categories or meanings that result from the analysis cannot be known in advance but must emerge from the data through the analysis; a process clearly influenced by the values of the researchers themselves. Teachers' ideas about children's decision-making capabilities were analysed and categorised in relation to the research questions. The main similarities and differences both between teachers from the same, and from different countries, are presented below.

From the analysis of the results it can be observed that during the first stages of the elementary school teachers set quite rigid tasks to children that give very few decision-making opportunities. Teachers believe that young children need to work with very structured tasks in order to gain basic designing skills. As they progress they are giving more complex tasks and more choices, therefore providing more decision-making opportunities to children. For example a teacher said: "I have more requirements from older students as they have learned working with design and craft processes, but with younger children most of the times the project is mainly driven by the teacher".

Most of the design decision was related to outlook rather than the function. In all cases the initial projects had been pre-defined by the teacher and the student's freedom to take their own design decisions limited. However, in some cases the students were given opportunities to modify the form. In the following projects the students were given more freedom and both allowed designing the form and decide the technical solution. One of the teachers said: "It is easier for the teacher to decide the design in advance and let the students play with the form. The students find it easier."

Teachers expressed the belief that the curricula include decision-making opportunities, but in practice it is difficult to apply those decision-making opportunities with children due to many limitations (time, resources and children's abilities). For example one teacher complained about too little time for the subject in order to train the students according to curriculum requirements, e.g. "The curriculum is too complicated and asks for too much of the teacher as the time is too little". One important element before any decision-making is the ability to seek information in order to improve their knowledge to support the design decision. The teachers were using the internet as the main source of information, but said there was a lack of on-line teaching material. The teacher seems to have a less important role as a source of information within Icelandic education.

According to teachers the majority of books that are in use in design and craft classes do not include many decision-making opportunities. Some of the teachers were using English design and craft books but they reported the difficulty for children in collecting information autonomously from the books. For example a teacher said: "Some of the students like me to explain for them how to do everything before they start. Sometimes I help them too much but I have to get them started".

Teachers believed that children have many difficulties in setting appropriate criteria in order to evaluate their available options. For example when children are asked to evaluate possible options it is very difficult for them to set any criterion further than attractiveness. One teachers' referred to the innovation part of the curriculum as an area where it was very helpful for students to use criteria based on problem-solving. They also express the idea that students use the internet to help them specify criteria, for example a teacher said: "Many establish their criteria by using the internet and look inside of themselves to find want they want to make". During interviews all teachers identified some difficulties that children face in their effort to make rational design decisions. One teacher mentioned the importance of training the students and being connected to the innovation part or the curriculum. One of the teachers said: "After I started to train the first classes in idea generation it became easier in later classes."

None of the teacher had been specifically training students in design and to make their own design decision. However, some of them had given lessons in technical drawing. Students were encouraged to search in books and at the internet for ideas. In most cases students were asked to make few sketches of the form before their makings. However, students are most often impatient and want to start their makings. One of the teachers said: "I tried to use the first lessons for design drawings but it was difficult as the students wanted to start their makings."

In all cases the teachers stated most students find it difficult to make their own design decisions but are happy with their own designs. Some student always copy the teachers example. Active students initiative encourage the passive students to start making their own designs. One of the teachers stated: "Too much freedom makes it difficult for the teacher to manage the class."Four of the interviewees described big differences between students groups at same age. Some of the groups had big initiatives and were creative when others wanted to follow the teachers own decisions. Teachers seemed to feel unsure as to whether decision-making skills were learned within design and craft classes. However, all of the teachers agreed that students training in design decisions were practical skill in all areas of live. One teacher talked about creative thinking as a very positive life skill. A

teacher said "I don't know, this has to be researched in more depth mainly by the academic researchers".

Reflection

From the review of the curricula it can be observed that the national curriculums are framed in process terms. Designing and making provide the philosophy of the curriculum, from which knowledge is supported. The national curriculum specifies less design decision requirements and relies more on a general form of a design process with the emphasis on innovation. During children's early designing activities, aesthetics of the product seem to be more important than the manufacturing or the construction of the product. This outcome is acknowledged by the teachers.

Teachers expressed the opinion, that some children expect everything to be done for them and that they are not used to thinking for themselves and therefore find decision-making difficult. They use their past experiences from previous years and their textbooks to decide mainly about the appropriate materials. According to some teachers as children progress, they should be given more decision-making opportunities to identify their own tasks and activity, and should use their knowledge and skills to make decisions which are more complex, or satisfy more demanding needs. This outcome was observed as well in earlier research by Webster (1990) in a comparative study between design and craft in England and France. Most of the teachers do not offer any kind of formal instruction on decision-making techniques to their students. It seems that children are expected to take design decisions without being given any training to develop this complex skill. One teacher said during his interview: "I am not giving them any formal instruction, just some general guidelines that they have to follow in order to make effective choices".

The majority of children rarely search for information outside the class before taking their design decisions. The main source of information for the children is their teacher and this is more obvious at younger ages (age 11–12) than later on (age 14–15). However, teacher said that their students use the internet as the main source of information for their design decisions. Other sources of information that children use to support their decisions includes, peer influence, existing designs from previous students and technical books. An obstacle that children face during decision-making is their inability to set appropriate evaluation criteria for their design decisions. This difficulty was identified in previous research (Mettas & Constantinou, 2006a) with slightly older students (age 18). Another difficulty

identified from the research is the lack of motivation that children might have during decision- making. Children do not acknowledge the importance of spending time on designing their project and they like to move to the making part.

It is likely that explicit teaching of decision-making skills by teachers might enable children to develop their ability to handle complex design decisions earlier, although the challenge remains as to how such designing can be developed to provide the same motivation as making. Decision-making skills are an important part of our everyday activities. Therefore general education should give the opportunity to children to develop such skills. Despite the small sample of the study some interesting conclusions can be drawn.

From the results of the study it can be concluded that curricula in Iceland include many opportunities for decision-making in design and craft classes. However in practice teachers believe that some of the requirements of the curricula are not feasible to apply. Another potentially significant outcome for curriculum developers is that children very rarely search for information, or set appropriate criteria to support their design decisions. Children rely on teachers and past experience in order to reach decisions, and explicit requirements to develop decision-making capabilities could well improve the curricula in all three countries. Associated formal training in decision-making techniques might also improve the quality of children's decisions during design activities.

Another important issue is that there is a positive motivational effect when children take design decisions, and there is an improvement in their participation in their design project, when it is something meaningful to them. This finding echoes those of many other researchers. This study is the first phase of a larger research project that aims to improve our understanding about children's decision-making capabilities in design and craft education and researchers from other countries would be welcome to join our efforts in this important and complex area.

References

Baron, J. (2000). *Thinking and Deciding*. (third Edition). New York: Cambridge University Press.

Bazerman, M. (2005). *Judgement in Managerial Decision- making* (sixth edition). John Wiley& Sons.

Birnbaum, M. (1998). *Measurement, Judgment and Decision- Making*. San Diego: Academic Press.

Cohen, L., Manion, L. & Morrison, L. (2001). *Research Methods in Education* (fifth edition). London: Routledge.

Gibson, F., Fichman, M. & Plaut, D. (1997). Learning in Dynamic Decision Tasks: Computational Model and Empirical Evidence *Organizational, Behaviour and Human Decision Processes, 71*(1) 1–35.

Coles, R. & Norman, E. (2005). An exploration of the role values plays in design decision-making, *International Journal of Technology and Design Education, 15*, 155–171.

Davies, L. (2004). Planning, managing and teaching decision- making for 11–14 year olds, In I. Mottier & M. de Vries (Eds.), *Proceedings of 14th PATT conference*. USA: New Mexico.

Hasselgren, B. & Beach, D. (1997). Phenomenography – A "good-for-nothing-brother" of phenomenology?' *Higher Education Research and Development, 16*, pp. 191–202.

Jimenez-Aleixandre, M.P & Pereiro-Munoz, C. (2002). Knowledge producers or knowledge consumers? Argumentation and decision-making about environmental management. *International Journal of Science Education, 24*(11) 1171–1190.

Kimbell, R., Stables, K., & Green, R. (1996). *Understanding Practice in Design andTechnology*. Philadelphia: Open University.

Kolstø, S. D. (2001). To trust or not to trust- pupils ways of judging information encountered in a socio-scientific issue, *International Journal of Science Education, 23*(9), 877–901.

Konold, C. (1995). Social and Cultural Dimensions of Knowledge and Classroom Teaching. In P. L. Steffe & J. Gale (Eds.), *Constructivism in Education*. New York: Lawrence Erlbaum Associates, Publishers, Hillsdale.

Lewis, T. (1996). Comparing Technology Education in the U.S. and U.K. *International Journal of Technology and Design Education 6*, 221–238.

Marton, F. (1981). Phenomenography – describing conceptions of the world around us. *Instructional Science, 10*, 177-200.

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