

# **Defining Craft Quality Theory Framework in Sloyd Education**

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*Constructing a unique craft quality theory for artifact production is an essential part of sloyd teacher students' research studies during which students are faced with establishing the perspectives of craft methodology for the master's thesis. The student's craft quality theory construction is based not only on his inherent needs or problems with the product and process but on constructing and testing the theory as a whole. To construct a craft quality theory based on the discipline knowledge of sloyd education, the student shall define the values representing the craft as well as its unseen qualities. The purpose of this article is to describe the perspectives sloyd teacher students (N69) apply to craft quality theory construction in their master's theses. The perspectives applicable to constructing a craft quality theory are based on the idea of educational growth towards research-based crafts teachership. The main results constitute the analyses of students' craft research tasks and craft quality targets defined as theory constructions. In conclusion, the results are compared to the perspectives in theory construction in the capacity of a craft quality theory framework.*

Keywords: method, sloyd, teacher students, master's theses, phenomenography

## **Background and theoretical perspective**

The aim of this article is to describe how sloyd teacher students (N69) construct a craft quality theory for their masters' thesis prepared at the University of Turku, Sloyd Teacher Education in Rauma. In their theses, students have constructed a craft quality of their own, testing it with a uniquely produced artifact in its usage target. So, each craft quality theory (CQT) is uniquely constructed for the purposes of each research case as a whole. CQT constructing comprises two foundational parts: 1) Defining the Craft Task embodied in the value and risk analysis of craft, and 2) Theory Formulation defining the craft qualities. These two parts form a CQT framework. The research task is titled *How students' CQTs manifest themselves in the master's theses*. To a certain extent, the perspectives of CQT construction are always associated with the student's educational growth towards

craftsmanship as a craftteacherhip during sloyd teacher education (Metsärinne, Kallio, Kullas & Pirttimaa, 2010).

The research task is studied in five parts. This chapter explores the theoretical perspectives of CQT, Chapter 2 defines the research questions and Chapter 3 comprises the method and analyses while Chapter 4 describes the results of the empirical study. The discussion forms the CQT framework, showing how it is linked into students' growth towards research-based crafts teachership. The knowledge to produce craft features the true sense of craft while the knowledge of design and technology is the other part of it, formulating a general question of "*How does the craft characterise the essence of SE subject knowledge?*" Hence, the pedagogical knowledge raises the question of "*How can a teacher student use the CQT for teaching in future?*" Together they form the 'teacher knowledge' (cf. Banks, 2008). Teachership cognition may be divided into (i) Declarative (knowledge that), (ii) Procedural (knowledge how), and (iii) Control Function. (Chester, 2007, p. 26). The latter can be compared to Hope's idea (2009, p. 50), i.e., '*know how*' and '*know that*' contributing to the strategy knowledge required to conduct any technological activity. Strategy knowledge can be compared with control function or regulatory knowledge (Schraw, 2006, p. 245–246). So, Ryles' (1949) classification of '*knowledge that*' is based on a student's quest and search for a research task and '*knowledge how*' is based on his ability to apply the knowledge of craft to the knowledge of new qualities of the craft. They outline the strategic knowledge, formulating the CQT for the purposes of crafts teachership. The hypothetical perspectives of CQT construction are: (i) Craft Sense Method, (ii) Product Planning Methods (iii) Methods of Product Development and (iv) Factual Problem as the research task itself. The perspectives are based on the levels of logic (Peltonen, 1988) and the models of sloyd education (Metsärinne, 2007).

The Craft sense method comprises an individual's intention of his own transaction-driven life position which envisions a product vacuum (Metsärinne, 2007). Peltonen (2002) has introduced the basic elements of the craft sense method. The following are short and modified descriptions of the method. (Cf. Metsärinne, 2009a, 2009b): 1) Gestalt: life situation envisioning and obtaining the knowledge of research interest; 2) Existence of Artifact Envisioning: defining existential conditions of invisible artifact envisioning; 3) Artifact Qualities: envisioning and formulating artifact qualities; 4) Artifact Criteria Defining; 5) Artifact Dimensions: clarifying artifact criteria to measurable dimensions; 6) Research Problems are derived from elements 1 and 2 in order to define the research task. They are linked to elements 3, 4 and 5, which construct an artifact quality theorem for producing the artifact and for testing the theorem by artifact functions.

*Product planning methods* in SE are typically linear models (Oakley, 1990, p. 10 and Lindfors, 1992), two-dimensional models (Cross, 1977, Lawson, 1983) and a spiral model (Zeisel, 1981, p. 14). Yli-Piipari (1991) has associated product planning models with various problem solving methods used in SE. A very well-known model is Anttila's (e.g. 1993, 1996, p. 150) theory model of craft and design planning and making. As distinct from product design, product planning (product development likewise) generally focuses on the product, adding valuable qualities to it. Design is a more general phenomenon of managing the constructed environment (cf. Parsons, 2009; Cross, 2007; Koskinen, Battarbee & Mattelmäki, 2003; Valtonen, 2007; Julier, 2008; Kaukinen, 2005). Design is also compared with 'craft', the major difference being in the way of argumentation and the language (Rees, 1997, p. 130–135). Craft planning in SE is supposed to follow different product planning models to create a CQT, for example, by defining the usage target, atmosphere and place. That can be considered as a composition and a construction space in craft. (Seitamaa-Hakkarainen, 2000) All artifact planning is based on a combination of a craftsman, material design and making process of the craft in a certain culture and time with the given knowledge of sciences (Kaukinen, 2002, 2003). In the professional industrial context, planning appears as a kind of predefinition stage for the development process (Ulrich & Eppinger, 2000).

Product planning and *product development* are often used for the same purpose. In SE the perspective of craft development appears to be based on the certain usage target of the artifact. It is a question of searching for a solution to a certain predefined case, such as bettering a quality of the artifact(s). In the professional artifact developing process there is plenty of special craft knowledge that can define a CQT. However, special craft is related to the manufacturing of a specific kind. For example, material and immaterial product development has been connected to the systems of innovation, business as well as social and digital networks (Valtonen, 2007). Different dimensions of the product, such as economy, social context and technological factors, should be taken into account, and special emphasis should be placed on such dimensions when developing the product for its usage target (Cagan & Vogel, 2003). When development is business orientated, for example, the objective is to get economic value while developing artifacts may equal developing a brand (Lindström, 2005). Technology-orientated development is based on the engineering knowledge to improve products systematically (Petroski, 1997). Finally, the product as a basis to define qualities in CQT is anchored to the user and the usage target. The qualities have to be defined in a multi-dimensional and methodological way encompassing the aspects of human emotions and needs as well as technological facts. (See Koskinen, Battarbee & Mattelmäki, 2003; Papanek, 1985, etc.) In certain constructions, innovations and

the innovative work itself are value as such (Kelley & Littman, 2006; cf. Jokinen, 2001). It is useful to connect it to team work and cooperative learning (Siltala, 2010).

*Problem based* craft is not involved in any particular method. Usually it consists, for example, of a predefinition of the research area using a literature overview and a pre-evaluation of the prospective research problem (cf. Anttila, 2005). In other words, the problem is specified exactly within the subject area of SE and it needs no further discussion but a deep insight into the qualities of the subject area.

To sum up, the above perspectives pave the way for composing a CQT. When students have defined the CQT it must be tested by producing an artifact and evaluating the theory in the usage target. In many cases, a few empirical tests are carried out in school, too.

### **Data collection and empirical investigation**

The research task was to study how students' CQTs manifest themselves in the masters' theses. The task was based on the hypothetical framework of reference perspectives and it was carried out, using two research questions. The first question analysed students' research tasks focused on the CQT perspectives. The second question analysed their theory formulation, based on the results from the first question. The research questions were:

- 1. What kind of research tasks do the students define in the perspectives?*
- 2. What do students' CQTs manifest in the way of the perspectives?*

The SE master's theses of this sample (N69) were collected at the University of Turku in Rauma, and the study was supervised by three teachers in 2005 - 2010. For validity, an equal number of theses were selected from each supervisor. One of the supervisors had 23 theses in total and they were all taken into the sample. Consequently, from the other two supervisors, another 23 theses were randomly selected 23 to amount to 69 in all. Master's theses are usually prepared in pairs while some of students work individually.

### **Methods and analysis**

Phenomenography research means phenomenon describing (graphic). It studies humans' comprehension of different phenomenon. In the research method each of the students' CQT have a knowledge phenomenon of their own. In the method the

aim is not to understand them as such. The research phenomenon is formed so that we have considered CQT cases as a whole meaningful comprehension in SE context. (Uljens, 1989, p. 7, p. 62–63.) This is to use concepts similarly and avoid misunderstandings. (Marton, Dahlgren, Swensson & Säljö, 1980). This research can also be conceived in ex-post research methodology to yield useful information on the nature of a phenomenon. Although one cannot say with confidence that the student's research task depends on the theory formulation for crafting, it is nevertheless customary to designate the variables of a task as independent and the theory formulation as dependent. (Cohen, Manion & Morrison, 2000, p. 208–209.) The first stage is followed by a clear and precise statement of the research questions to be answered; hence the phenomenography method better describes the methodological wholeness in this study.

The phenomenon is formed from researchers' external world because of the data but also from researchers' inner world and their own research interest in and experience of SE. Experiences are involved both in external and inner phenomena. Finally, the comprehension is like a picture of the research problem. It is formed from the experience and thinking. (Marton, 1994) It is important to realize that one cannot make a different objective reality from representations. One only develops a subjective world from the experiences. There is only one world which appears as different habits in each human's comprehensions. (Marton, 1988) In this way phenomenography produces no factual knowledge but evidence and a kind of sample knowledge. This connects it strongly to the qualitative research tradition (Alasuutari, 2001, p. 114) and without exception it produces qualitative phases of doing phenomenography research (Uljens, 1989). In this study the methodology is formed in four phases (Syrjälä, Ahonen, Syrjäläinen & Saari, 1996). In the first phase, we go deeply into the research object, discussing and guiding students in their master's theses studies (Metsärinne, 2009a, b, c) and using other research studies supervised by the researchers in SE. There is disconcerting comprehension between some craft concepts of work and research based craft concepts. Therefore and due to earlier studies of the research object (Peltonen, 2002, 2003; Metsärinne, 2007a, b, c), a preconceived idea of the phenomenon of four methodological perspectives was formed. Also, it is one positive validity matter of the subject management based research. Similarly, there is a problem because researchers cannot easily abandon their deep-seated comprehension and set their mind on a phenomenological open basis of phenomenography. In the second phase, the idea of the phenomenon is conceptualized on perusal of literature. In the third phase, the research data described in the following chapter is collected. Usually this done by interviews about phenomenography. In the fourth phase, the categorization is mostly based on vertical and horizontal categorization. (Marton, 1988, p. 141–

161). Vertical categorization has two criteria. First, one establishes how many master's theses are put in each category and how many of them are linked together over the categories. Second, one studies the consecution of theory construction and the theory in proportion to the task of the student. On the basis of the criteria, the first question is answered. By horizontal categorization, one describes different conceptions of qualities and their implications for CQT, getting an answer to the second question. In addition, some hierarchical categorization is suggested but ranking the theses is not in order. Hierarchical categorization is only linked to Chapter Reflection, because in education it is strongly related to all aspects of pedagogical thinking (Kansanen, 1995).

### Presentation of results

In Figure 1 the results of the first question are summarized and presented with reorganized perspectives.

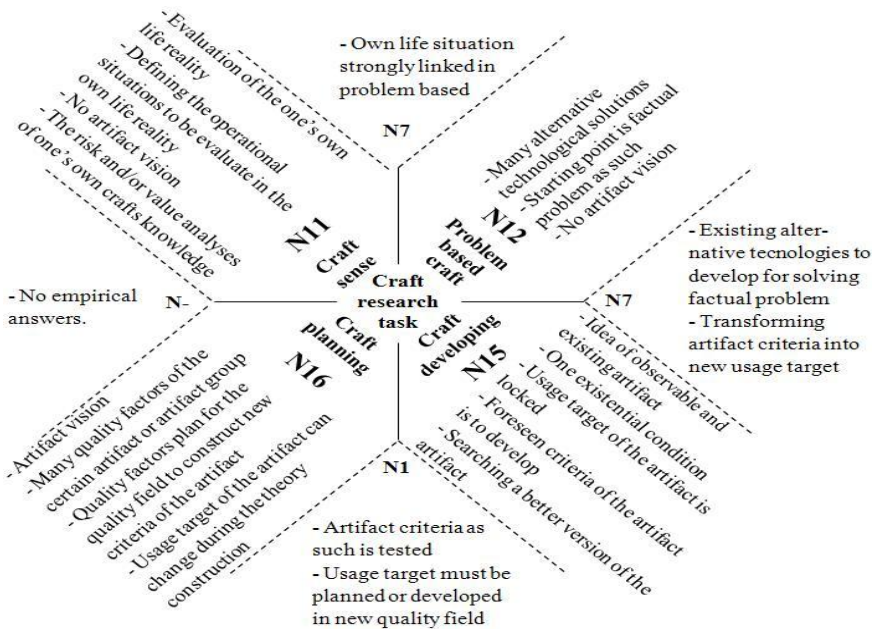


Figure 1. Results of Question 1: Summary table of perspectives.

The research tasks for 54 theses were established within the hypothetical reference perspectives on method while the other 15 were borderline cases. Table 1 introduces each perspective with examples. The second question is based on the

results of the first question: “What do students’ CQTs manifest in way of perspectives?” It is introduced in Table 2 and Figure 2.

*Table 1. Example of each perspective and its borderline*

<p><i>Problem based perspective (N12). Example:</i> Research task was to plan and produce material for sloyd/technology education in comprehensive school. Theory formulation was based on knowledge of material technology and education. Research problem was derived from the original problem: how to illustrate material mechanics to pupils?</p>
<p><i>Craft developing perspective (N15). Example:</i> The research task was to develop work safety of the surface planing machine in comprehensive school. The task leads to define qualities for the new unique version of safety equipment. For that students’ had to search and collect knowledge of comparable market products with theory formulation</p>
<p><i>Craft planning perspective (N16). Example:</i> The research task was to design and produce a teaching material for primary school sloyd design teaching. The solution was defined by envisioning a Power Point based digital material with design tasks for pupils. The conditional criteria for the produced material were searched through exploring the knowledge of sloyd subject, design concepts, individual learning and teaching theories. The aim of the teaching material is to contribute learning design skills in primary school and to give better abilities to do in sloyd design when moving up to grades 7-9.</p>
<p><i>Craft sense perspective (N11). Example:</i> The researchers were interested in how teachers and pupils are motivated in sloyd. Different tasks of sloyd subject were discovered and their values were evaluated and compared into the theories of motivation and the own experiences of the researchers. Especially the project sloyd teaching concept is connected to motivation. That idea of new concept of motivating in sloyd teaching was defined.</p>
<p><i>Borderline perspective of craft development and problem based craft (N7). Example:</i> In this study the researchers developed illustrative teaching material and connected it into teaching solid geometry. There were some market solutions in this area, but not suitable for the purpose. To develop them the researchers started with problem of illustrating solid geometry in teaching.</p>
<p><i>Borderline perspective of craft development and craft planning (N1). Example:</i> As an interesting example of connecting these perspectives we found a thesis where the researchers searched a new version of compost, but by using old useless refrigerator. The task of the research is clearly to make better compost, but not any observable artifact of the new version exists. Criteria of the usage target have been changed. Artifact criteria as such is the same but the usage target is reconstructed in new quality field. The new quality field must be constructed to the new criteria of unique artifact.</p>
<p><i>Borderline perspective of problem based craft and craft sense (N7). Example:</i> In this study the problem is connected into researchers own life reality by comparing the problem area into the knowledge finding and analysis. Drawing a circle on the blackboard appears as a common problem. It is as well in close connection with the life reality of the researcher as a future sloyd teacher or some other purpose of his life. Some technological alternatives of the forthcoming artifact as well as risk / value analysis of them are discovered to set the research problem.</p>
<p><i>Borderline perspective of craft planning and craft sense (N-). Explanation:</i> Craft planning is in connection with the usage target through artifact envision. It provides so much knowledge of the usage target that one does not return to apply value and risk analyzes of research task. In individual point of view it is a question of defining craft in one’s own life situation or some craft planning areas outside of it. Therefore it is obviously very difficult to theorize them together – none of the theses in this study.</p>

Table 2. Illustration of each perspective

<p><i>Craft planning perspective (N16). Example:</i> In the category of craft planning all the theses were in the area of education. They were generally (N15) planned to support pupils' learning, only one (N1) thesis was to help teacher in his presentation for pupils' parents. General (N13) solution was to test the CQT by constructing unique digital multimedia learning or teaching technologies. Comparing to general models of design craft models the difference was in the coherent connection to the research based educational task of them. However a strong connection to the knowledge of product planning models and processes is presented in the CQT of the theses.</p>
<p><i>Craft development perspective (N15). Example:</i> In the perspective of craft development students had developed some existing technological tool or system. Majority of the theses in this category dealt with educational technology (N10). All the technologies were connected especially to the sloyd teaching context but not in the context of general education or other school subjects. Other theses (N5) had an idea of professional product development means with some extraordinary challenge like developing a new intake air filter unit for industrial oxygen production (figure 3). In all theses the CQT had qualities of a unique material artifact. The artifacts had some inventive new mechanical solutions. In constructing CQT of the theses a large area of the knowledge of engineering sciences has been explored.</p>
<p><i>Problem based craft perspective (N13). Example:</i> There were several different usage targets for the unique artifacts constructed to test CQT of problem based craft. Majority of the theses were for educational means (N9) and the others (N3) were for some other professional means. There were for example observational instruments (N3) and different aids for education in the context of teaching especially sloyd (N3) and other school subjects (N2). In the CQT there were a large view to apply knowledge of technological combination.</p>
<p><i>Craft Sense perspective (N11)</i> was constructed in all areas of life. <i>Example:</i> There were a model to apply traditions of craft into the education, two solutions for improving safety culture in the context of sloyd education and model for teaching home technology through wide-range technology construction. To sum up, the idea of craft sense seems to have a connection to the growth of internal motivation of crafting. It has lead students to explore complex knowledge of multiple sciences when constructing their CQT. This has lead students to research different areas of life and evaluate the values and risks of their crafting in them.</p>



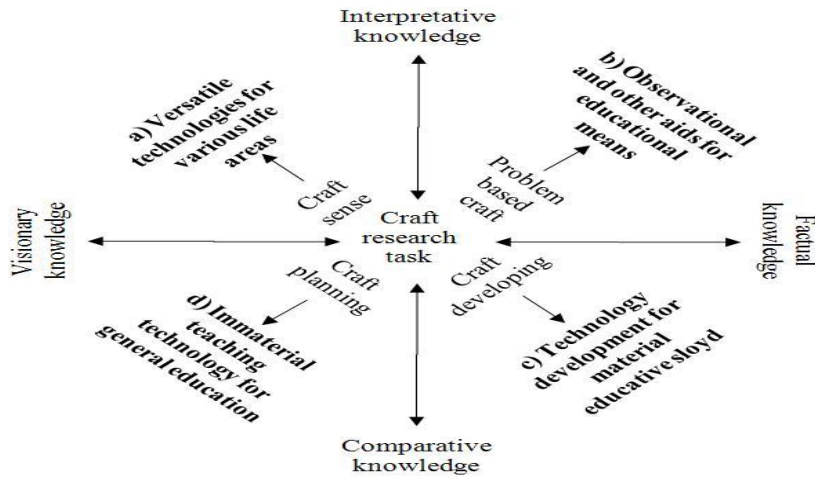


Figure 2. Summary of Question 2 (results in bold) with knowledge areas.

According to one result from Question 2, the students' had formulated their CQT for a) versatile technologies for own life situations, b) observational and other aids for educational means, c) material educative sloyd technology development and d) immaterial teaching technology for general education. (Figure 2) The interpretation is that elements a) reveal craft life phenomena, b) reveal craft as observable need, c) reveal craft as certain craft area innovation and d) craft as craft areas combination. Results from Questions 1 and 2 together with the above interpretations appear as the knowledge areas of craft.

## Reflection

The results of this study outline how a CQT is constructed and connected into students' growth towards research-based crafts teachership. According to Kansanen (1995, 2004), teachers' pedagogical thinking is hierarchical. The first level is a Functional level (A in Figure 8) with practical thinking ('knowledge that'). This includes everyday solutions, evaluation and planning. In this study, the functional level is associated with the thinking of the teachers who have earned a master's degree in sloyd education or in teacher education. (See Jakku-Sihvonen & Niemi, 2006). The second level is that of Object Theory (B in Figure 8). It comprises theoretical thinking and content knowledge of the subject as well as pedagogical knowledge of the science of sloyd education ('knowledge how'). The third level is a Metatheoretical level (C in Figure 8). It includes critical evaluation

of the solutions made at lower levels ('strategic knowledge'). In this study the hierarchy appears in each perspective.

On the first level of thinking one generates novel research ideas, thinking of and making technological solutions. On the second level, one constructs a craft task for the CQT, applying the craft knowledge areas of (i) factual, (ii) comparative, (iii) visionary and (iv) interpretative knowledge. On the third level, the thinking illustrates one's metatheoretical profession in craft education research as a whole.

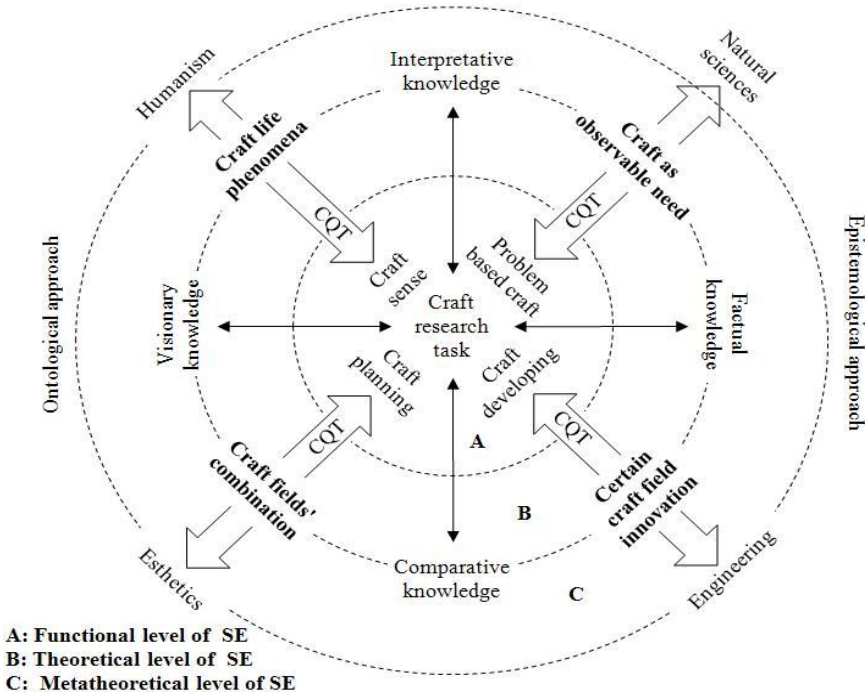


Figure 3. Craft Quality Theory Framework in Sloyd Education

Comparison of visionary knowledge derived from an ontological approach and that of factual knowledge derived from an epistemological approach to craft is clear. (Peltonen, 1988; Anttila, 1996, p. 43–44; Kaukinen, 2003). Yet, the interpretative knowledge comprises analysing one's own life situation with some observable needs of craft. This indicates phenomenon-centered craft. On the other hand, the comparative knowledge involves a combination of craft fields and developing certain craft fields, which directly indicate more about the subjects of crafts than does the interpretative knowledge of craft. Together with factual knowledge the comparative knowledge represents the field of craft by means of which it is possible to apply information of mechanical engineering and product types. It

actively involves the crafts styles, trends and brands in their product making knowledge. From this point of view one's personal and individual CQT construction is secondary in this field. Together with visionary knowledge the interpretative knowledge represents one's own CQT. It is mostly formed from a combination of craft fields or certain needs of personal crafting. That is mostly based on an SE phenomenon centered viewpoint of individual educational growth.

On the metatheoretical level, there is a connection between the results and the concept of craft knowledge in a scientific network. SE is a kind of central crossing point when connecting dimensions of natural sciences, engineering, humanism and aesthetics (Peltonen, 1993). According to this study the emphasis of each dimension is connected to the perspective where the craft research task is being searched for and the CQT constructed. On the metatheoretical level, students' orientation is being directed towards versatile crafts teachership. It remains for further studies to research how the perspectives are connected to sloyd teachers' pedagogical thinking. For example, by emphasising factual knowledge, sloyd teaching may start applying natural sciences to technological solutions related to engineering by observing and developing the solutions. (Metsärinne, 2009d) SE does not lay emphasis only on technology or aesthetics. It needs the knowledge of humanism, arts and general education for developing school sloyd deeply and openly.

Evaluating the (instrumental) values and risks of craft – as well the product and processes of CQT – falls into the metatheoretical thinking. Evaluation of values and risks of forthcoming craft mostly appeared in visionary and/or interpretative knowledge, using the craft sense method. From the point of view of risk management the craft appears not only as producing values but as producing values to hide some risk (Kallio, 2010). This makes it even necessary to evaluate values and risks in every single case. It is a civic concern, too. Everyone is entitled by civil right to receive education against excessively technological somnambulism. (cf. Winner, 1997, p. 57–61) From this point of view, SE has its mission to make teacher students aware of their ability to manage technological environment and make things work. (Metsärinne, Kallio, Kullas & Pirttimaa, 2010; Peltonen, 2001, 2009; cf. Kansanen, 2004, p. 98). The CQT in SE is connected into solving research problems through general phases (i) to search and quest for the craft research task, level A, (ii) to set the craft quality theory by understanding the craft knowledge areas, level B and (iii) to test it with an artifact. The test result is significant on level C only, if the craft research process takes place at every level of thinking. In order to facilitate growth into a versatile research-based crafts teachership, it necessary to lend each perspective to levels A, B and C alike.

## References

- Alasuutari, P. (2001). *Laadullinen tutkimus. 3. uudistettu painos*. Vastapaino.
- Anttila, P. (1993). *Käsityön ja muotoilun teoreettiset perusteet*. [Theoretical basics of craft and design]. Porvoo: WSOY.
- Anttila, P. (1996). *Tutkimisen taito ja tiedon hankinta. Taito-, taide-, ja muotoilualojen tutkimuksen työvälineet*. [Research skill and knowledge acquisition Research equipments of skill-, art- and design areas] Artefakta 2.
- Anttila, P. (2005). *Ilmaisu, teos, tekeminen ja tutkiva toiminta*. Akatiimi. Hamina.
- Banks, F. (2008). Learning in DEPTH: developing a graphical tool for professional thinking for technology teachers. *International Journal of Technology and Design Education. Vol. 18, No.3. 221–228*.
- Cagan, J. & Vogel, C. (2003). *Kehitä kärkituote. Ideasta innovaatioksi*. Talentum Media. Jyväskylä.
- Chester, I. (2007). Teaching for CAD expertise. *International Journal of Technology and Design Education. Vol. 17, No. 1. 23–35*.
- Cohen, L.; Manion, L. & Morrison, K. (2000). *Research Methods in Education. 5<sup>th</sup> Edition*. Routledge Falmer. Taylor & Francis Group. London and New York.
- Cross, N. (2007). *Designerly ways of knowing*. Birkhäuser.
- Hope, G. (2009). Beyond Knowing How to Make it Work: The conceptual foundations of designing. *Design and Technology Education: An International Journal 14.1. 49–55*.
- Jaku-Sihvonen, R & Niemi, H. (2006). (eds.) *Research-based Teacher Education in Finland – Reflections by Finnish Teacher Educators*. Finnish Educational research Association. Research in Educational Sciences 25.
- Jokinen, T. (2001). *Tuotekehitys*. Otatieto. Oy Yliopistokustannus University Press Finland.
- Julier, G. (2008). *The culture of design*. SAGE Publications.
- Kallio, M. (2010). Managing Values and Risks of a Product and a Production by Craft Sense and Safety Sense. In *the conference publication the Insea European Congress*. Traces: Sustainable Art Education. University of Lapland.
- Kansanen, P. (1995). Teachers' Pedagogical Thinking. – What Is It About? In: Stensmo, C. & Isberg, L. (eds.) *Omsorg och engagemang*. Uppsala Universitet. 32–45.
- Kansanen, P. (2004). *Opetuksen käsitemaailma*. PS-kustannus.
- Kaukinen, L. (2002). Concepts and Domains of Craft Sciences, especially in Textiles, Clothing and Craft Design Studies. In Kärnä-Behm, J & Salo-Mattila, K (eds.) *Current Themes in Craft Research. Techne Series. Research in Sloyd Education and Craft Science A: 11. 9–22*.

- Kaukinen, L. (2003). Ajatuksia käsityötieteen ontologiasta. Teoksessa: Virta, A & Marttila, O. (toim.) *Opettaja, asiantuntijuus ja yhteiskunta. Ainedidaktiikan symposium 7.2.2003*. Turun yliopiston kasvatustieteiden tiedekunnan julkaisuja B:72. 307–315.
- Kaukinen, L. (2005). Focusing on the research of design elements. In: Kullas, S. & Pelkonen, M.-L. (eds.) *The relationship of Nordic handicraft studies to product development and technology. Techne Series*. Research in Sloyd Education and Craft Science B: 14/2005. NordFo. Nordic Forum for Research and Development in Craft and Design. 13–24.
- Kelley, T. & Littman J. (2006). *The ten faces of innovation. Strategies for heightening creativity*. Profile books.
- Koskinen, I., Battarbee, K. & Mattelmäki, T. (eds.) (2003). *Emphatic Design. User Experience in Product Design*. IT Press.
- Lawson, B. (1983). *How designers think. The Architectural Press*. London.
- Lindström, M. (2005). *Brand Sense. Sensory Secrets behind the stuff we buy*. Free Press
- Lindfors, L. (1992). *Formgivning i slöjd. Ämneteoritisk och slöjdpedagogisk orienteringsgrund med exempel från textilsöjdundervisning. Rapporter från pedagogiska fakulteten vid Åbo Academi, nr 1*. Institution för lärarutbildningen. Vasa.
- Lindström, M. (2005). *Brand Sense. Sensory secrets behind the stuff we buy*. Free Press.
- Marton, F. (1988). Phenomenography: A Research Approach to Investigating Different Understandings of Reality. In: Sherman, R. R. & Webb, R. B. (eds.) *Qualitative Research in Education: Focus and methods*. The Falmer Press. London. 141–161.
- Marton, F. (1994). Phenomenography. In: Husen, T. & Postlethwaite, T. N. (eds.) *The international encyclopedia of education. Second edition. Vol. 8*. Pergamon. Oxford U.K. 4424–4429.
- Marton, F.; Dahlgren, L. O.; Svensson, L. & Säljö, R. (1985). *Oppimisen ohjaaminen*. Prisma tietokirjasto – psykologia. Amer -yhtymä.
- Metsärinne, M. (2003). *Teknisen käsityön visio-opetus ja -oppiminen. Toiminta- ja tapaustutkimus peruskoulun 9. luokalla*. [Sloyd vision teaching and learning. Case and action research on the 9<sup>th</sup> classes.] Turun yliopiston julkaisuja. Annales Universitatis Turkuensis. Sarja – ser. C osa – tom. 198. Turku: Painosalama.
- Metsärinne, M. (2007). Käsityön oppimisen innovointi. [Sloyd learning innovation] In: Metsärinne, M & Peltonen, J (edit.): *Katosiko tekninen työ Turun yliopistosta? - Käsityön oppimisen innovointi. Techne Series. Research in Sloyd Education and Craft Science A: 11*.
- Metsärinne, M. (2009a). A Theoretical Approach to Artifact Development in Sloyd/technology Education. In: Kaukinen, L. K (Ed.) *Proceedings of the Crafticulation & Education Conference. Techne Serien*, Research in Sloyd Education and Craft Science A: 14/2009. 299–306.

- Metsärinne, M. (2009b). Käsiyökasvatuksen pro gradu-tutkielmien toiminnan tavoitteet. [Functional aims in the sloyd education master's thesis]. In: Metsärinne, M (ed.) *Käsiyökasvatus tieteenalana 20v [Sloyd education 20 years as discipline]. Techne Serien, Research in Sloyd Education and Craft Science A: 15/2009. 79–97.*
- Metsärinne, M. (2009c). Käsiyökasvatuksen didaktiikan ja oppimisen tutkimussuuntia [Formulation of craft research methods for sloyd experiment]. In: Metsärinne, M (toim.) *Käsiyökasvatus tieteenalana 20v - Sloyd education 20 years as discipline. Techne Serien, Research in Sloyd Education and Craft Science A: 15/2009. 98–130.*
- Metsärinne, M. (2009d). Teknologisten käsiyösystemien tuottaminen. [Creating technological craft systems in sloyd education]. In: Metsärinne, M (toim.) *Käsiyökasvatus tieteenalana 20v - Sloyd education 20 years as discipline. Techne Serien, Research in Sloyd Education and Craft Science A: 15/2009. 131–156.*
- Metsärinne, M., Kallio, M., Kullas, S. & Pirttimaa, M. (2010). *Teacher students' individual growth into the craftteachship.* In: In the spirit of Uno Cygnaeus – pedagogical questions of today and tomorrow. Conference publication: University of Jyväskylä.
- Oakley, M. (1990). *Design Management. A Handbook of issues and methods*, ed. Oakley, M. Great Britain. Butler & Tanner Ltd.
- Papanek, V. (1985). *Design for the Real World.* Thames & Hudson.
- Parsons, T. 2009. *Thinking: Objects. Contemporary approaches to Product design.* Thames & Hudson.
- Peltonen, J. (1988). *Käsiyökasvatuksen perusteet [Grounds of Sloyd Education] Koulukäsityön ja sen opetuksen teoria sekä teoreettinen ja empiirinen tutkimus peruskoulun yläasteen teknisen työn oppisisällöistä ja opetuksesta.* Turun yliopiston kasvatustieteiden tiedekunta. Julkaisusarja A:132.
- Peltonen, J. (1993). *Outlines of Research on Craft Education.* Kasvatus 24 – supplement 1/1993. 6–11.
- Peltonen, J. (2001). Utbildning for akademiskt innehållsproduktion inom slöjdpedagogik. In: Nygren-Landgårds, C. & Peltonen, J. (eds.) *Visioner om slöjd och slöjdpedagogik. B:10/2001. Techne Series.* Research in Sloyd Education and Craft Science. NordFo. Nordic Forum for Research and Development in Craft and Design. 331–342.
- Peltonen, J. (2002). *Research study instructions.* University of Turku. Department of Teacher Education in Rauma.
- Peltonen, J. (2009). Core Curriculum: Linkki yliopiston käsiyökasvatuksen tutkimuksen sekä peruskoulun käsityön opetuksen välillä. In Metsärinne, M (ed.) *Käsiyökasvatus tieteenalana 20v – Sloyd Education 20 Years as Discipline. Techne Series A:15.* Research in Sloyd Education and Craft Science. NordFo. Nordic Forum for Research and Development in Craft and Design. 11-38.

- Petroski, H. (1997). *Ideasta tuotteeksi. Miten insinöörit keksivät suunnitelmallisesti*. Terra Cognita: Vaasa.
- Rees, H. (1997). Patterns of making: thinking and making in industrial design. In: Dormer, P. (ed.) *The Culture of Craft*. Manchester University Press.
- Ryle, G. (1949) *The Concept of Mind*; London. Huchinson.
- Schraw, G. (2006). Knowledge: Structures and Processes. In Alexander, P. A. & Winne, P. H. (Eds.) *Handbook of Educational Psychology*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.
- Seitamaa-Hakkarainen, P. (2000). *The weaving-design process as a dual-space search*. University of Helsinki. Department of Home Economics and Craft Science. Research Report 6.
- Siltala, R. (2010). *Innovatiivisuus ja yhteistoiminnallinen oppiminen liike-elämässä ja opetuksessa*. C 304. Kasvatustieteiden tiedekunta. Turun yliopisto.
- Syrjälä, L.; Ahonen, S.; Syrjäläinen, E. & Saari, S. (1996). *Laadullisen tutkimuksen työtapoja*. Kirjayhtymä Oy.
- Uljens, M. (1989). *Fenomenografi – forskning om uppfattningar*. Studentlitteratur, Lund.
- Ulrich, K. & Eppinger, S. (2000). *Product Design and Development*. McGraw-Hill.
- Valtonen, A. (2007). *Redefining Industrial Design*. Changes in the Design Practice in Finland. Gummerus Printing. Jyväskylä.
- Winner, L. (1997). Technologies as Forms of Life. In: Shrader-Frechette, K. & Westra, L. (eds.) *Technology and Values*. Rowman & Littlefield.
- Zeisel, F. (1981). *Inquiry by design: Tools for environment-behavior research*. Moterey, California: Brooks/Cole publishing Company.
- Yli-Piipari, E. (1991). *Tuotteen suunnittelusta ja suunnitteluprosesseista peruskoulun teknisessä työssä: Teoreettis-didaktista tarkastelua*. Turun yliopisto. Kasvatustieteiden tiedekunta. Julkaisusarja B: 34.

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