Heritage building as a Concept and as a part of Technology Education

Conceptions of, structuredness of conceptions of, and conceptual change in students in teacher training during a study module on heritage building

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As a concept, heritage building is young and previously undefined in Finnish scientific literature. Earlier studies about the very notions of heritage building are also nonexistent in Finland. The purpose of the present study was to investigate the conceptions of students in teacher training about heritage building before and after a study module on heritage building, which constitutes a part of their subject studies in didactics of crafts. The lack of previous studies about conceptions of heritage building in Finland led to the selection of these conceptions as a research target. The study uses two different approaches for achieving its purpose. In order to find answers to the research problem, the students' common conceptions about heritage building were examined first. Secondly, it was considered how structured these conceptions were. Therefore, the research process included a conceptual review of heritage building to provide a baseline for comparing the student's conceptions and their structuredness.

The research results indicate that even though students in didactics of handicrafts have conceptions about heritage building that are parallel with the definition formulated for the purposes of the study, they are superficial on average. The review of structuredness of conceptions supported the results achieved in the phenomenographical analysis of conceptions. It was observed that completing the study module had an impact on the structuredness of conceptions. Furthermore, the students' personal background was found to have some implications on how structured their conceptions of heritage building were, which was evidenced by notable differences in structuredness of conceptions on an individual level. This article is based on the writer's doctoral dissertation.

Keywords: Heritage building, conceptions, conceptual change, level of structuredness, phenomenography, technology education

Introduction

Heritage building is a familiar word to most of us and is used in several contexts, on TV, in building and interior design magazines, in advertising and also in ads by real estate agents. In everyday speech connotations about traditional, real and pure building are attached to heritage building. In Finland there are attempts to solve indoor air problems in schools with traditional building (Nissilä, 2013). Also, concepts such as sustainable development (El Harouney, 2008a; Outila, 2002), conscious consumerism (Young, Hwang, McDonald & Oates, 2010) and thoughts of slowing down climate change (Paloheimo 1998) are attached to the concept of heritage building. Because the term heritage building is used in various contexts, its exact meaning in everyday speech remains vague. This study approaches heritage building purely from a Finnish point of view mainly because heritage building has very local dimensions and it hasn't been studied before in Finland.

In Finland, the term heritage building is used in scientific circles mainly in lower academic theses. In Finnish doctoral dissertations the concept of heritage building has not been used at all (e.g. Jokelainen, 2005, Soikkeli, 2000) or it only appears when summarizing literature (e.g. El Harouney, 2008a,, 2008b). In these contexts the concept is not defined, so the reader must have made his or her own conceptual confining regarding the surrounding context. Sometimes heritage building was understood as a guideline when renovating an old building, but only the traditional style was copied and execution was purely modern from a technical point of view (e.g. Tuomola, 2013). The planning of repairs and executing the renovation can also been done using traditional materials, working methods and structural solutions, and required modern structures and building services are hidden or minimalized (e.g. Uosukainen, 2012). Sometimes the context in which heritage building is used doesn't explain the concept's meanings and in these situations heritage building is used merely as a fashionable expression (e.g. Heino, 2006). When approaching heritage building as a concept one's focus can be completely on the actor's skills and knowledge (e.g. Hotinen, 2003).

In Finnish general literature, recognized experts in the field of tradional building use the concept of heritage building to variying degrees. Some writers make practically no use of the concept (e.g. Kaila, 2009, 2008, 1997; Vuolle-Apiala, 2006, 2002; Koskela, 2003; Kaila, Pietarila & Tomminen 1987; Kaila, Vihavainen & Ekbom 1983; Härö & Kaila 1976). As a concept heritage building has slowly started to appear in literature in the 21th century (e.g. Rinne, 2013, 2010). The same effect can seen on the internet. Many Finnish traditional building associations web sites have started to use the concept of heritage building in the past decade or so (e.g. www.perinnerakentaminen.fi). In professional builders special journals, heritage building is mainly articles of traditional techniques or materials (e.g. Rissanen, 2003). In Finland, the National Board of Antiquities (www.nba.fi) or the Ministry of the Environment (www.ym.fi) are the main operators when we speak about cultural heritage and cultural environment, and they don't use the concept of heritage building on their official websites. For instance, Google search engine finds 55400 hits for the Finnish word *perinnerakentaminen* (searched on 2.12.2016). The notions above indicate that the more scientific or the more official the text is, the less the concept of heritage building is used. The reason for this situation might be that heritage building as a concept is young and it hasn't got any current official definition in Finnish scientific literature.

The aim of this study was to reveal new information of student teachers' conceptions of heritage building. One aim of the study was to describe, and strive to understand, how students understand the concept of heritage building, how structured their conceptions were and did they change during a study module of heritage building. In the study module students orientated themselves to heritage building through a co-operative scale model project and through a task to create pedagogical teaching material for basic education. The following research questions were addressed:

1. What is understood by the concept of heritage building?
2. What are the students' own conceptions of heritage building and did changes occur in their conceptions of heritage building during the study module?
3. How structured were students' conceptions before and after a study module?
4. What kinds of personal relationships do the students have with heritage building?

Method

The study at hand had a qualitative approach. Simple quantitative variables were used when analysing and presenting data. The material for this study was collected at the University of Eastern Finland and at the Savonlinna campus. The target group (N28) comprised two classes of students carrying out subject studies in didactics of handicrafts (60 ECTS). Seventeen of the students were male and eleven female. The philosophy behind didactics in handicrafts at the Savonlinna campus is technology education, which has given rise to the study module mentioned above. In technology education the aim is to increase general technological education (Lindh, 2006). In this context it was essential to understand that beliefs (e.g. Pehkonen 1994) and conceptions (e.g. Vosniadou, 2007, Özdemir & Clark, 2007, Chi & Roscoe, 2002) don't mean the same thing. Beliefs often don't have valid arguments (Pehkonen 1994, p. 39). Conceptions can be so called everyday conceptions (Ahonen1994), where beliefs are mixed up with accurate knowledge about the matter at hand. Conceptions can contain partly or totally wrong information. Vosniadou (2007) calls this kind of conception naive conceptions. Chi and Roscoe (2002) calls them preconceptions and they can be altered by education.

The aim of the study module was to arouse interest in heritage building and start a technological conceptual change of heritage building. Conceptual change can begin when a learner recognizes a conceptual contradiction between his/her personal conceptions and the scientific explanation of a concept (Sinatra & Pintrich, 2003, p. 1-3). The conceptual change starts from the learner and change doesn't occur if the learner's motivation is weak (Rauste-von Wright, von Wright & Soini, 2003; Linnenbrink & Pintrich, 2002).

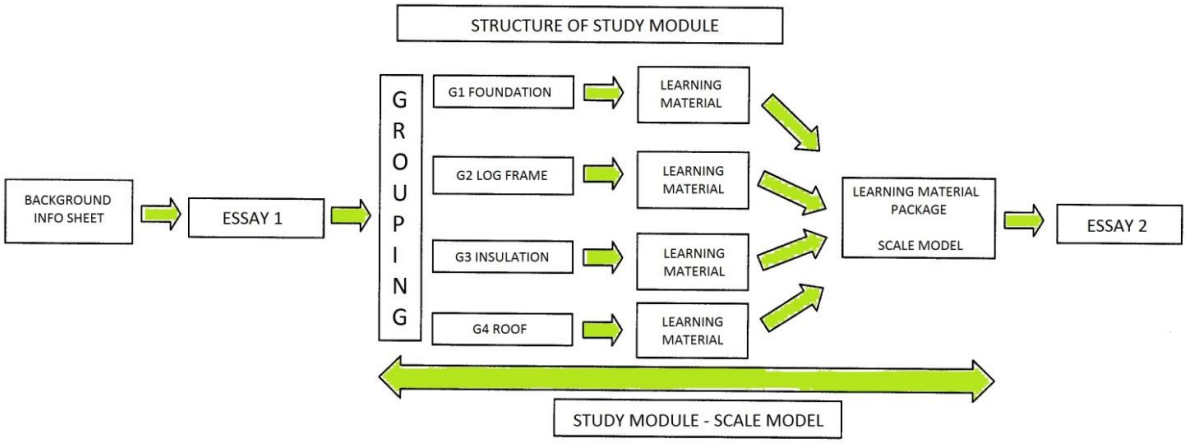

Figure 1: Structure of the study module

In figure 1 the structure of the study module is presented. Before the study module a background information sheet was gathered. Students were asked for gender, age, hometown and area (countryside, rural town or village, city), studies in crafts (technical work) in elementary school and in high school and technical studies in vocational schools. Students were also asked about their prior hobbies in technical fields and in heritage building. Before the study module students wrote an essay about their conceptions of heritage building. The aim of this structure was to raise a possible conceptual contradiction between thoughts they wrote in essay 1 and what they learned during the study module.

In the study module students were grouped into four groups. Each group had a specific section of a traditional house and they manufactured a scale model of a traditional Finnish log house in study module 1. In study module 2 students made a scale model of a Finnish type of detached house built after the Second World War for the families of soldiers who fought in the battlefront. This type of house has a wooden frame and saw dust insulation and it has a cubic shape.

The study module was based on shared expertise (Reilly, 2008), self-guidance (Brockett & Donaghy, 2011) and discovery learning (Hakkarainen et. al. 1999). The aim of the structure of the study module was to increase students' technological understanding of heritage building and their expertise in cultural heritage education. In the study module students made learning material for heritage building in their group that they would be able to use in elementary school grades 1-6. The learning material contained study modules where the traditional handtool techniques that are used in heritage building and natural materials were used in inventive projects like building a sandbox in a school yard with logs using traditional wood joints. Another example was boxes that had different kinds of traditional insulation and pupils learn the basics of thermodynamics when measuring the cooling of hot water in different boxes in cold weather and so on. The groups created eight different learning material packages, two from every segment of a building (G1-G4, see figure 1). The basic idea of learning materials was to create something with which traditional skills and materials could be introduced to pupils without labeling it as house building. So the aim wasn't so much in teaching and learning heritage building but also in learning technological understanding through cultural heritage content. This choice was made purely by the students because the insructions for making learning materials were very open. The learning material produced was not exploited in this study because the aim of this study was to examine students´perceptions of heritage building and the study module was only a tool to lead students to the world of heritage building and Finnish cultural heritage. After the study module students wrote a second essay about heritage building.

A scale model project was selected as a study module because it was short and we were able to excecute a small scale study module in our own workshop with familiar tools and equipment. This was also a choice due to work safety. A scale model was also meant to encourage students to think about the learning material process in an open minded way and not from the strict perspective of a full scale building process.

Essays were chosen as a method to gather data because the target group was university students and they had basic technological knowledge about crafts. One can assume that university students can produce essays of good quality. This defines them as an elite sampling (Tuomi & Sarajärvi, 2002, p. 88-89). Nowadays essays are a more approved way of collecting data than before (Polkinghorne, 2005, p. 137).

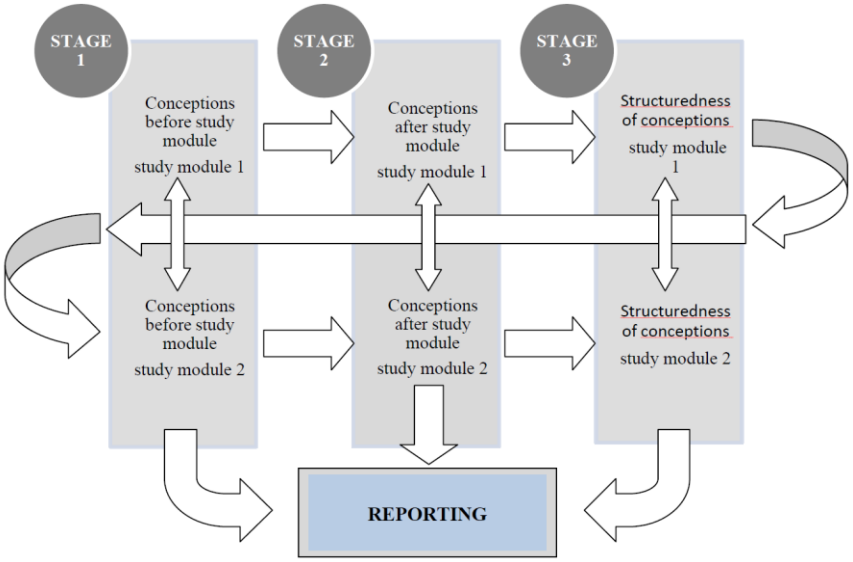

Figure 2: Three stage analysis

Analysis was made in three stages (see figure 2). After three stages of analysis on study module 1 minor adjustments were made to study module 2. The adjustments were mainly in defining instructions. Analysis was repeated on the same basis.

Phenomenographical analysis of overall conceptions of heritage building is similar to content analysis theming (Anttila, 2006, p. 292-293). Students´ conceptions of heritage building were analysed by theming frequently used expressions. Expressions were tabled and frequencies were calculated. Expressions were regrouped and then transformed to various lower and upper categories. Categories were also repeatedly regrouped and renamed when seeking clarity. The category system can be seen in the results section (see figures 3-5). Study modules 1 and 2 were not compared to each other. In analysis researching students´conceptions of heritage building and researching students´ levels of structuredness of heritage building, methodological triangulation was executed (e.g. Hirsjärvi, Remes & Sajavaara, 2013). These two different approaches supplemented and deepened the results.

Conceptions are the core of phenomenographical study. In phenomenography reality is built up socially and constructively from a second-degree angle. In this approach, the interest lies in an individual's different ways of experiencing the world and phenomenon, i.e. as an object of conceptions. (Marton 1995) Analysis of this study approaches Martons (1995) second-degree angle when students' conceptions of heritage building were analysed before and after the study module. In phenomenography the world from a first degree angle is described without taking an individual's personal ways to experience it into account. From this point of view individuals' conceptions can be described purely by how accurate they are when compared to theory (Niikko, 2003, Nummenmaa & Nummenmaa, 2002). In this study students' structuredness of conceptions are viewed from phenomenography's first degree angle's point of view. Students' structuredness of conceptions are compared to a conceptual review of heritage building that was made (table 2). Individual parts of conceptual review of heritage building were scored and specific descriptions were made to which students' expressions were compared. Students' expressions in both essays were scored, the maximum total was 40 points. Because students understood the two essays as a continuum, essays were scored by adding the first essays scores to the second essays scores. If an expression was used in essay one, in essay two it was left unscored. Students´ scores were calculated and tabled from the different perspectives from background information like gender, age and so on.

Structuredness of students' conceptions of heritage building was examined through a three stage level scale. The scale was adapted from Lepistö's (2004, p. 13) scale. In her dissertation she examined classroom student teachers' conceptions of crafts as an educational tool before and after a study module on crafts.

Table 1: Levels of structuredness of heritage building, adapted from Lepistö (2003, p. 13)

Levels of structuredness		
UNSTRUCTURED 0-13 points	FAIRLY STRUCTURED 14-26 points	STRUCTURED 27-40 points
Defining heritage building succeeds weakly. The definition may also contain a lot of incorrect assumptions. Knowledge of the basic principles and terminology of heritage building is superficial.	Conceptions of heritage building are fairly structured, but the understanding of key concepts, technologies and basic principles of heritage building are inconsistent and inadequate. Some misconceptions still occur.	Key concepts, technology and the basic principles of heritage building are understood consistently. Only very minor misconceptions occur.
Conceptions differ clearly from writers conceptual review of heritage building.	Conceptions are partly parallel with writers conceptual review of heritage building.	Conceptions are parallel with writers conceptual review of heritage building.

After the conceptual review of heritage building was scored, a maximum score of 40 points was divided into three parts as seen in table 1. Lepistö`s (2003) scale expressions were transformed to a heritage building context. Expressions were checked for linearity, from unstructured understanding of heritage building to structured understanding.

Results

Conceptual review of heritage building

The answer to the first research question what is understood by concept heritage building, and partly the main result in this research, was a conceptual review of heritage building. As mentioned in the introduction heritage building is a relatively young expression and it doesn't have any prior definition in Finnish scientific literature. A conceptual review contains its own sections on planning, building materials, tools, know-how, know-why, ecology and surface finishing. The review is also divided into two parts, renovating an old house and building a new house. It is essential to notice that these two parts are not exclusive. For instance taking compass points into account is mentioned only when talking about building a new house. This is because this aspect has already been considered when the old house was built. Also in this section, ecology and taking energy efficiency into notice is in parenthesis because energy efficiency is not the main intention when renovating an old house. Moderate and suitable improvement of energy efficiency is always sensible when renovating an old house (Rinne, 2013).

A conceptual review of heritage building is composed through the Finnish literature of traditional building, personal notifications from Finnish experts on traditional building and through the writer's own technical and theoretical knowledge and experiences in renovating an over 100 year old protected tavern into his family home. In this study heritage building is limited to consist of small house building that took place before 1960. In Finland, this choice limits the main focus to massive log buildings and wooden frame and saw dust insulated houses that were built in a large scale after the Second World War. Common to these two house types are natural building materials with a low degree of processing and the use of basic handtools.

Table 2: Conceptual review of heritage building

Sector	Renovating old house	Building a new house
Planning	Treasuring a building's authentic solutions	Traditional conception of a good building site and layout of buildings
	Point of reference is a building's certain historical time period or acceptance of multiple historical layers	Expression based on Finnish traditional building or modern architecture
	Noticing a building's local qualities	Noticing a traditional building's local qualities
	Treasuring and respecting architecture from the time period of the building	Taking compass points into account
	Natural ventilation or at most so called hybrid ventilation	Natural ventilation or at most so called hybrid ventilation
	Preserving ventilated base floor or, e.g. soil bench	Most of the times ventilated base floor
	Skilled exploiting of special features of natural materials	Skilled exploiting of special features of natural materials
	Preserving or returning breathable structures	Breathable structures

	Repairing possible building faults mainly with procedures and solutions that are typical to building's time period	Typical structures for traditional Finnish building
	Minimising renewing of building parts	Skilled details
	Simplicity and practicality	Simplicity and practicality
	Renewing useless building parts with original type of materials and structures	Considering energy efficiency and how ecologically the building energy needs are produced
Building materials	Natural materials with a low degree of processing	Natural materials with a low degree of processing
	Wood and wood based building materials	Wood and wood based building materials
	Purposeful selecting of materials	Purposeful selecting of materials
Tools	Traditional hand tools	Traditional hand tools
	Modern motor/electric tools (pricipal of adequateness)	Modern motor/electric tools (pricipal of adequateness)
Knowledge-skill, "Know-how"	Traditional professional skills in Finnish building	Traditional professional skills in Finnish building
	Master-apprentice situation, preserving skills and transference	Master-apprentice situation, preserving skills and transference
	Tacit knowledge	Tacit knowledge
Skill-knowledge, "Know-why"	Technological knowledge. Understanding components behind skills.	Technological knowledge. Understanding components behind skills.
	Understanding of natural scientific principals behind heritage building's knowledge and skills, "technological general knowledge"	Understanding of natural scientific principals behind heritage building's knowledge and skills, "technological general knowledge"
Ecology	Materials with a low degree of processing from nearby area	Materials with a low degree of processing from nearby area
	Using recycled materials	Using recycled materials
	A positive effect on the massive wood construction in the prevention of climate change	A positive effect on the massive wood construction in the prevention of climate change
	Renovating or rebuilding wood-burning stoves	Wood-burning stoves form at least part of heating system
	Extension of the building life cycle	life cycle of the building
	(Taking energy efficiency into account.) Ecology of heating energy that building requires.	Taking energy efficiency into account and ecology of heating energy that building requires
Surface finishing	Traditional and natural finishing products that are typical to building's time period	Traditional and natural finishing products

The conceptual review of heritage building as described in table 2 can be summarized as follows:

Heritage building can be either renovating an old building or building a new one. It can also be a combination of the two. In planning, the building physics of materials that are used is taken into account. Also, traditional Finnish structural engineering solutions are taken into account. The aim of planning is breathable structures. When it is possible, traditional electricity free technologies, for instance ventilation, should be favoured. In new construction, the intrinsic value is not in copying traditional

genres. It is more important to combine traditional material technology and structural engineering solutions with modern architecture.

Heritage building is affiliated with lots of know-how in building that is based on manual skills, the maker's knowledge and special features of materials that are used. In building, natural materials with a low degree of processing are mainly used and also surface finishing products that have a long practical experience and have been used in building for a long time. Modern tools can be used unless the goal is a certain finishing tool mark of some precise historical time period.

Ecology is reflected in heritage building, for instance in the inventive and frugal use of natural materials with a low degree of processing, in repairing old building parts and in recycling. The know-why of heritage building contains an extensive understanding of the qualities of materials, working methods and structural solutions. This gives an opportunity to understand the fundamental basics of material technology and building physics in heritage building.

Students' conceptions of heritage building before the study module

The second research question, what are students' own conceptions of heritage building and did changes occur in their conceptions of heritage building during the study module, was answered by analysing students' essays, which they wrote before and after the study module. Students' approached heritage building from two different points of view, *general understanding of heritage building* and *personal relationship to heritage building*.

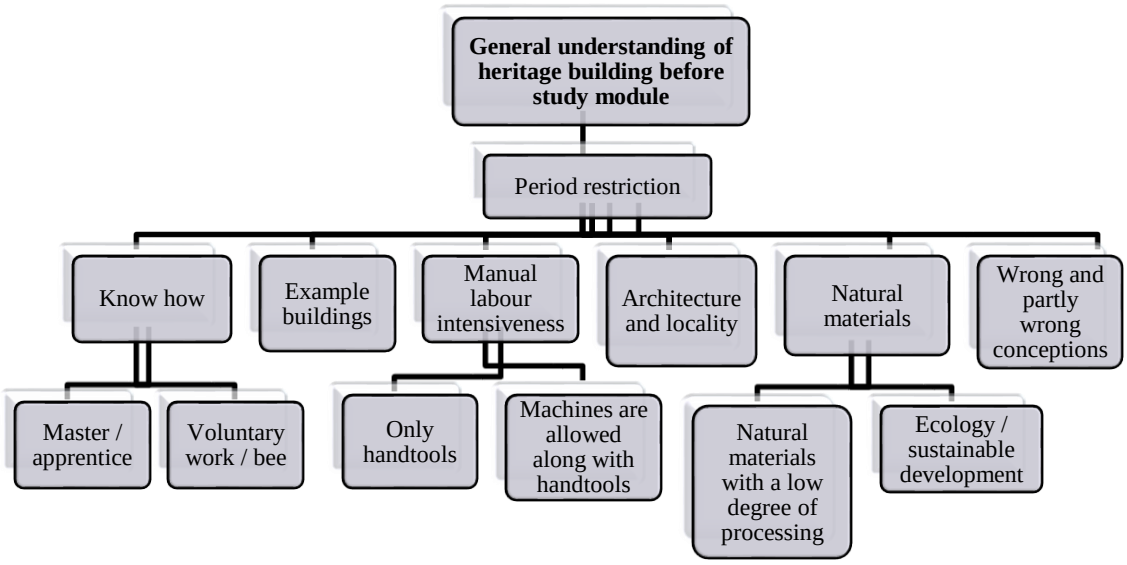

Figure 3: Categories of students' general understanding of heritage building before the study module

In figure 3 there are different themes that students used to approach the concept of heritage building. Period restriction is an upper theme because most of students' used it as a justification when defining other dimensions of their conceptions of heritage building. Very few students were able to describe most of these themes.

All expressions that described heritage building were collected in one table and frequencies and percentages were calculated (N28). The following description of heritage building was made out of expressions that were found in over 40% of students' essays:

Heritage building is renovating or building an old small house or a cottage. In heritage building natural building materials are used. Heritage building is manual labour and only hand tools are used. It is typical for old buildings that are built using traditional methods as that they are aesthetically pleasing.

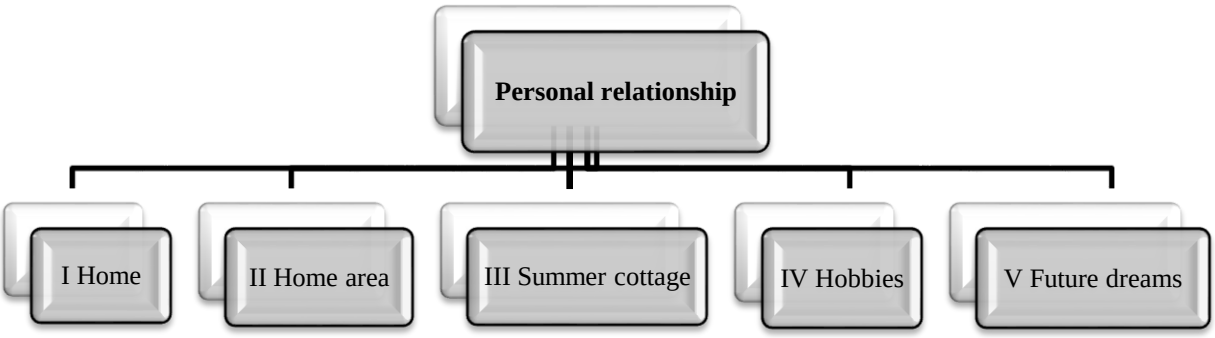

Figure 4: Categories of students' personal relationship to heritage building before study module

A total of 83% of students described their personal relationship to heritage building through five categories, presented in figure 4. The most powerful and emotional descriptions were in essays whose writers had lived in an old building when they were children. Fullilove (1999) states that a location that generates strong feelings often has some kind of bond to an individual's childhood. Heritage building was also described through the home area, especially if the student's childhood home was in an area where there are plenty of old buildings left. Also, local history museums were important places to some students. The meaning of a home area is very similar to home when an individual creates personal relationships to places, because the feeling of belonging to places gets stronger when history is attached to it (Forselles-Riska, 2006, p. 226).

The third way to describe a personal relationship to heritage building was through a summer cottage. Summer cottages were often the only living connection to traditional log building. The fourth way was if a student had prior studies on heritage building or prior hobbies regarding to it, it was natural to describe their personal relationship to heritage building through those experiences. The fifth way was to describe future dreams that were attached to heritage building. It is noticeable that all of these students felt that heritage building was very close to them through a childhood home or home area. These students usually wanted their own future home to be also built in a very traditional way.

Students' conceptions of heritage building after the study module

In essays written after the study module, students approached heritage building from three different point of view, *general understanding of heritage building*, *appreciation* and *meaning of the study module*. Students understood the instructions given for writing essays a little differently than planned. The idea was to write two essays that were independent of each other. Students understood these two essays as a continuous story, so this had to be concidered in analysis.

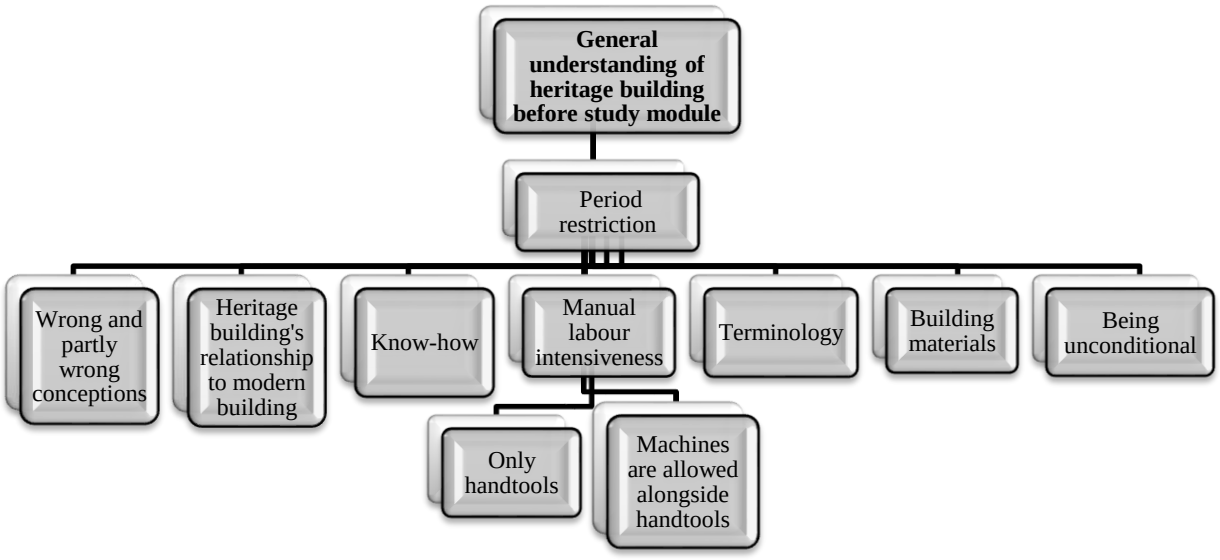

Figure 5: Categories of students' general understanding of heritage building after the study module

In figure 5 are the themes that students used to approach the concept of heritage building in their second essay. Period restriction is an upper theme because most of the students used it as a justification when defining the other dimensions of their conceptions of heritage building. In the second essay after the study module students were able to express different categories to their first essay. It was obvious that many categories that were presented in the first essay were not expressed in the second essay because students understood their two essays as a continuous story. In the second essay all expressions were more precise and more descriptive than in the first essay.

Terminology that is typical to heritage building arose from the second essay. Before and during the study module students read literature about traditional building, which was there to help groups to make their own scale model project. When groups did their scale models, the correct terminology was used and this was shown in the second essays. The study module also got students to process the relationship between heritage building and modern building. Those students who had previous experiences of building realized how little the basic principles of building had changed in the past hundred years. One student also expressed that knowledge of the history of building is also essential to modern builders so that they could choose the right renovation methods for old buildings.

Being unconditional means that few students interpreted literature and things they learned in the study module very strictly. For instance heritage building was defined to be a building method, where only natural materials and manual labour are used and nothing else is allowed.

Appreciation of heritage building appeared as expressions in three different ways: *meaning to cultural identity*, *own personal appreciation* and *appreciation in modern Finnish society*. The study module was described as an "eye opening experience". Many students wrote in their essays that they have never paid attention to old buildings around them. Those students who had no previous experience of heritage building described that their appreciation rose, and those who had previous experience felt that their appreciation got deeper. Heritage building's meaning to cultural identity was attached widely to the Finnish builder's nature, which consists of resilience, common sense and inventiveness. When students attached these features to a narrow selection of building materials and a poor selection of tools their appreciation for the building skills of their forefathers rose.

When dealing with the appreciation of heritage building in Finnish society students expressed the idea that nowadays many old things are trendy. It is also fashionable to “downshift” and live an ecological life. Some students felt that this trendiness has gone a little too far. Overall, students thought that the appreciation of heritage building is stronger in modern Finnish society than before.

Altogether 26 out of 28 students handled the study module in his/her second essay. Few students had preconceptions when they heard the idea of the study module. Some of them thought that the study module was only about building. When they realized that heritage building was approached through crafts, history and pedagogy their attitude towards the study module changed. Students felt that shared expertise was a good way to learn new things. Each group had their own special area in the scale model house and groups had to co-operate all the way through the study module. Altogether the study module was considered a very good learning experience. Making an actual scale model with traditional and/or modern methods and tools was a very efficient way to learn for most of the students.

Level of structuredness of heritage building before and after the study module

The answer to the third research question, how structured students' conceptions were before and after a study module, was examined through the levels on structuredness on heritage building. Students' conceptions of heritage building were scored based on their expressions in essays before and after the study module. The conceptual review of heritage building was altered to a more defined criteria listing. If a student's expression was correct, he/she got points that were defined in the criteria. If a student's expression was too vague or undefined so that context was not to be understood points were not given. Dispersion of points was substantial. On the first essays, points varied from 2 to 25 and on second essay from 7 to 30.

Table 3: Level of structuredness before and after study module

	Unstructured	**Fairly structured**	**structured**
Points	**0-13**	**14- 26**	**27-40**
Students, writing **before** study module (f)	12	15	1
Students, writing **after** study module (f)	4	20	4
Change %	**-67%**	**+33%**	**+300%**
Share of all in writings **before** study module	43%	54%	4%
Share of all in writings **after** study module	14%	71%	14%
Maximum points 40, N28			

Table 3 shows that twelve students' conceptions on heritage building were unstructured before the study module. Their amount decreased conciderably after the second essays. After the study module only four students were on an unstructured level and most of students were on fairly structured level (71%). Before the study module only one student got to the structured level. After the study module there were four students.

Twelve out of fourteen students (N28) that got the lowest total points after the study module improved their execution by more than 25%, an average of 79%. Twelve out of fourteen students that got the highest total points after the study module improved their execution less than 25%, an average of 13%. This indicates that the study module helped students that got the lowest level of structuredness of heritage building before the study module the most.

Table 4: Level of structuredness as a group, by gender and percentage change between essays by genders and between genders

Total AV age 27,3 (N28)	f	Essay 1 AV	Essay 2 AV	Change *	Age AV
All students	28	15,47	19,54	+26%	27,3
Female students	11	16,28	19,82	+22%	26,9
Male students	17	15	19,36	+29%	27,8
Difference men/women *		8%	2%		
* percentages are rounded to nearest full percentage					

Every student had higher points after the study module than before. The average change was 26%. When examined more closely small differences between genders did come up. A total of 36% of female students and 47% of male students had unstructured conceptions of heritage building before study module. After the study module all of the female students had fairly structured conceptions of heritage building. After the study module 24% of the male students still had unstructured conceptions of heritage building, but on the other hand all students that had structured conceptions of heritage building were male. This indicates that male students had more variation on their levels of structuredness. However, the differences between genders are still small and therefore not remarkable.

Table 5: Level of structuredness on essays by students age

Total AV age 27,3 (N28)	f	Essay 1 AV	Essay 2 AV	Change *	Age AV
Older than AV	9	20	24	+20%	33,4
Younger that AV	19	13	17	+31%	24,5
Difference younger/older *		54%	41%		
* percentages are rounded to nearest full percentage					

In table 5 students are divided in two groups, younger than the whole groups average age and older. Older students got an average of a 52% higher level of structuredness before the study module. The difference got smaller after the study module, but is still obvious. It is noticeable that the age difference between these two groups is almost nine years so the variation in students´ ages is wide.

Table 6: Level of structuredness of conceptions on essays by students childhood home location

Total AV age 27,3 (N28)	f	Essay 1 AV	Essay 2 AV	Change *	Age AV
Countryside	12	17	21	+24%	25,4
Rural town or village	3	14	19	+35%	28,7
City	13	14	18	+29%	28,9
* percentages are rounded to nearest full percentage					

Table 6 indicates that students from the countryside got a higher level of structuredness of conceptions before and after the study module than students from rural towns/villages or cities. Table 5 showed that older students got higher scores than younger students. Table 6 shows that students that were from countryside and got higher scores before and after study module were also younger than students from rural towns/villages or cities.

Table 7: Level of structuredness on essays by students' hobbies on heritage building

Total AV age 27,3 (N28)	**f**	**Essay 1 AV**	**Essay 2 AV**	**Change ***	**Age AV**
Has hobbies on HB	6	19	24	26%	29,8
Doesn't have hobbies on HB	22	15	18	20%	26,7
Difference hobbies/no hobbies on HB *		27%	33%		
* percentages are rounded to nearest full percentage					

If a student had prior hobbies on heritage building their level of structuredness of conceptions rose more (26%) during the study module than students that had no hobbies in heritage building (20%), see table 7. This was only noticable situation where students that got a higher level of structuredness of conceptions before the study module gained a higher percentage progress during the study module than another group.

When examining students other background info, like the amount of crafts (technical work) in elementary school, prior technical studies on vocational school and prior hobbies in a technical field, and comparing them to students' level of structuredness of conceptions on heritage building there were no noticeable differences whatsoever.

Discussion

When looking at the changes that occurred in students' conceptions of heritage building between the two essays the percentages don't tell the whole story. Expression of definition alone doesn't tell if the definition is understood in right context. In the second essay students were more able to argue their expressions and were more able to give examples to concretize their conceptions than in the first essay. Therefore change was noticeable.

Overall conceptions on heritage building became more precise during the study module. Students were able to point to exact materials, tools and techniques that are understood as a part of heritage building. However, the bigger picture was still a little vague. Only a few students were able to attach terms such as materials with a low degree of processing or ecology to the example materials mentioned. It is noteworthy that none of the students mentioned that for instance, massive wood building is attached to a concept of climate change (e.g. Paloheimo 1998). This is understandable because young people are often uncertain about the relationship between climate change and wood (Rämö, Härmälä, Hietala & Horne, 2012).

Some students had very absolute opinions on heritage building after the study module, i.e. no modern building materials that are breathable belong to heritage building because they are not old materials, the whole concept of heritage building is hard to get to a wider audience. Too much moralizing easily leads to the ecological way of life being assimilated into moral or religious dogma (Outila, 2002). If heritage building is just something people did a hundred years ago the view of heritage building is then very nostalgic and emotionalized. Latvala (2005) calls this image an *ideal view*. When talking about conceptual change, strong beliefs, emotional influences and values can help or prevent conceptual change (Ferrari & Elik, 2003).

Because students' overall conceptions of heritage building were superficial before the study module, skills required by heritage building were not often mentioned. After the study module students were better able to express the skills needed and especially to give credit to builders from the past for their skills with a very limited selection of tools and materials. It was remarkable to notice that tacit

knowledge (Toom, 2006) was not expressed in any essay although the master-apprentice setting (Jernström, 2000) was expressed. It is essential to recognize the tacit knowledge that lies behind skills that are taught in crafts. It can be asked if tacit knowledge is too little on display in teacher education, if students at this point of their studies don't recognize its presence in a studied content?

The biggest misunderstanding regarding heritage building was a too positive attitude towards traditional building materials. Numerous essays mentioned that natural building materials are the answer to common building problems, such as moisture and mildew. Materials alone don't ensure anything, it all comes down to good planning and execution of building (e.g. Kaila 1997). Also, breathing structures were understood as a synonym for healthy building. Also, breathing structure was commonly misunderstood and mixed up with ventilation. These kind of misunderstandings Chi and Roscoe (2002) call misconceptions. After the study module these kinds of misconceptions decreased but they still existed and most of them were more inaccurate expressions than totally wrong conceptions.

More than 40% of students named old buildings as aesthetically pleasing. Massive structures and a feeling of permanence were usual (cf Pallasmaa, 2006). Expressions of aesthetics were usually attached to some personal memory or experience. All these expressions were emotionally charged and these kind of strong feelings towards places are described by El Harouny (2008b, p. 562) as *experiencing the place as blessed.* The personal relationship to heritage building was always built up in childhood. Childhood is a period when experiences of places that last a lifetime arise (Fullilove 1999). It is important to notice that children who go through our educational system become a generation that define the development and appreciations of our society.

Students' appreciation towards heritage building rose during the study module. It can be said that the short study module was enough to raise an interest towards students' own built enviroment. Students described this as *an eye opening experience*. Students started to look at their enviroment in a new way and see traditional details in buildings and so on.

Common conceptions of heritage building were still quite superficial after the study module. Qualities that are essential to traditional building materials require deeper material, technological, and physical building understanding and only few students were able to address these qualities in their essays.

Structuredness of perceptions of heritage building before the study module were unstructured by over 40% of students. After the study module this was 14%. Changes in structuredness endorses perceptions that were made when students' conceptions of heritage building were examined. The study module had a positive effect on structuredness of conceptions and overall conceptions of heritage building. The study module was of most benefit to students that got the lowest structuredness scores before the study module. This indicates that teaching about our cultural heritage should be aimed at children and youngsters, especially in elementary school and at upper secondary level (cf Järnefelt, 2003, p. 11-12; Hesso, 2003, p. 101–102).

Table 8: Level of structuredness on essays by students age and location of childhood home

Strucutredness and age					Structuredness and childhood home location			
	Age AV	**Essay 1 AV**	**Essay 2 AV**			**Essay 1 AV**	**Essay 2 AV**	**Age AV**
Older than AV (N9)	33,4	20	24		City (N13)	14	18	28,9
					Rural town or village (N3)	14	19	28,7
Younger than AV (N19)	24,5	13	17	⟺	Country (N12)	17	21	25,4
Younger than AV, NOT living in countryside (N3)	23,3	7	12		Country under 24,5 years old (N7)	14	18	23,3

Students' backgrounds had some significance to the level of structuredness on heritage building. If a student was from the countryside his/her level of structuredness was a little higher than students from cities, or rural towns/villages. When this point was examined with age, the significance rose (see table 8). Students that were from the countryside had a higher level of structuredness than students of the same age that lived in cities or rural towns/villages. The reason for this perception might be that in the countryside people live mainly in detached houses. Also in the countryside there are still lots of old farmbuildings left and living in the countryside usually requires more building skills. In cities more industrial and less stimulative building can cause rootlessness according to the environment (Pallasmaa, 2006). This can also diminish the interest to observe one's own built environment.

Also, age appeared to have some meaning to the level of structuredness on heritage building. Older students got higher scores than younger students before and after the study module. One explanation could be life experience. Many of the older students already had experiences of living in their own house and experiences of renovating or building. Therefore an interest towards building might have been born naturally over the years. Life experience might also be seen as contributing to higher ecological awareness (Haanpää, 2005). The study revealed that the higher a student's level of structuredness on heritage building was, the more he/she was able to express valuation towards ecology and sustainable development. Also, prior hobbies on heritage building provided motivation to learn as much as possible in the study module. This showed as a higher level of structuredness before the study module and as a higher percentage increase compared to others in the total level of sturcturedness.

CONCLUSIONS

This study indicates that a study module that was practical and student based had an impact on students' increased knowledge of heritage building. It was also important from the beginning to assume that doing by hand was a good way for people to learn and to structure the information, as the subject persons were student teachers in crafts. It is essential to understand that the aim of this study was not to create a new

way to learn crafts in teacher education. The study module was merely focused on cultural heritage content and the means that were used in the study modules are commonly used in teacher education. The aim of this study was not to develop heritage building contents for craft teacher education or for basic education, but to learn about student teachers' conceptions of heritage building. This is one reason why the study model was designed at a small scale rather than learning building in full size.

Heritage building as a concept has never been studied in Finland before. This study`s main result was to correct that situation. Now there is a concept of where to continue this definition process domestically and also internationally. The constructed concept could also be useful in higher education where future architects and engineers are being trained. The study also produced learning material for basic education that was not used in this study. This material could be explored in a school context in the future in Finland or elsewhere.

This study revealed that students' studies in crafts (technical work) in elementary school had no effect on the level of sturcturedness. The amount of hours that students had crafts in elementary school in classes 3–9 varied from 8 to 760 hours but even that did not have meaning to the level of structuredness. This might tell us that crafts in school has no contact surface to building processes although building processes contain the same basic techniques that are learned in school crafts but in a different context. It would be ideal if the technological general knowledge (Lindh 2006) that is given in crafts could be applied, for instance, to builders' work. School crafts might be too technique orientated, product centred and contain too little holistic crafts (Hilmola, 2011, Seitamaa-Hakkarainen, 2009, Matinlauri, 2008). Holistic craft projects could cross school subject boundaries and create natural connections between traditional craft contents and for example, building or architecture.

These results may help the craft teachers' education system to recognize our cultural heritage that lies in traditional techniques and materials and possibly help to create a deeper technological understanding when teaching traditional craft techniques or modern craft techniques like CNC-carvers, lasers and 3D-printing. If you teach a student how to program a CNC-carver to make a wooden tray, it is important that the student also understands how the same product can be made with handtools or with power tools. An understanding of where we come from is essential when figuring out where we are going. A broader picture creates a deeper understanding and that is one of craft's great assets. This is one reason why crafts should never abandon old traditional techniques and touch to the material completely and move to a solely digital world.

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