Long-Term Use of ePortfolios in Craft Education among Elementary School Students: Reflecting the Level and Type of Craft Learning Activities

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Abstract

This paper analyses the longitudinal use of electronic portfolios (hereafter ePortfolios) in craft studies across six years (2013-18). Eight comprehensive school students participated in the study, tracing their craft process activities via photos, narratives, and tapings from the third to the ninth grade. The data involved self-assessment by the learners; peers and teachers were included in the textual content. The data also contained interviews, which were carried out in late spring 2019. The interview focused on students' conceptions of the ePortfolio method and the central elements in constructing it and, finally, improvements of the ePortfolio method. The ePortfolio data was analysed by applying Anderson and Krathwohl's taxonomy for learning, teaching, and assessing. The results revealed that students' knowledge types transformed throughout those years, from versatile to more limited area and students' cognitive process levels, from concrete to more abstract. The interview data supported these interpretations. The interviewees described the changes in their focus when tracing their learning processes; they considered visual and textual content, communication, and metacognitive knowledge as essential elements of ePortfolios. Suggested improvements of the ePortfolio addressed technical issues, platform demands, and practical functionalities.

Keywords

craft education, electronic portfolio, documentation, content analysis, revised learning taxonomy, knowledge creation

Introduction

There is a need for an understanding of comprehensive school students' longitudinal learning processes. Defined in more detail, we need to follow the development of students' skills and reveal the level of learning gained (Atjonen, 2014; FNBE, 2014). This research aimed to study the use of an electronic portfolio (ePortfolio) method to analyse how it promotes the longitudinal learning process and how it fulfils the expectations set for it. Documentation of the craft process and the collected pieces of evidence (photos, narratives, tapings) enable learners to recall and reflect on the learning experiences and hence maintain a much richer and broader view of the craft processes (Barrett, 2007; Keune & Peppler, 2017; Meyer, Abrami, Wade, Aslan & Deault, 2010). The documentation also enables sharing and celebrating achievement, so that learners may enjoy learning, and so that utilisation of recent and prior capabilities are acknowledged for longer. The present study sought to report the results of the exceptionally long ePortfolio study and reveal how the young students experienced working with it. Further,

we aimed to examine students' conceptions of the portfolio and the central aspects of constructing ePortfolios in craft studies. We were also interested in the learners' suggestions for improving ways of working with ePortfolios.

Craft is an obligatory school subject in Finland and guides students to identify design constraints, create ideas, and construct design solutions by using various materials and techniques (Syrjäläinen & Seitamaa-Hakkarainen, 2014). Craft education emphasises multi-materiality and the development of versatile working capabilities (FNBE, 2014). The instructional aim is to develop students' craft-related knowledge and skills and, thus, improve learners' self-esteem, sense of responsibility, and enjoyment (Rönkkö et al., 2016). Craft studies are also expected to advance more generic skills, such as problem solving, thinking, and communication, as well as collaboration and social participation (Pöllänen, 2011). Moreover, the national curriculum for craft education (FNBE, 2014) requires documentation of the learning process at many levels. Documentation is one of the six content areas for every grade and constitutes one of the educational objectives from the third grade upwards. The ePortfolio in craft education appears useful for tracing extended processes of working with various craft projects and products. As a working method, it guides the learner and directs the learning process, enabling formative assessment during the learning process as well as evaluation at the end of it (Saarinen et al., 2019). Furthermore, working with ePortfolios fosters the development of digital competences; mastering digital technologies is one of the seven transversal competences in curricula at all levels of the comprehensive school system and, therefore, it is encouraged to be widely integrated into learning activities in every subject (FNBE, 2014).

We have conducted two earlier ePortfolio studies in craft education. The first study focused on the pupils' user experiences and was carried out after three years of using ePortfolios. The functions and benefits of using ePortfolios in craft education were studied through stimulated-recall interviews. The data was collected from 38 pupils, 25 girls and 16 boys in the sixth grade (Saarinen et al., 2017). The study revealed that pupils identified the key functions (Waltz, 2006) of the ePortfolios, such as collection and management of knowledge, communication, and verification of developmental progress. They were also able to describe the educational benefits of ePortfolio work, such as extending memory, improving digital competences, and learning to organise knowledge. The second study (Saarinen et al., 2019) investigated the content of the ePortfolios across four years. The textual and visual contents were analysed and conceptualised through qualitative content analysis. The study revealed four categories of documentation: process, product, and free and formal reflections (Saarinen et al., 2019). The aim of the present study was to deepen our understanding of comprehensive school students' longitudinal learning processes. We focused on what kind of learning activity and cognitive processes can be found in students' ePortfolios and triangulated the findings with student interviews. Our research questions were as follows:

1. What types of knowledge and cognitive processes did the ePortfolio work contain?
2. How did the contents of ePortfolios change from the early to the later grades?
3. How did students reflect on the changes in various elements, their usage, and improvements of the ePortfolio?

Elements and Maturation of the ePortfolios

Several significant and inspiring development programs (ePearl, Project Zero, Reflect-initiative, Open Portfolio Project, Project e-scape) of portfolio methods have been conducted, and some studies also address ePortfolio working in comprehensive education (Saarinen et al., 2019 and 2017; Nicolaidou, 2013; Barrett, 2007; Moritz & Christie, 2005). The term ePortfolio lacks distinct boundaries and has been defined in various ways: by its process, by its final outcome, and most commonly by its purpose of use (Kimball, 2005; Kimbell, 2012; Carmean & Christie, 2006; Barrett, 2007; Balaban, Divjak & Kopic, 2010). As a working method, the portfolio contains elements that distinguish it from other similar methods, such as completing a task book exercise or writing training. Zubizarreta (2009) points out three central elements of learning portfolios: documentation, reflection, and collaboration. The documentation contains activities of collecting, selecting, and prioritising. Reflection includes analysing and thinking, and collaboration consists of sharing, joining, and communicating (Zubizarreta, 2009). A learning portfolio exists when these elements overlap, but each part can be unequal depending on how it serves the purpose (Zubizarreta, 2009; Corley & Zubizarreta, 2012). According to Kimball (2005), similar elements are present in most portfolio implementations. He crystallises rationales of the ePortfolio pedagogy into four: the process itself giving a deeper picture of the action, multidirectional reflection of the process, the connections with the experiences (coherent sense), and increasing activity of the learner (control and responsibility) (Kimball, 2005).

The implementation of portfolio pedagogy, a chosen system with a chosen tool, is a demanding and multistage process. Love, McKean & Gathercoal (2004) defined the levels of maturation concerning a process to implement both the pedagogy and the electronic webfolio (WBEP). They analysed and categorised eight physical and theoretical qualities related to the use of portfolios (such as type of portfolio, student role, feedback, and heuristic process), six value-oriented issues (e.g., value for student, educator, institution, and digital equity). Furthermore, they identified five levels of maturation of using portfolio platforms: 1) scrapbook, 2) curriculum vitae, 3) collaboration between student and institution, 4) mentoring to mastery, and 5) authentic evidence of learning. These levels are in hierarchical order, containing changes in roles, responsibilities, content, and organisation. The two lowest levels of portfolios could be implemented with paper, ePortfolio or WBEP platforms, and the three highest levels could only be implemented with web-based platforms. The purpose of their model was to provide a conceptual framework for understanding webfolios and to provide guidance for taking the next step to reach new levels (Love et al., 2004; see also Chung, 2010; Challis, 2005).

A Reflective ePortfolio as a Tool for Knowledge Practices

The content of an ePortfolio is dependent on many components: its purpose, the platform used, the available instruction, and especially the practitioner; in other words, the learner and the learner's activity. The ePortfolio method contains designed structured opportunities, which assist students in creating (collecting, selecting, and documenting) their own ePortfolio and reflecting on their experiences. The learner has different interests (for example, with ideological functions), which are served by knowledge (Morrison, 2001). Habermas' (2008) theories of knowledge and human interest examined processes of inquiry through the connection between logical-methodological rules and knowledge-constitutive interests. He divided cognitive interests into three categories: technical, practical, and emancipatory. These

categories contain different kinds of knowledge: instrumental (causal explanation), practical (understanding), and critical (critique, emancipation, and freedom). Furthermore, they answer different questions (knowing what/how/why). This theory has influenced the ideological level of the educational field (Habermas, 2008; Morrison, 2001; Terry, 1997; Quong, 2003).

In the ePortfolio method, the learner collects evidence of experiences, and this way learns new concepts and meanings, which in turn enables further knowledge creation (Bereiter & Scardamalia, 2010). This working with knowledge (with a scale from routine to novelty innovation), individual or social, is called, according to Hakkarainen (2009), knowledge practices. These knowledge practices allow learners to create epistemic artefacts of their activities (Hakkarainen, 2009). An ePortfolio can be seen as one of the epistemic artefacts of knowledge practices. Bereiter and Scardamalia's (2010) requirements of knowledge creation contain five essential criteria to meet: there should be problem solving, shared and longer-lasting (more than the moment) value, a modicum of creativity, and adaptableness to generalisation. General knowledge activities in classrooms could serve as objects or side effects of knowledge creation as such, but the most important function for these activities is enabling further knowledge creation. In reference to Bereiter and Scardamalia's (2010) conclusion, that is a possible way to gain productive knowledge, which means knowledge lived by the learners, worked with it and used it in various ways (Bereiter & Scardamalia, 2010).

Methods

Participants and the Study Setting
The present study took place in an elementary school (grades 1-9) located in a suburb of northern Helsinki, Finland's capital city. Craft education is a common subject for boys and girls. Obligatory craft studies begin in the first grade and finish in the seventh grade. Voluntary craft studies continue further into eighth and ninth grade. All the pupils in this school worked with their own ePortfolio starting from the third grade and ePortfolio was used in this particular school as a support and assessment tool.

An Apple iPad application called Book Creator (non-web-based) was used with young students (from 3rd- 6th grades) and the older grades continued working with Microsoft's web-based platform OneNote. Four iPads (one per group of three to four persons) were available throughout the lessons and the ways of sharing the iPad were agreed within each group. ePortfolios consisted of photos, texts, audios and videos, which were chosen and produced independently by the students. They made decisions independently regarding documentation and content; took photographs, named the content of the image and explained verbally how the process proceeds etc. The teacher defined and reminded to collect personally pivotal events of their working and learning processes. Also, a minimum list of documentation (that covered phases of the holistic craft process) was created by the teacher after the first trial year 2012-2013. The teacher gave feedback related to students' ePortfolios once or twice a month. At the end of every school term the teacher and every pupil individually assessed the school year in the assessment debate and ePortfolio played an important role in this evaluation process. It offered samples of the working processes and advancement of the pupil's understanding but also revealed the weaknesses and limitations of students' documentation and interest to complete the task, just to name a few.

This study focused on ePortfolio data, which was gathered during the years 2013–2018, and students' interview data which was collected in spring 2019. Early years portfolios were stored and dislocated as Portable Document Format (PDF) which is the reason for the disappearance of videos and audios. Other visual data, namely photos, were often general or close-up and challenging to analyse, so the written content appeared to be the most appropriate for research purposes. The written ePortfolio data was selected from the fourth, sixth, and eighth-grade portfolios, and the interviews were organised at the end of the ninth grade (after final evaluation). The content of the learning activities consisted of different craft techniques such as sewing (4th 8th grades), knitting (6th grade), printing (5th, 8th grade) and quilting (4th, 5th grade) and making processes of soft toys (3rd grade), bags (5th grade), clothes 4th, 8th grade) and pieces of art (6th grade) just to name a few. Our study focused on the discretionary sampling of eight students (female), who had six years of experience with ePortfolio usage and were voluntarily willing to participate in the interviews. These students had also chosen craft education as an optional subject. The students of the sampling covered all four documentation categories found in the previous study (Saarinen et al., 2019): the process-oriented, the product-oriented, the free reflection-oriented, and the formal reflection-oriented.

The textual content of the ePortfolios was analysed by theory-driven qualitative content analysis using a summative approach (Hsieh & Shannon, 2005). In the previous study, we had analysed visual data produced by the students separate from the written data but the results revealed congruent emphasis with written content categories (Saarinen et al., 2019): the photos mainly referred to working procedure (see figure 1. below) and therefore our decision was to not analyse isolated contents in this research. The computer program ATLAS.ti was used to analyse the texts which were interpreted to signify an entity of both textual and visual parts. Students' notes were organised in chronological order, and each note was segmented into smaller meaningful units (i.e., the main content of the idea). The length of analysis units varied from one to over 60 words. Altogether, 755 notes were analysed. The coding categories are explicated in more detail in the next section. Figure 1 presents one example of the student's ePortfolio page.
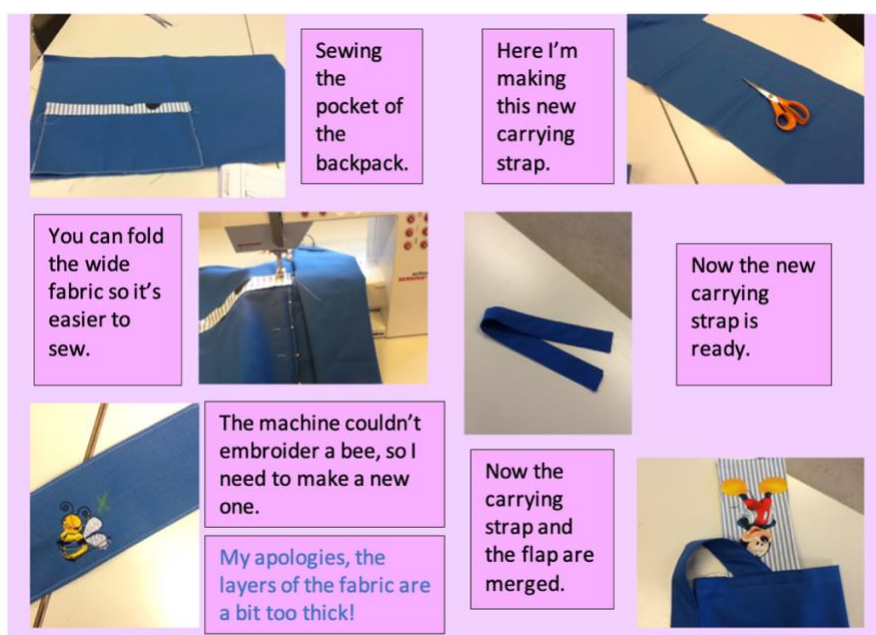

Figure 1. *An Excerpt from a Student Page, with Teacher Comment in Blue*

Thematic semi-structured interviews (Wengraf, 2001) were also conducted, involving three themes: a) perception of the portfolio work, b) changes in practices of working with the portfolio, and c) comparing experiences with different platforms and working styles and providing suggestions to develop the ePortfolio method further. The first theme investigates what essential procedures the ePortfolio method contained. Questions emphasised here include how to work with ePortfolios, what elements are more and less important, and how to guide someone in using the method. The second theme focuses on students' experience and self-observed changes in working throughout these years. They were asked to remember their experiences from the start of using ePortfolios, their experiences after using them for a few years, and their experiences from their last year (grade 8). The last theme challenged students to compare their experiences with different platforms and styles of work and to further develop the method. The interviewer reminded participants of some platform names and helped students remember their working periods with different platforms. Interviews were transcribed and analysed by classifying the responses inductively to the theme groups (approach, changes, and development).

Coding Taxonomy of the Contents of ePortfolios
For the theory-driven content analysis of the ePortfolios' data, we applied the taxonomy developed by Anderson et al. (2001). The applied taxonomy has its roots in Benjamin Bloom et al.'s (1956) *Taxonomy of educational objectives.* Anderson et al. (2001) reorganised and extended the original taxonomy with a few new concepts and with a new dimension and named it *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. The revised taxonomy examines the learner from two different dimensions: the cognitive processes and the knowledge types. The cognitive processes (remember, understand, apply, analyse, evaluate, and create) describe the learner's level of operating in the learning process. According to Krathwohl (2002), these cognitive categories construct a cumulative hierarchy, based on the complexity of the cognitive processes, and there is a continuum from simple to complex processes. The knowledge types (factual, conceptual, procedural, and metacognitive) distinguish the different kinds of knowledge with which the learner is working. The knowledge dimensions, in turn, consist partly of a hierarchy, based on complexity, but also distinguishing factors such as the type of knowledge (Anderson et al., 2001). Amer (2006) has pointed out that the main difference between the original and the revised versions of the taxonomy is how the limitations and weaknesses of the original taxonomy were developed in the revised version and emphasises how the taxonomy benefits pedagogically (see also Wilson, 2016; Pickard, 2007). This taxonomy can be used for many educational purposes: to plan, to control, to assess, and to evaluate both at school and national curriculum levels. The two-dimensional view presents easily what parts are included in the learning process and which are missing, and how well the objectives are mastered (Krathwohl, 2002).

In this study, the Anderson et al. (2001) taxonomy was applied to analyse the content of the ePortfolios fluently. After the first test of data analysis, some categories were merged to better assist the content analysis. Our taxonomy (Table 1) has *three cognitive process* dimensions (the original combined concepts are in blocks): recall (remembering and/or understanding), apply (applying and/or analysing) and evaluate (evaluating and/or creating). The classification highlights the dissimilarities between these categories. The first was declaratory by its nature: a recalling of events that included understanding and was the basic description of one's reality.

The second category was interpretative: more verbose, it covered one's own conceptualisation and the world around him/herself. The third category consisted of evaluation with a creative tendency. It contained a transparent description of the experiences, solving problems and developing a new understanding. Note types are presented with the taxonomy categories in Table 1.

Table 1. The Applied Taxonomy Table with a Short Description of Each Section

Applying Anderson et al. (2001) *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*			**The cognitive process dimension** concrete - - - - - - - - - - - - - - abstract --->		
			Recall: Remember and/or understand	**Apply:** Apply and/or analyse	**Evaluate:** Evaluating and/or creating
The knowledge dimension	WHAT?	**Declarative knowledge** Factual Bits of information Conceptual Organised knowledge forms	**Explains and describes** experience with single or cluster organised knowledge	Uses documentation to highlight own experience, **connecting** assemblies, relevantly like a story of proceedings (naming + connecting)	**Evaluates** based to produced content and develops **uniqueness** of own thinking within the given resources
	HOW?	**Procedural knowledge** How to do something and when to do what?	Recognises, names and uses different methods of working. **Visualises a part** of the procedure.	Connects and organises the parts of the process to construct a quite **flowing narrative** of own experience/s	**Evaluates** the suitability of the **methods** and develops the used methods creatively to reach inventive final result, problem solving
	OWN LEARNING?	**Meta-cognitive knowledge** General and one's own cognition	**Guides** own experience by naming and using different functions and describes own choices, expression of feelings	**Exploits strengths** of own actions to reach the target of flowing story and **ponders the impact** of own action to the final result, expressions of feeling with justification	Develops a novel and original style to create an **individual story** of one's own learning process

The knowledge dimension also had three sections: declarative knowledge (factual and/or conceptual content) and procedural and metacognitive knowledge dimensions, as in the original Anderson et al.'s (2001) taxonomy. These *knowledge dimension* categories were distinctive: declarative knowledge was descriptive and answered the question of what; procedural knowledge based on the activities answered the question of how; metacognitive knowledge covered learners' interpretation of their own learning and action.

In our study, declarative knowledge was largely descriptive and declaratory, naming tools, supplies, and equipment. The notes were generally short—only a few words long—and were often related to photographs by naming the artefact or tool seen in the picture. Descriptions in procedural knowledge were more verbose and contained descriptions of the process retrospectively, concurrently, and prospectively. The content of the note explained what was happening, how the work was going to be done, or what would happen next. In the first recall category, only one event was named and was often expressed with short sentences. In the applied category, the notes contained at least two connected events. The sentences of the note created a narrative-like story of the event described. In the evaluation category, the sentences of the note were fairly long, often including expressions of feelings. The note's content indicated the evaluation or creation of the event. For instance, problem solving was placed in the third category because it consisted of evaluation and creative estimation of the object. The third knowledge dimension refers to metacognitive, which consists of the reflection of one's own action and its impact. Metacognition also consists of naming feelings, sorting out one's

own strengths and developmental targets, reasons for success or failure, or explaining one's own learning solutions in a personal way.

An external researcher tested the inter-coder reliability of the categories for the inter-rater reliability analysis. Two researchers categorised randomly selected samplings of 148 notes (20% of the data, with sample lengths between 1-60 words). Both completed the analysis independently, and the inter-rater reliability was 94.6%.

Results

In this section, we will present the main findings from the first research question: "What type of knowledge and what type of cognitive processes can be revealed in ePortfolios?" We will then describe changes in the quality of the contents in the ePortfolios: What kind of changes can be observed when comparing the contents from the early grades with the contents from the later grades? Finally, we will reveal the results of the students' interviews (RQ3) related to ePortfolio elements, changes in usage of the ePortfolio, and proposals on how to develop the tool and the method. Because of the small number of participants, we did not provide any statistical analysis.

The analysed data consisted of the written notes of eight female students in ePortfolios dating from 2013 to 2018. The total number of analysed words was 12,659, and an average note consisted of about 17 words. The majority of the notes (59%) emphasised procedural knowledge: students described what was happening, how the work was progressing, and what they would do next. This kind of knowledge of working procedures masters justly a subject like craft education, as well as other artistic and practical subjects.

> *We decided that we'll do the highlights out of bias. Lastly, I began to attach the bias to the replacement piece and the old fabric (i.e., shirt). In the next class, I will continue working on it, and I hope that the work will progress better than it did today! (V5)*

The second-largest group of knowledge dimensions was the declarative category, with nearly a quarter of the notes (23%). In this category, students made statements and explained their choices of elements such as design, materials, and tools.

> *Here is the plan I made during the first lesson. On the left is a denim jacket with angel sleeves. There are two versions of the style in the middle. The style at the top has sleeves which are the same fabric as the other parts and is using patterned fabric. In the lower version, the sleeves are the same fabric as the denim jacket, i.e., chiffon or something like that. The upper part on the right is lace and the lower part is made of easily descending and light fabric. I ended up making a denim jacket. (E1)*

The smallest group of knowledge dimensions was metacognitive knowledge (18%, f=92). The students were pondering their learning activities, successes and failures, and the received feedback.

> *It feels like a sort of automation has come over me now! I'm still a bit slow, but when we hold a loop creation contest, I was able to do 21 in 2 minutes. (K6)*

While examining the cognitive process dimension of the notes, it was revealed that the majority of analysed notes, 59%, fell into the recall category and were mainly declaratory in nature.

> *Here's a backpack plan. (H4)*
> *Now there's a pattern on the fabric. (S2)*

A third of the notes placed to the apply category (185/521) and contained more descriptions of craft knowledge and making practices, as well interpretations of the work.

> *The position of the zigzag stitch is so that the other paw is outside the fabric and straight, it is so that both paws are on the fabric. (L7)*

The evaluate category consisted of only 6% (30/521) and was wordier and contained more interpretation than the former category. It also contained statements analysing and evaluating either working processes or decisions.

> *Personally, this part was the hardest for me because the elastic band got lost multiple times inside the sleeve and it was hard to attach the elastic band because the elastic band kept coming out from under the presser foot! (A3)*

These results crystallised the variations of the content used in craft education. There is a need for versatile knowledge types, and naturally, the narratives from the activities change during the different assignments, personalities, inputs, and experiences, to mention just a few relevant perspectives. These kind of student-led ePortfolios contain and reveal large-scale variations of learning outcomes. Despite the variation, learning itself is studied and somehow organized on every level. Therefore, the most important outcome, the learning process itself, is realized and the demonstration of revision and growth is performed.

Developmental Changes in ePortfolios

Next, we analysed developmental changes in the ePortfolio data between different grades. The cognitive process dimension of the recall category was obviously dominant (78%) in the earlier grade (fourth). The apply dimension consisted of approximately 21% of the notes, and the evaluate dimension could hardly be detected (1%) (see Table 2). However, in grade 8, the apply dimension was the largest category, representing over half of the data (55%). The recall category consisted of approximately 32% of the notes, whereas the evaluate dimension had increased to 11%. In turn, the knowledge dimension of procedural knowledge was the major knowledge type in all grades, and declarative as well metacognitive knowledge decreased steadily.

Table 2. Distribution of the Cognitive Process Dimensions and the Knowledge Dimensions in ePortfolios in Grades 4, 6, and 8 (Coloured Categories Represent the Three Highest Frequencies of Every Grade)

Knowledge dimension		Grade 4			Grade 6			Grade 8			Total frequency
		The Cognitive process dimension									
		Recall	Apply	Eva-luate	Recall	Apply	Eva-luate	Recall	Apply	Eva-luate	
	Declarative	36/ 22%	7/ 4%	0/ 0%	43/ 19%	17/ 7%	0/ 0%	9/ 6%	10/ 7%	0/ 0%	122
	Procedural	58/ 36%	16/ 10%	1/ 1%	73/ 33%	40/ 18%	13/ 6%	34/ 24%	56/ 40%	16/ 11%	307
	Meta-cognitive	31/ 19%	12/ 7%	0/ 0%	19/ 8%	15/ 7%	0/ 0%	3/ 2%	12/ 8%	0/ 0%	92
	Frequency	125	35	1	135	72	13	46	78	16	521

When comparing the knowledge dimension between the fourth and eighth grades the change of the highest references can be observed: at first, in grade 4, the knowledge type was decentralised to all three knowledge categories; but in grade 8 the procedural knowledge had clearly the highest frequencies in every cognitive process category. This result was expected because of the nature of craft education: the design and making process is a key element, and "learning by doing" is a focal activity. Also, the change from using declaratory communication to a more verbal, individual, process-oriented interpretation of the action shows how the students can use more subject knowledge and combine the content learned with their own action and to their own story—not just naming or recalling things, which itself is also one of the aims of craft learning. Moreover, to analyse and evaluate one's own work requires practice and guidance and is therefore understandable as being achieved and performed in the higher grades. Further, the evaluation of learning was implemented with different applications (in grades 6 and 8), and therefore it decreased significantly. These findings showed that the knowledge content was more versatile in the fourth grade than in the eighth grade. The highest knowledge frequencies in the eighth grade concentrated strongly on the procedural dimension and the cognitive process dimension on the apply section, and the contrast became more versatile in the eighth grade compared to the fourth-grade recall category. This change was also expressed by the students during the interviews. They explained that things they did in the lower grades, like discussing their feelings and thoughts about their learning, were not in focus anymore during the later grades. They felt that it was more important to write a more professional report of things they had done than to ponder their own perceptions.

The results of the cognitive processes in the present study indicated that the concrete (cognitive process) skills (recall) dominated among younger students when compared to the more abstract skills (apply and evaluate). The results with the data revealed that there were some changes in student work throughout the years. At the beginning of using the ePortfolio method (fourth grade), the content consisted of versatile pieces of knowledge compared to the higher grades (sixth and eighth). However, the elements of documentation in the fourth grade were seldom combined and did not contain an interpretation of the students' action, although emotions were more often processed. However, a clear personal trace and a critical attitude were still missing in the highest grade. It is good to note that craft education, as well as the

assessment of it, strongly emphasises the craft processes themselves, which could influence students' documentation during their studies.

Results of the Students' Interviews

In the interviews, the usage of the ePortfolio focused on how students perceived this working method. Interviewees highlighted the working method by explaining what one could do and how they should do it and also raised the concept of students' action (i.e. accurately proceeding from start to end) and things to be added to ePortfolios (i.e. feelings and communication). As an important element, interviewees further named such as telling "step by step," guidance on how to use the platform, and the teacher's active role in communication. Understanding one's own work was highlighted as well; two students stated that the whole documented content is the most important thing.

> *Let's write what happened as if to clarify and then it when it becomes such a good whole that how such a conclusion has been reached. (K6)*

The importance of the method was emphasised in showing their development, and the ePortfolio was considered important in supporting their memory and their successful assessment.

> *Even the teacher sees better what has been done when there are many students, so it is easier to see from the portfolio what has really happened and then it is also good for you to remember what has been done. (S2)*

> *I have noticed that it helps to outline all the different stages of work and it can help to get a better overall picture. (V5)*

> *Then it helps the teacher and the students in life and in assessment. (A3)*

For weaknesses of the method, they mentioned time consumption, interruption of flow when working, and some technical problems (battery, loading).

> *Just that even if you get into some good flow on the job, so that you can do that job for a really long time, then you have to remember to stop in between and take that picture and put it there so that you don't forget about them. (Q6)*

There were similarities between students when they were describing the changes in their work. They described that the focus of the documentation had changed. During the first years, they paid more attention to external factors like visual representations (colours, for example), partly playing with funny decorations; but later they learned to take better documentary pictures and briefly explain their work in progress. In other words, they learn to do documentation more systematically and accurately.

> *Then there might have been a bit of a fumble and most of all I didn't pay attention to the appearance of the thing that was just those colours and such and then afterwards have learned to take as illustrative pictures as possible and write short and concise texts. (L7)*

They also emphasised the importance of the content and how they learned to document in a more "professional way" through detailed photos, more explanations, and no childish decorations. They also explained how they focused more deeply on working, learning, and trying to use the right craft concepts. Some students explained how they learned to edit pages and work in a more logical order. Other students emphasised how they learned to use ePortfolio as a part of their learning, not just for having fun.

> *So it really started to take the kind of thing that quite rightly illustrated it in its own work and in a way used it as part of learning and not just the silence that you can make such funny texts and take nice pictures here. (S8)*

The students' suggestions for improvements to the ePortfolio were divided into three themes: technical issues, platform demands, and practical functionalities. The technical issues were related issues like battery charge and a suitable quantity of equipment. The platform demands were more general issues, like being easy to access, use, or import data to; or wishes for a book-shaped format. These wishes on how to improve the platform would need a more detailed description of the desired changes to be able to concretely develop the platform to be more user-friendly (for example, signing in or adding elements).

> *It had to be functional… what we had in primary school was functional, you got access to it so quickly, but the only thing was that there were several students at the same end so there was sometimes a wait and then what was online application, so it was difficult to transfer pictures, that is, when you had to go to a computer, and it took time to log in. (E1)*

The practical functionalities contained knowledge of user experiences, which could be easily implemented in everyday practices. Participants wished to have their own time for ePortfolio work, for example, at the start or end of each lesson. They also wished to have closer communication with the teacher; for example, the teacher would read the ePortfolio every week and comment on their processes.

> *You can write a bit like something for the next lesson, that at the beginning of the lesson you could always read what is the next task or some tips that if at the beginning of the lesson everything covers the portfolios and then you have written there that the heel of the wool sock or the hem something like that might get started more easily when you can sometimes be there and you have no idea what you should do. (H4)*

Discussion

The aim of this research was to fulfil the need to follow the students' longitudinal learning processes and, through the analysis of knowledge and cognitive processes, reveal how their use of ePortfolios has changed during their six years of craft studies. The topic and the data in this study are unique, and overall, studies of sustained use of ePortfolios with young students are rather unusual. Significant development projects and programs exist (ePearl, Project Zero, Reflect-initiative, Open Portfolio Project, Project e-scape), but more research, especially long-lasting and young students learning-centred process data, is needed (Meyer et al., 2010; Carney, 2006).

The results of the present study indicated that the concrete cognitive process skills (recall) dominated among younger students when compared to the more abstract skills (apply and evaluate). However, when analysing the data in a class-based setting, some transition toward more abstract cognitive categories could be detected. Anderson et al.'s (2001) revised taxonomy has been framed for lifelong learning, and could be the reason why the results of this study emphasised the upstream categories (recall and apply). The transition of the focus toward more abstract cognitive processes can result both from the increased learner experiences and their age. The interview data also confirmed the trend toward highlighting the craft process more than reflecting other elements of the learning activity. The craft education, as well as its assessment, highlights the craft processes (Syrjäläinen & Seitamaa-Hakkarainen, 2014) that could have influenced students' observations and documentation during their studies. Still, other objectives (Rönkkö et al., 2016; Pöllänen, 2011) such as communication, social participation, and enjoyment were also observed.

The ePortfolio types (Kimbell, 2012) determined the three different contents: storage (student as storer), rapport (student as reporter) and dialogue (student as thinker). This division has similarities with Habermas' (2008) three-tier model of interest: technical interest (knowing what, contains no challenge and things accepted as they are), procedural interest (knowing how, contains a wider picture with more interpretation and therefore more led by the individual), and emancipation/critique interest (knowing why, contains all the described levels plus a critical, distinctive imprint on one's own viewpoints). Introduced levels also have similarities with Andersson et al.'s (2001) taxonomies. This kind of transition could be observed from the results of this study: in the eighth grade, the students paid more attention to procedural knowledge, but rising to the highest level demands more mature cognitive development and is seldom found in the output of young learners.

When classifying the three types of ePortfolio, Kimbell (2012) explained the differences based on reflection and working. Figure 2 gathers the process of the ePortfolio with its elements, different ePortfolio types and development levels of the learner, and seeks to clarify understanding of the ePortfolio method in craft education as well as adapted to other subjects. These changes can be described by using the elevator metaphor (see Figure 2) that can be affected by the variation of the ePortfolio type. The other elevator is the degree of freedom, where students are closely guided at the beginning of the process, and in time get more responsibility. The background thoughts of the elevator metaphor were applied from Habermas' theories of knowledge and human interests and philosophy of emancipation (Habermas, 2008) as well as from Love et al.'s (2004) levels of maturation theory. The elements of the ePortfolio are connected from Zubizarreta's (2009) model, The Learning Portfolio.

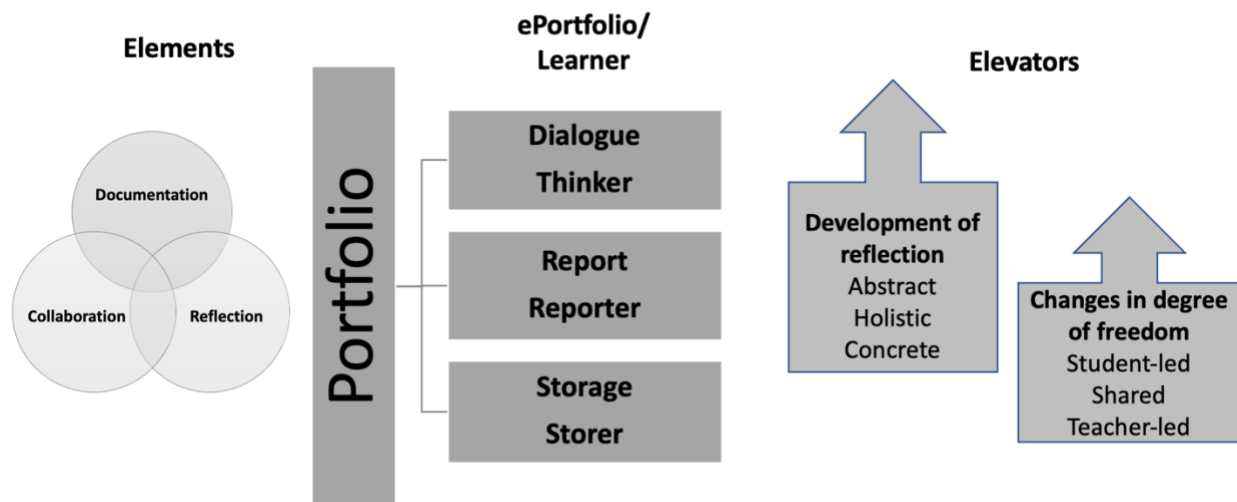The Elements of the ePortfolio Process and the Development Levels

Figure 2. The fusion of ePortfolio theory and practice

The ePortfolio method as such elicited pleased experiences among the interviewed students, giving a more versatile picture of the learning process, as Keune and Peppler (2017), Meyer (2010), and Barrett (2007) have highlighted. Chen and Black's (2010) concept of "folio thinking" could be detected from the interview data: students outlined the importance of the process, reflection, and their own role in creating the ePortfolio, as Kimball (2005) has stated. The improvements that students discussed showed a critical attitude towards the ePortfolio method. Students suggested, for example, a stronger connection with the curriculum (plain periods) and closer communication with the teacher (mentoring).

Students' reflections gathered understandably around the process and procedural knowledge. That knowledge could be interpreted in terms of Bereiter and Scardamalia's (2010) concept of productive knowledge. The data confirmed how the students worked with the knowledge and the knowledge lived by the learners—they got their own interpretation to the level a comprehensive school student reached. The section of knowledge creation (Bereiter & Scardamalia, 2010) could also be traced from the data. Some situations demanded problem solving with a modicum of creativity to be able to proceed with assignments smoothly.

Our study had several limitations. The study was conducted in one of the researcher's schools with the students she had worked with during the data collection period. Familiarity should be taken into consideration, as well as the modest size of the chosen sample. Eight participants were voluntarily willing to give their ePortfolios to researchers and were also voluntarily willing to participate in the interview. The participants were all female and belonged to a group which had positive attitudes towards school and assignments. Furthermore nearly all of them performed well in all school subjects. These students were interested in the crafts (had chosen it as an optional subject) and in crafts in general and were willing to develop their own understanding of the topics. A positive attitude could enrich and add diversity to the data. An engaged student could be more active, could analyse more eagerly and could be more competent to verbalize reflections in their ePortfolios as well as in interviews. Craft education

was the only subject that used the ePortfolio method in the studied school at the beginning of the data collection period, but later also other school subjects started to use it more frequently. This could have positively influenced students' active participation in the early years of the data collection.

Nevertheless, this study was a serious trial run to discover how students, while working, can perceive and save their learning processes individually in action with the help of technology. In the future, we need to develop different methods and data collection models to be able to discover learners' inner qualities in educational context, as Seery et al. (2019) stated. Our challenge in craft education is also to regain a more balanced situation with the stages of craft process and product focus: to bring ideation and design to the foreground along with the dominant making stage, and to revise the importance of the final product. ePortfolio and process documentation could be one way to enable the above mentioned development. Technology still plays a meaningful role in the discussion of ePortfolio use now and in the future. According to Carney (2006), these technology-enhanced knowledge practices need to be studied carefully to be able to show what the electronic method has to offer learning (Hakkarainen, 2009) and what are the effective methods for studying it (San Jose, 2014). Carney (2006) names five recommendations for future studies: grounding research in theory, clarifying the role of technology and the contribution of the studied methods, retaining the richness of the ePortfolio, and increasing large-scale and long-term research. Our study contributed a few pages in the context of craft education, but these topics need to be further researched in the future.

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