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Self-Documentation Software as a means to increase Self-Efficacy at Schools: Design Concepts based on Co-Design with Students

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Summary

Information and Communication Technology (ICT) systems are employed in a wide array of settings. One such setting is the educational domain where ICT is taking an ever increasing part in the classroom. Due to this evolvement, ICT may be a well-suited aspect in supporting the students to overcome their challenges. With the goal of this support in mind, ICT addressing the students' feeling of Self-Efficacy may provide an answer. As of today the majority of technology used in classrooms come in the form of Learning Management Systems (LMS) which main focus is to provide a digital platform for the teacher/student interface.

A promising field of study is that of Self-Documentation tools employed in education. The act of Self-Documentation is shown to be empowering, which in turn can lead to an increased feeling of Self-Efficacy. To this end, the main aim of this thesis concerns investigating possible avenues in which digital Self-Documentation tools can incorporate functionality in order to increase student Self-Efficacy.

A user-centered approach was employed in order to better capture the students' perspective regarding the main aim. As part of this approach, a workshop was conducted with students using a Self-Documentation tool as part of their education. The goal of this workshop was to elicit design concepts supporting Self-Efficacy that were important to the students. By building on these concepts together with concepts from theory, this thesis seeks to illustrate ways in which they can be combined into software applications with the aim of supporting student Self-Efficacy.

Main findings regarding this aim concerned design concepts and documentation modals preferred by students. A trend regarding documentation modals is that they should be varied as well as reflecting the user habits of today's students. These user habits are strongly influenced by software and applications that are employed in the social parts of the students' lives. Furthermore, conceptual design inputs from students indicate that there are several ways in which support for Self-Efficacy can be incorporated in Self-Documentation tools. Suggestions for how the documentation modals and design concepts can be combined in software applications are presented through wireframes.

Sammendrag

Informasjons- og Kommunikasjonsteknologiske (IKT) systemer brukes i en rekke kontekster. En slik kontekst er utdanning der IKT ser større og større grad av bruk i klasserommet. Grunnet denne utviklingen kan IKT være et velfungerende verktøy for å støtte studentene gjennom deres utfordringer. Med den forenevnte støtten for øyet kan IKT som søker å øke studentenes mestringfølelse være et svar. Per i dag er majoriteten av teknologi som man finner i klasserommet i formen av verktøy for håndtering av læring, hvis hovedfokus er å være et grensesnitt mellom lærer og elev.

Et lovende forskningsfelt finner man innen selvdokumenteringsverktøy som brukes i utdanning. Det å selvdokumentere er vist å være styrkende som igjen kan lede til økt mestringfølelse. Til dette formål er hovedmålet til denne avhandlingen å undersøke mulige innfallsvinkler der selvdokumenteringsverktøy kan inkorporere funksjonalitet for økt mestring.

En brukersentrert tilnærming ble brukt for å bedre kunne fange studentenes perspektiv angående hovedmålet. Som del av denne tilnærmingen ble en "workshop" avholdt med studenter som bruker et selvdokumenteringsverktøy som del av deres utdanning. Målet med denne "workshop"-en var å frembringe mestringøkende designkonsepter som var foretrukket av elevene. Ved å bygge på disse konseptene, samt konsepter funnet i akademisk teori, søker denne avhandlingen å illustrere måter de kan kombineres på i programvare, som har det mål å øke mestringfølelsen til studenter.

Hovedfunnene angående dette målet angikk studentenes foretrukkede designkonsepter og dokumenteringsmodaliteter. En trend blant dokumenteringsmodalitetene er at de bør være varierte samt at de tar hensyn til brukervanene hos dagens studenter. Disse brukervanene er sterkt påvirket av programvare og applikasjoner som studentene bruker i deres sosiale liv. Konseptuelle designbidrag fra studentene indikerer at det er flere måter å støtte mestringfølelsen på i selvdokumenteringsverktøy. Forslag til hvordan dokumenteringsmodalitetene og designkonseptene kan kombineres i programvare er presentert ved hjelp av "wireframes".

Preface

The work that lies before you is written as part of *TDT4900 - Computer Science, Master's Thesis* and concludes our MSc. degree at NTNU. Our specialization is within software engineering and the motivation for researching and writing about the topics in this thesis come from our desire to help people in their everyday life through software.

We started working on this thesis in January 2018 and it concluded in the beginning of June 2018. During this research we learned many valuable lessons that we will bring with us in later parts of life.

We would like to extend our deepest admiration and gratitude to our supervisor Associate Professor Babak Farshchian at the Department of Computer Science at the Norwegian University of Science and Technology (NTNU). This thesis would not be possible without his thorough guidance, interest and eagerness towards our work.

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Sincerely,
Jonas Løchsen & Henrik Martinius Negård Mørk

07.06.2018, Trondheim.

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Abbreviations

CEO	=	Chief Executive Officer
CPP	=	Career Portfolio Program
HCI	=	Human-Computer Interaction
ICT	=	Information and Communication Technology
LMS	=	Learning Management System
NTNU	=	Norwegian University of Science and Technology
RQ	=	Research Question
URL	=	Uniform Resource Locator

Introduction

This chapter serves as an introduction to this master thesis where the motivation for the research conducted and relevant background information will be presented. Furthermore, the problem that has been investigated will be described together with the research questions which constitute the ground work for this thesis.

1.1 Background & Motivation

Overcoming challenges and developing the resilience to see challenges through is applicable to almost all situations a person can find themselves in throughout the entirety of life. Being able to overcome something that previously seemed impossible can be of great enjoyment and relief for many. One context in which this is highly applicable is in the educational one. The academic results of students is not only important to the individual, but can also give indicators as to how advanced a society has become. In connection with advances, software and informational systems are seeing an ever increasing use throughout students' educational process. To this end the main motivation for this research is to investigate possibilities for software applications and systems to aid users in overcoming their challenges.

The ability to overcome challenges can be covered in the word Self-Efficacy. People who are struggling with certain aspects of their lives would be better equipped to handle these challenges through an improved feeling of Self-Efficacy. Among many ways in which this improvement can be addressed, Empowerment stands out as it is attainable due to the distributed nature of technological systems. So how does a system or application empower it's users? This study will argue the case that this can be achieved through Self-Documentation: the act of documenting experiences, work and thoughts in a portfolio or similar structure. Consequently, these concepts form a relationship that suggests a guideline in the search for increased Self-Efficacy:

Self-Documentation → Empowerment → Self-Efficacy

The aforementioned relationship can be used to investigate avenues in software design and creation. Since the relationship indicates that Self-Documentation can lead to improved Self-Efficacy through Empowerment, it was decided that Self-Documentation software tools would be the main type of software to be studied. The authors were introduced to two such tools called Mindfit and Dokker. The former is a self-betterment mobile application grounded in psychological theory implementing personal goal-setting and positive self-reflection. The latter is a self-documentation tool used in education focusing on documentation of school related work.

The CEOs of said applications envisioned an integration of functionality with the goal of supporting Self-Efficacy gain in an educational Self-Documentation tool. Although integrating the two applications was not the goal nor purpose of this research, the vision was used as an inspiration by the authors to investigate further how such functionality could be achieved digitally. A collaboration was established between the authors and the CEOs of the applications, which granted access to valuable insights from their users. It was decided that the authors would share valuable insights learned about the applications with the CEOs, but there was no demand from them to produce specific products.

1.2 Problem Description

This thesis is the continuation of the work done in a specialization project the authors conducted in the fall of 2017. The overall problem investigated has remained the same throughout the specialization project as well as in the the research presented here; namely the apparent lack of functionality supporting Self-Efficacy in educational software. Functionality that supports Self-Efficacy was found in Mindfit in the form of daily goal-setting and positive self-reflection, which are grounded in theory concerning positive psychology. The results from the specialization project, mainly insight into how a Self-Documentation tool is employed in a Norwegian High School, led to a preliminary research vision for this master thesis:

”Using co-design workshop methodology, how can daily goal-setting and positive self-reflection be incorporated into a self-documentation tool used in education?”

The main challenge with investigating the aforementioned research question was the act of conducting a user-centered design process around the vision of combining two applications. Firstly, it was decided to look at several potentially Self-Efficacy enhancing features, instead of only goal-setting and positive self-reflection. Furthermore, to accommodate the technological shift the act of self-documentation would be looked at in new ways. The change of focus for the research process resulted in revised research questions that are listed later in this chapter.

1.3 Research Questions

Based on the problem described above, research questions were developed to address the new vision and goals of this research. The research process consisted of two phases based

on the research questions presented here. The first phase involved the organization of a workshop with the aim of answering *RQ1* and *RQ2*. The second phase tackled the answering of *RQ2.1*.

RQ1 What documentation modals are preferred by users of self-documentation tools?

RQ2 What are important design concepts in digital self-documentation tools that promote student self-efficacy?

RQ2.1 In what ways can these design concepts be combined in software applications?

1.4 Reading Guide

This thesis is organized into six chapters not including the introductory chapter presented here. Chapter 2 presents theory regarding the main concepts of this thesis, organized in a literature review. Following the theory is chapter 3 describing the structure of the research process. Chapter 4 presents data collection and analysis methods used in the research process. The results from the data collection and analysis are presented in chapter 5, followed by a discussion of the results together with visualizations of the most important findings in chapter 6. Chapter 7 presents a conclusion of the results and seeks to answer the research questions listed above, possible future work is presented at the end of the thesis. Appendices are found after the Bibliography.

Chapter 2

Theory

In this chapter relevant background theory on the subjects investigated in this thesis will be presented. The chapter consists of a literature review of the three main concepts of this thesis: Self-Documentation, Empowerment and Self-Efficacy. As mentioned in the introduction of this thesis the relationship between these three concepts is vital to many assumptions made by the authors. A discussion providing evidence of this relationship is given below, followed by a literature review divided into the three concepts. The state-of-the-art of the three concepts is presented in the context of education, backed up by examples from other fields of study where it seems fitting. The purpose behind this chapter is to provide to the reader an understanding of how the links in this research came to be, as well as theoretical knowledge about the concepts in general.

As mentioned in the last paragraph the link between the three concepts self-documentation, empowerment and self-efficacy needs to be established in order for the assumptions made in this research to make sense. It is shown that student performance is linked to their notion of self-efficacy through the work of Bandura (1993). Therefore, by enhancing the students' feeling of self-efficacy, one could expect that their academic results would increase. One way of enhancing the students' feeling of self-efficacy is through their empowerment in the learning process (Conger and Kanungo, 1988). A method to increase student empowerment is to let them take greater part and control of their learning process (Cleary and Zimmerman, 2004), which could be done by self-documentation (Alexiou and Paraskeva, 2010).

2.1 Self-Documentation

Portions of the digital generation — youth that has grown up surrounded by technology — has been reported to lack self-regulating characteristics in their learning process (Zimmerman, 2002). The article defines learning as "... an activity that students do for themselves in a proactive way rather than as a covert event that happens to them in reaction to teaching". There may therefore be a demand in education for technology that helps students to

focus and take part in their learning process. Self-documentation may be such a tool. In the educational setting, self-documentation can be found through the use of e-portfolios. According to Abrami and Barrett (2005) an electronic portfolio is defined as "... a digital container capable of storing visual and auditory content including text, images, video and sound". The use of e-portfolios in learning processes is justified by some "... not only because they act as multimedia containers for students and teachers but also because they support student self-regulation and core educational competencies, especially literacy skills" (Abrami et al., 2008). The enhancement of self-regulated learning skills through the employment of e-portfolios is further supported by Cheng and Chau (2013). An important takeaway from their article regarding self-regulated learning skills is: "As such, the application of metacognitive self-regulation strategies in ePortfolio development may assist students in setting goals, monitoring progress, evaluating outcomes and then making strategic adjustments, thereby enhancing ePortfolio achievement". Therefore, the e-portfolio as a tool, as well as self-documentation on its own may be the right tools for stimulating students into taking greater part in their education. Research into the motivational motives for students using e-portfolios has been conducted in Mobarhan et al. (2014). It was found that students' motivation for using e-portfolios is grounded in "... giving and receiving feedbacks, long-term consequences of use, self-documentation, informativeness, information sharing, social interactions, entertainment and convenience utility".

E-portfolio Design and Examples

Looking at examples of e-portfolios is interesting as it can give inspiration and pointers as to what can work and what can not work in self-documentation tools. There are examples from research that combine aspects of the concepts described in the introduction to this chapter. One such example is that of the Netfolio, a variant of the aforementioned e-portfolio. The Netfolio and a case study of its deployment is presented in Barbera (2009). The Netfolio adds to the e-portfolio system the abilities for students in a class to peer-assess each others work, as well as co-author content. Based on feedback from the students that participated in the case study the authors could conclude that: "Using the netfolio leads to more revisions both by the students, of their own work, and amongst students, and this in turn leads to better final results". The feedback students gave regarding the use of the Netfolio would suggest that concepts such as peer-assessment and co-authoring of content could be of significant aid to students. Research has been conducted looking into the current trends of e-portfolio use in higher education. There is lacking literature for e-portfolio use at the High School level, so as of the moment of writing this thesis, the authors have to make due with lessons learned from other levels of education. Current trends of e-portfolio use is presented in Reese and Levy (2009). An interesting finding that the authors present is: "...e-portfolios can help universities and colleges connect to today's undergraduates who feel comfortable communicating through multiple media by publishing their experiences on sites such as Facebook, Youtube, and Flickr". This is an interesting finding as it identifies the need for educational institutions to better reach out to younger generations, and it presents a tool for doing just this; the e-portfolio.

An extensive example of the development and utilization of an e-portfolio system is presented in Reardon et al. (2005). From the article we can learn important design criteria the

development team at Florida State University elicited from staff, the school administration and students. Design goals for the e-portfolio that the university developed, called The Career Portfolio Program (CPP), are:

- (1) a comprehensive system for helping students connect learning opportunities with employer needs;
- (2) a program for helping students integrate curricular and co-curricular experiences (e.g., academic/career advising, courses, and service learning);
- (3) an innovative Internet-based system to promote student learning, career preparation, and employment; and
- (4) a high-visibility program to positively support student recruitment and retention.

Evaluation made by staff at Florida State University showed that a majority of students enrolled in the system: "By May 2005, 25,038 students out of 38,886 (64%) currently enrolled had initiated some level of contact with the CPP". In addition to the high user engagement, "Employers continue to indicate acceptance of the CPP and a willingness to use it in making hiring decisions." which indicates that the CPP, and the way it is designed, can be of great interest when designing self-documentation tools.

Another example of an e-portfolio is presented in Alexiou and Paraskeva (2010). Although the article only presents a pilot study, some positive results can be extracted from it. A key quote from the paper is: "Lastly the process of structuring e-portfolio as a learning strategy can be used in order to enhance self regulated learning skills." This fact that an e-portfolio tool can help students increase their "self-regulated learning skills" clearly links it to positive effects on both empowerment and self-efficacy, where these links will be made apparent below through discussion of the two concepts. Giving the student the responsibility of managing and adding to his/her e-portfolio is one of the cornerstone design principles of an e-portfolio system created and used at Queensland University of Technology (QUT). It is stated in an article describing the work of designing and deploying the system that the system should: "be student-centred and student-managed, with each student responsible for their own work;"(Mccowan et al., 2005). This statement from the paper written by Mccowan et al. further sements the e-portfolio as a promising tool for engaging students in their education. Furthermore, this article highlights the importance of grounding the development of a University-wide system in as many departments of the University as possible: " The formation of a small multi-division project group made for shared ownership, rather than this being the proprietary responsibility of one section, and it enabled decisions to be made quickly after appropriate consultations." It is made apparent by Mccowan et al. (2005) that this decision of including as many stakeholders as possible into the development team made the appropriation of the system much easier.

Self-Documentation in other Domains

Self-Documentation has been deployed in the psychological domain as well. The authors have encountered the use of self-documentation in the field of positive psychology through one of the applications that were investigated in this study. Positive psychology and the effects it may have on mental illness is introduced in Seligman and Csikszentmihalyi (2014). Interventions implemented online where the user would write down positive aspects of everyday life is shown to have a positive effect on happiness (Seligman et al., 2005). A study

performed in England shows a significant coupling between depression, financial issues and degrading academic results (Andrews and Wilding, 2004).

2.2 Empowerment

Empowerment is being investigated in the field of education as well as in the health care domain. An array of ICT solutions have been designed and deployed into the health care domain with the intention of increasing patient empowerment, it may therefore be interesting to investigate this avenue further. Portions of the research conducted into the field of technology, education and student empowerment revolve around the educational system's ability to adopt new technologies. Empowerment has been defined by some literature as "... 'to enable.' In contrast to the earlier definition of empowerment as delegation (of authority and resource sharing), enabling implies motivating through enhancing personal efficacy." (Conger and Kanungo, 1988). One can find a definition of empowerment from the perspective of students in Solhaug (2009): "Empowerment is understood as the process through which students gain the power of self-direction and the possibility of further emancipation", cited by Solhaug from the work of Shor (1992).

Empowerment in Education

An introductory notion of the feeling of empowerment, in the organizational setting, is elaborated in Conger and Kanungo (1988). Bringing the concept of empowerment into the classroom and linking it to communication between learners is done in Frymier et al. (1996). It is worth noting that a substantial amount of the research that was found on empowerment in the educational setting has been conducted at the university level. Although this diverges from the main focus of this thesis, which focuses on students at the High School level, the authors are of the opinion that important lessons can be learned from research presented in this literature review.

Arriving at similar conclusions to those of Frymier, computer networks and students' ability to communicate with each other at their own leisure is shown to be empowering by Warschauer et al. (1996). Other devices have been employed in the research into empowerment in education. Group work and peer assessment is investigated by Stanier (1997) where these devices were positively received by the students in the survey. Self-assessment and the possible positive effects it may have in University level courses are presented in Rover and Fisher (1998), where students are allowed to take much greater part in their education through: "...student journal, a self-assessment report, a student management team, and use of the Web".

Empowerment through Technology

Technology has been deployed in many different ways with the end goal of increasing student empowerment. A study into the use of technology in education, reporting on the technological state in Norwegian schools, and the possibly empowering effect of technology for students is done in Erstad (2003). Another Norwegian study implies that students'

access to computers may affect their empowerment and ability of critical thinking: "It may therefore be concluded that computers might have a solid empowering potential that can be developed by teachers and students." (Solhaug, 2009).

An additional way of empowering students is through *Microworlds* and the manipulation of these is elaborated in Hannafin and Land (1997). It is found that technology can enable a learner-centric educational situation, where students are able to take greater part in their own education. It is argued that by letting the students explore on their own, find information and critique this information is empowering.

Linking the notion of empowerment in education to state of the art technology is done by McLoughlin and Lee (2008). The authors believe that the advent of Web 2.0 can enhance the opportunities of student empowerment in the classroom. The huge advances made in technology, illustrated here by Web 2.0, makes it easier for system developers to create what Erstad (2003), Hannafin and Land (1997) and Frymier et al. (1996) present as important factors for student empowerment. Transforming education into a more individualized endeavour, thus rendering it empowering for students is argued for by Renner (2006). Web 2.0 is argued to enable students to be empowered: "New online technologies allow individuals to filter and control existing content (aggregation), easily create new content (personal publishing) and rapidly communicate, inform and distribute this information with peers through online social networking services." Technology is shown to benefit both the teacher and the student in the classroom, as well as outside of it by McKnight et al. (2016). Teachers are able to save time, individualize instruction and connect students with a broader audience through technology. Students are able to seek information in a much greater pool of sources through the internet and "...extend the purpose and audience of their work."

Empowerment through Organization

Technology can support the increase of student empowerment in other ways than being an information look-up, administrative or communication tool. Digital Game-based Authorship is shown to significantly increase students' critical thinking scores in Yang and Chang (2013). Students that were given the task of authoring an authentic game showed significantly higher levels of critical thinking skills than those students that were given the task of creating Flash animations. These findings are similar to those of *Microworlds* since both academic works argue the case that by students being more independent in their education, they will be empowered. A flipped classroom methodology was employed in Pharmacy courses held at different satellite locations and the empowering effect this had on students is presented in McLaughlin et al. (2013). A group of students having used the flipped classroom methodology responded in a qualitative evaluation with the main impression: "..., the flipped classroom created an environment that facilitated enhanced learning and increased confidence." Similarly to a flipped classroom, an Audience Response System (ARS) was employed and surveyed in Sharp and Sutherland (2007). The authors reported that the "Respondents [students] have acknowledged increased levels of engagement, enhanced motivation, morale and the capacity to work together." The students that participated in the use of ARS were given the opportunity to anonymously raise

questions regarding the lectures being held as well as using the system for peer-review. Peer-review has already been talked about in this literature review, and it has been shown to give an empowering effect on students.

Looking at the broader lines of student empowerment, studies have been conducted into the school and classroom organization. A Student Empowerment Model is presented in Kirk et al. (2017) and it shows that: "The results suggest that classrooms in which teachers shared power with students, setting up equitable relationships and inviting students to participate in decision making, were connected to student empowerment". It is believed by the authors of the article that student empowerment is linked to both how the school views student interaction with the administration as a whole, as well as how students are brought into decision making in the classroom setting. A case study was undertaken into a course where its content was collaboratively designed between the students and teachers (Jafar, 2016). According to the author of this paper the response from students was overwhelmingly positive and a substantial part of the students reported that they felt empowered.

Designing for Empowerment

The concept of designing for empowerment is introduced by Ladner (2015). The term of user empowerment in the article is set in the context of users with disabilities, but parallels can be drawn to design processes regardless of intended user groups. The essence of Ladner's idea of design for empowerment is: "In design for user empowerment, users develop the project, design the requirements and features, develop the prototypes, test the prototypes, and analyze the results of testing to refine the design." Conversely, empowerment of the user of a software system could be achieved in the features and customizability of the system itself. Such a system is presented in Kynigos (2004). The authors of the article argue that by giving the users of their program (E-slate), in this case students, greater control and lower threshold for taking this control, they are in effect empowering them. This empowerment of their users come in the form of component based design of computer software. A balance is struck between black-box and white-box design:

On the one hand, it [E-slate] provides the user with higher-order black-box building blocks—the components—which are pieces of software themselves. ... On the other hand, these components are designed to be as generic as possible allowing the user to think up many creative ways to connect them to make software consisting of custom configurations. Furthermore, E-slate is based on a scripting language, enabling users to define their own kinds of connections between components and to design special user interface features in their software. (Kynigos, 2004)

Looking back at Ladner's initiative, there have been made efforts to include students in the design process of an LMS. Greek students at two institutes were given the opportunity of voicing their desires for features in a Web 2.0 Learning Management System (Palaigeorgiou et al., 2011). This effort showed that the students participating in the study wanted: "... openness, participation, and interaction...".

Empowerment through Communication

Empowerment in school and education can be achieved through technology, that much has been shown by the academic products that are listed above. Social networks and support can help empower students and people in general. Research has been conducted on the effects of social networks and the support cancer patients can receive through their social network in Ashkanasy et al. (2009). It is found that connecting to one's social network can have an empowering effect when one finds oneself in a difficult situation. There may be parallels that can be drawn from the support and empowerment patients get from reaching out to their social networks in the educational setting. Further, Hietajärvi et al. (2015) refers to research that shows that "the largest group of adolescents engages mostly in friendship-driven activities (e.g., interacting with friends, entertainment)" underlining the prevalence of social networks in the lives of students. Arguments are made for adapting the educational system to better align itself with modern ideas for learning. A review of modernized educational processes is presented in McLoughlin and Lee (2010), where the authors underline the need for LMS' to better incorporate ideas and principles underlined by Web 2.0. It is stated that by giving students the ability to communicate with each other and to facilitate cooperation, the students will achieve a higher degree of empowerment.

2.3 Self-Efficacy

The authors regard self-efficacy, or mastery, as one of the cornerstones for the success of youth in education. The purpose of this section is to look at the relation between self-efficacy and the educational domain as well as looking at important factors that are regarded as self-efficacy enhancing. To this end, the first part will deal with how self-efficacy relates to education, while the second part concerns topics on how to increase self-efficacy. Throughout this section, self-efficacy and mastery will be used interchangeably.

Self-Efficacy in Education

Bandura (1997) as cited in Stajkovic and Luthans (2002) defines self-efficacy as "an individual's belief (or confidence) about his or her abilities to mobilize motivation, cognitive resources, and courses of action needed to successfully execute a specific task within a given context". Self-efficacy has, during the past two decades, proved to be an effective contributor to student's motivation and learning (Zimmerman, 2000). Research reviewed in Linnenbrink and Pintrich (2003) support this by stating that it seems clear that efficacy plays an important role in how students engage in learning materials and their school achievements. In addition, compared to related concepts of learning and motivation (e.g. outcome expectancies, self-concepts and perceived control), Zimmerman (2000) states that self-efficacy has a "discriminant validity in predicting a variety of academic outcomes". Furthermore, Bandura (1993) presents that there exists three different levels where perceived self-efficacy acts as an important contributor to academic development. One of these levels is "student's beliefs in their efficacy to regulate their own learning and to master academic activities determine their aspirations, level of motivation, and academic

accomplishments". Zimmerman et al. (1992) goes on saying that there is a strong correlation between goal-setting, self-efficacy and academic attainment.

In 2006, Dalgard et al. (2007) conducted a nation wide health monitoring study in Norway and stated that there is a strong correlation between low level of education and psychological distress. This link was further elaborated and concluded with that low sense of mastery stood for most of the association between them. The results of this study gives the idea that to enhance the level of education one needs to enhance the sense of mastery. Moreover, research has been conducted considering how self-efficacy relates to academic motivation which also supports this idea. Schunk (1991) states that people may avoid tasks where they have a low sense of efficacy for accomplishing it, while those who feel capable should participate without hesitation. He explains further that efficacious individuals work harder and persist longer when facing difficulties than people who doubt their abilities. In addition, Schunk (1991) cites Schunk (1989) who discusses how self-efficacy functions during academic learning. When starting an activity, students experience an initial self-efficacy based on aptitude and previous experiences. Personal factors (e.g. goal setting and information processing) and situational factors (e.g. teacher feedback and rewards) affect student self-efficacy while they are working. This sums up to assess how well they are learning and the increase of self-efficacy. This, in turn, will enhance motivation for learning if the progress of self-efficacy is positive.

Topics on increasing Self-Efficacy

A proposed extension to the Technology Acceptance Model (TAM) is presented in Mun and Hwang (2003). In addition to Usefulness, Ease of Use and Behavioral Intention, three other constructs are introduced to achieve Use of Technology: Enjoyment, Learning Goal Orientation and Application Specific Self-Efficacy. These constructs play important roles in determining human behavior. Their hypothesis concerns how the newly introduced constructs influence each other and the former constructs of the TAM in order to predict the use of a Web-based Information System. One part of the proposed model that is specifically interesting for the research in this thesis is how Enjoyment and Learning Goal Orientation influence Self-Efficacy. It was found that Enjoyment positively influenced Self-Efficacy by reducing anxiety and help people feel confident about their ability to execute actions. Furthermore, Learning Goal Orientation was shown to have a positive influence on Self-Efficacy as well. Accepting challenging tasks in order to acquire new knowledge and enhance competencies proved to have a greater positive impact on Self-Efficacy than Performance Oriented Goals where the aim is to demonstrate competence and minimizing errors at the expense of acquiring new skills.

Schunk (1995) presents factors affecting self-efficacy and includes Goal Setting, Information Processing, Models, Feedback and Rewards. In *The Development of Academic Self-Efficacy* Pajares and Schunk (2001) says that these factors inform students of their capabilities and progress in learning, which motivates the students to continue performing well. In the elaboration of the factors affecting Self-Efficacy Schunk (1995) explains:

Goal Setting is an important cognitive process affecting achievement outcomes (Bandura, 1988; Locke & Latham, 1990; Schunk, 1989b, cited in Schunk (1995)). Setting or being given a goal may provide a sense of self-efficacy for attaining it and a commitment to attempt it (Schunk, 1995). Goal progress substantiates self-efficacy and promotes skill (Dweck and Leggett, 1988). Schunk and Swartz (1993) adds that feedback on goal progress also raises self-efficacy. The benefits of goal setting on self-efficacy depends on specificity, difficulty and proximity (Bandura, 1988). Pajares and Schunk (2001) goes on to say that specific, short-term learning goals that are challenging but attainable enhances students' self-efficacy better than goals that are general, long-term or viewed as unattainable. An experiment regarding participation in goal setting was conducted in Schunk (1985) where sixth-grade learning-disabled students were given subtraction instruction. The students either set their own goals, received goals from the experimenter, or did not set or receive any goals. Evidently, the students with self-set goals had the highest self-efficacy and attained the highest subtraction skill.

Information Processing concerns how methods on processing information influence self-efficacy. Schunk (1995) notes that students' perception of comprehending material raises self-efficacy. Salomon (1984) conducted an experiment to measure how mental effort relates to self-efficacy. 124 sixth-graders were tested in their perceived self-efficacy with print and TV. Half the students watched a silent film, the other half read a comparable text. It was found that mental effort was greater from reading text and produced higher achievement scores; which led to a positive correlation with self-efficacy. The students felt efficacious about learning with TV but correlated negatively with self-efficacy. In addition they expended less mental effort and had lower achievements. Furthermore, Zimmerman and Martinez-Pons (1990); Pintrich and De Groot (1990) both conducted experiments with students aiming to judge self-efficacy in relation to the use of strategies. It was found that self-efficacy has a positive correlation with motivation to employ learning strategies. Schunk (1995) follows by saying that "teaching students to use strategies raises self-efficacy and achievement".

Models demonstrating the application of various skills raises students' self-efficacy regarding learning as well as achievement (Schunk and Hanson, 1985). Such models can convey to observers that they are capable of learning and motivate them to attempt the task (Schunk, 1995). By following the same steps as the model demonstrates students are likely to believe that they too will be successful (Pajares and Schunk, 2001).

Feedback is regarded as a persuasive source of self-efficacy information (Schunk, 1995). Feedback on performance informs learners of goal progress, increases self-efficacy and sustains motivation (Pajares and Schunk, 2001). Attributional feedback links students' successes and failures with one or more attributions (perceived causes) (Schunk, 1995). Schunk further differs between effort and ability feedback. As cited in Pajares and Schunk (2001), in early stages of learning, effort feedback seems more credible to students (e.g. "You got it right because you worked hard"). As students improve their skills, switching to ability feedback (e.g. "You are good at this") may influence self-efficacy to a larger extent.

Rewards increase self-efficacy when associated with accomplishments and convey that students have made progress in learning (Pajares and Schunk, 2001). Students learn which actions result in positive outcomes, which guide in future actions. Desirable outcomes resulting in rewards motivates students to persist. A study on the effects of performance-contingent rewards and goals on children's self-efficacy, task motivation, and skillful performance were conducted in Schunk (1984). It was found that performance-contingent rewards and proximal goals led to equally rapid division solving, but the combination of the two resulted in the highest self-efficacy and performance.

2.4 Conclusion

In this chapter a literature review of the state-of-the-art concerning the three concepts self-documentation, empowerment and self-efficacy has been presented. There are many and powerful positive effects of employing these concepts in technology aimed towards the educational system, especially for students. The main takeaway that the authors want to highlight from this review is the link that was discussed at the beginning of this chapter. Many subconcepts have been identified within self-documentation, empowerment and self-documentation throughout this literature review. A comprehensive overview of all the subconcepts touched upon in this chapter is given in table 6.1, found in chapter 6.

Self-Documentation Software promoting Empowerment and Self-Efficacy

This chapter will present the link between the theoretical concepts presented in chapter 2 and the broader lines of the research presented in this thesis. As stated in chapter 1 the main motivation behind this research is to help people to be better equipped to handle challenges throughout different aspects of their lives. Triggering the research based on this motivation was the authors' introduction to two applications that applied some of the concepts reviewed in the previous chapter. These applications — called Mindfit and Dokker — are presented in the following sections. Inspired by their creators' vision to combine aspects of the two applications for the betterment of students, the authors decided to conduct research into discovering conceptual designs for Self-Documentation Software Promoting Empowerment and Self-Efficacy. To this end, the authors were fortunate enough to use the applications as a case study to discover concepts important from a user perspective that add to or support the state-of-the-art presented in the previous chapter. Further elaboration on the structure of the research process is presented at the end of this chapter.

3.1 Applications

3.1.1 Mindfit

Mindfit is a self-betterment mobile application aimed at increasing the user's self-belief, feeling of self-efficacy and to relieve the feeling of depression. It is implemented as a goal-based, positive diary where the users record positive aspects about their everyday life that they can link with positive features about themselves. The user can add a positive experience to his/her diary which has to be categorized into one of the categories seen in figure 3.1a. The user can add text, photos or positive thoughts to elaborate his/her feelings

about the positive experience, as seen in figure 3.1b. Finally, the user can then link a positive experience to one of the goals that he/she specified when first using the application, these experiences will be visible in the user's "Successes and goals", an example can be seen in figure 3.2a.

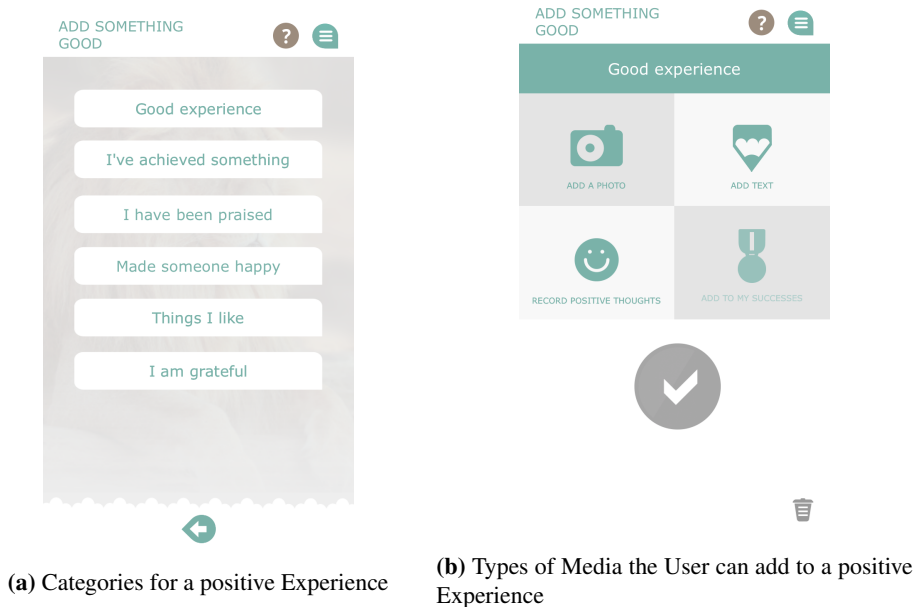


Figure 3.1: Screenshots from Mindfit

The theoretical background for the application is grounded in positive psychology, where it is believed that if users of the application are prompted to write down positive aspects/experiences in their everyday life, they will experience an increase in their overall happiness. The academic work that forms the grounding for the application is presented in Seligman et al. (2005). Here it shown that writing down positive experiences in everyday life can increase the happiness of a person for up to six months.

The first time using the application, the user is prompted to register a series of personal information so that the application can better identify which aspects of life that the user wants to improve. Specifically, the user is asked to identify personal challenges that he/she wants to cope with. Further, the user is asked to identify negative feelings that the user has when facing the difficult challenge that the user identified at first. The way in which the user then is able to work with these feelings is to identify positive experiences in his/her everyday life, usually things that happen where the user felt a sense of mastery, or generally felt well about the situation. These positive experiences may then be linked to a set of goals that the user has identified. The thought is that these positive experiences may help the user in achieving these goals.

Mindfit also provides a set of techniques the user can perform when facing the challenges that they have identified, these techniques can be seen in 3.2b. These techniques are designed to make the user overcome a sense of stress or when the user feels overwhelmed. To introduce the user to the application, there is setup a six week training program. This program guides the user in how the app works and prompts him/her to write something positive every day. It is believed that this recording of positive things will help the user to feel better about him/her-self.

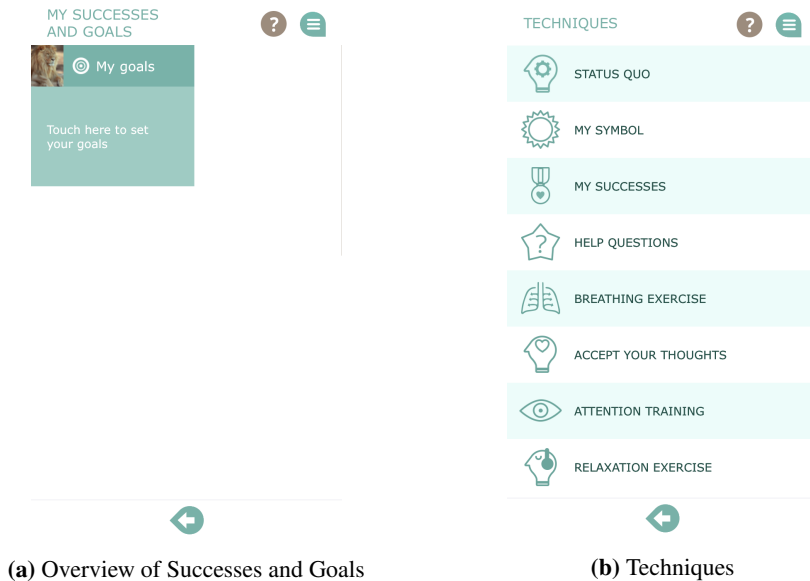


Figure 3.2: Screenshots from Mindfit

3.1.2 Dokker

Dokker is a web based documentation tool primarily used by high school students, but it is also being employed in helping immigrants generate documentation about their skills and competence. The users of the application can document their skills and knowledge in mainly two different ways; work assignments and courses/certifications. The work assignments are structured as an object where users can write about the work they have undertaken as well as link the work to relevant competence aims set in the curriculum of their class, organization etc. The linking of competence aims from the curriculum to a specific work assignment can be seen in figure 3.3.

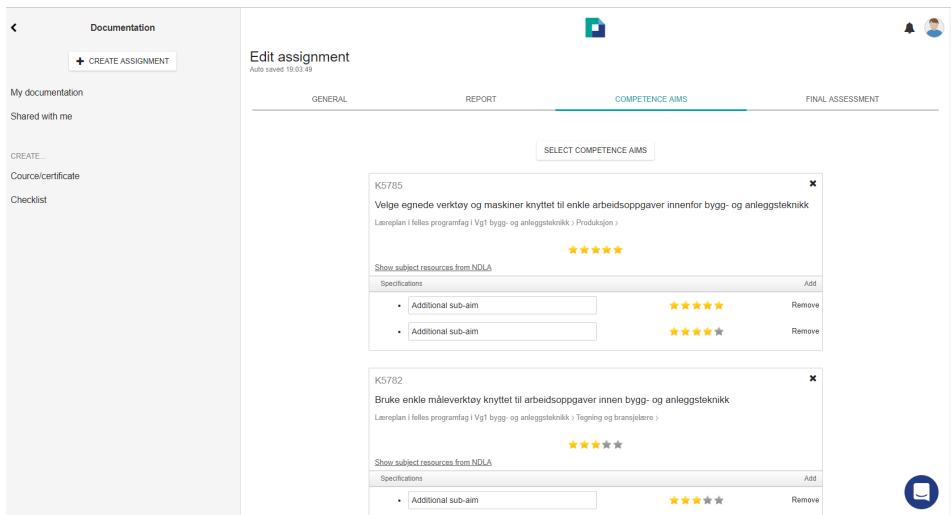


Figure 3.3: Linking of competence Aims to Work Assignment in Dokker

In addition to the main competence aims the student can add supplementing specification aims as shown in figure 3.3. This way each main aim can be split into several sub-aims which provides an easier assessment.

In the writing part of a work assignment the application scaffolds the user by prompting them with three headlines; planning, implementation and evaluation. These headlines are created to prompt the user to structure their documentation according to these headlines. These headlines can be seen in figure 3.4.

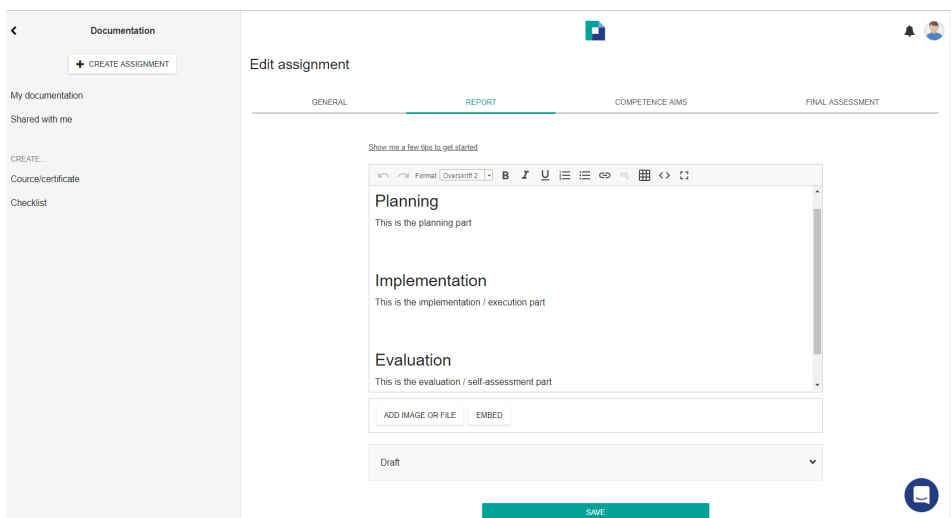


Figure 3.4: Writing Part of a Work Assignment in Dokker

The user is able to embed files and pictures into the document, to better illustrate their work. Other members of the group that a user is a part of is able to comment on a work assignment, typically used by teachers to give feedback on the work of students. How a comment is viewed in the context of a work assignment can be seen in figure 3.5.

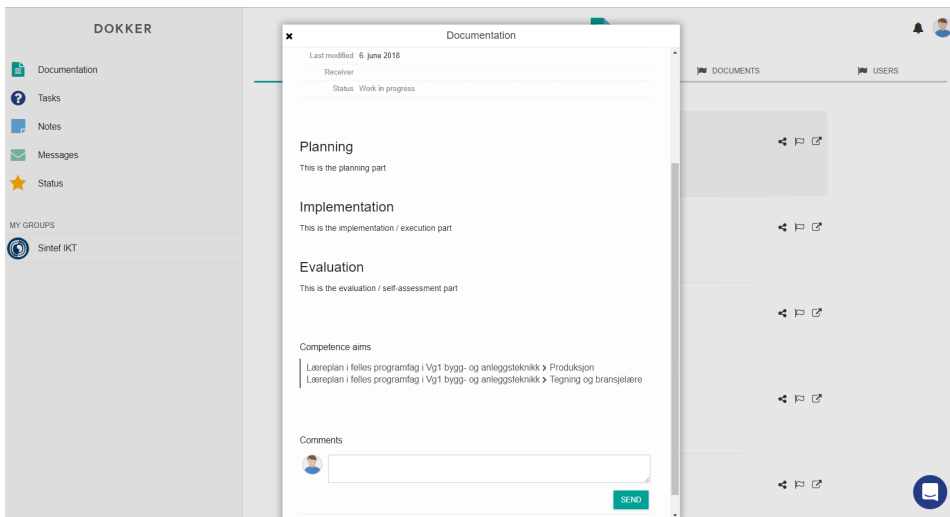


Figure 3.5: Comment on a Work Assignment in Doker

When the user feels that the document is finished, he/she can select it for assessment, notifying their supervisor that the document is ready. The assessment part of a work assignment can be seen in figure 3.6.

Courses/certifications is a function created to enable the users to display official knowledge or skills. This function works quite differently from the work assignment function because there is no way for the user to write about the course/certification. The user will create an object representing an official course/certification and similarly to a work assignment, mark it as ready for assessment.

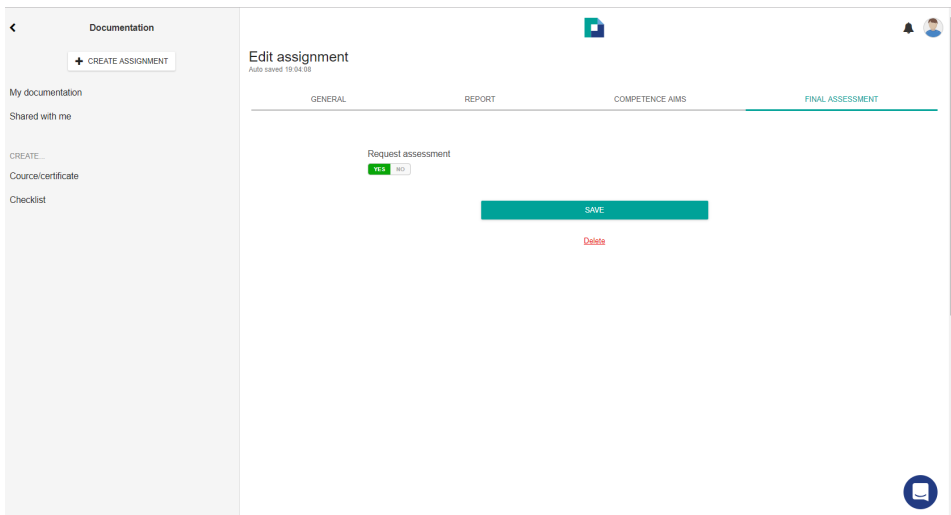


Figure 3.6: Request Assessment Page for Dokker

The last screenshot to be presented is the ability to communicate within the program; illustrated in figure 3.7. Messages can be sent to both teachers or students holding an account.

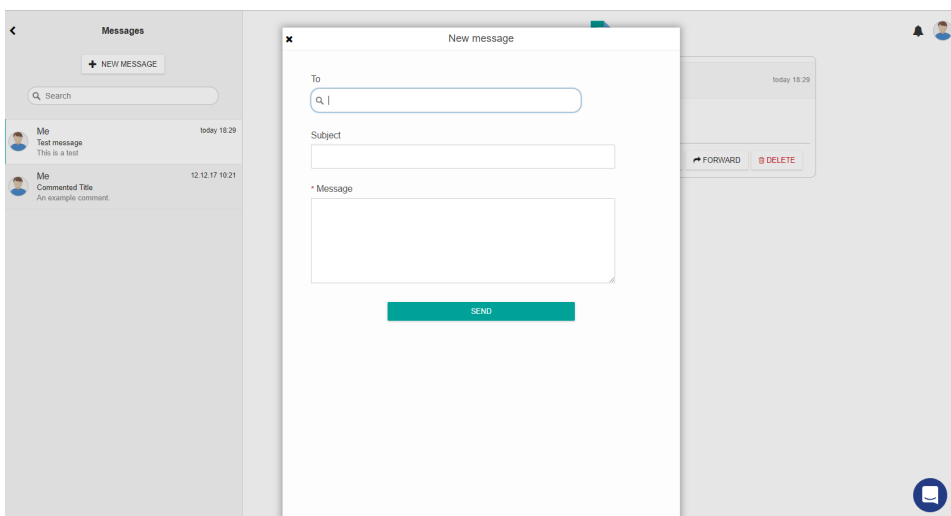


Figure 3.7: Communication within Dokker

All of these work assignments and courses/certifications make up a resumé for the user which can be shared via a public URL. This can further be shared to potential employers or other relevant contact persons.

3.1.3 Application to Concept Mapping

To clarify how the two applications aim to achieve the concepts and thus sub-concepts elaborated in chapter 2, an application to concept mapping is presented in table 3.1. The purpose of this mapping is to show how the two applications provide the user with the possibility to self-document, as well as how these applications can help increase the user's sense of empowerment and feeling of self-efficacy. The table is organized in the following way: Each column represents an application and in each row the concepts are represented. Thus, each cell presents sub-concepts that the applications include. Every sub-concept that an application includes is explained in parenthesis, either with reference to a screenshot or text.

3.2 Approach to addressing Research Questions

The research presented in this thesis is organized as a design and creation study, with a main aim to investigate self-efficacy enhancing concepts from a user standpoint. The hypothesis made by the authors is that a user is empowered through self-documentation, and empowerment leads to increased self-efficacy, as described in chapter 2. This link sparked the interest of the authors to possibly improve on existing self-documentation tools by including the user in the design process. Furthermore, through the investigation of Dokker it was found that the application was lacking in self-efficacy specific features/tools. A decision was made to inquire the students using the tool about design opinions concerning the improvement of user self-efficacy.

The authors were fortunate enough to establish a relationship with a teacher in a Norwegian High School which opened up a lot of possibilities for user centered design. The authors were set in contact with the teacher through the CEO of Learning Moment — the creators of Dokker. The teacher has been an invaluable gatekeeper into the classroom, which in turn has rendered the authors with a plethora of data regarding the use of Dokker and conceptual design input. Furthermore, full cooperation from the creators of Mindfit enabled students that were attending the Workshop to explore the application beforehand.

From the view of the authors there were various ways in which features promoting self-efficacy could be included in an existing self-documentation tool (Dokker). The possibility of developing an application that combined features from both Dokker and Mindfit was discussed, but it became apparent that, from a researcher's standpoint, the design process had to start with the user. Based on the Research Questions presented in chapter 1, the main goal of the research was to elicit the users' wants and needs. With this in mind it was decided to conduct a Design and Creation study starting with a conceptual design Workshop where students using Dokker would attend. A substantial motivation from the part of the authors for conducting a user-centered design process was the fact that software used in education, bought by government institutions, may not take into account the users' wants and needs. Since the user is different from the customer it is not always the case that the software system appeals to the user to a satisfiable degree.

In an effort to prime the students for a workshop focusing on self-efficacy, each student was given a license for Mindfit so that they could explore the application. The students were given the license three weeks prior to attending the workshop. The main goal of the conducting a Workshop with students using Dokker was to gather their conceptual design preferences with regards to Self-Documentation and Self-Efficacy. The Workshop aimed specifically to answer research questions *RQ1* and *RQ2*.

Due to the time schedule of this research and the time table of the High School that cooperated with the authors, a choice was made to illustrate the main findings from the Workshop in wireframes. There was not enough time to go back to the school with a prototype for the students to investigate and give feedback on. The wireframes were created as to clearly show what the students prefer in terms of documentation modals and Self-Efficacy-supporting features, thus addressing *RQ2.1*. The wireframes are presented in chapter 6.

<i>Concept</i>	<i>Mindfit</i>	<i>Dokker</i>
Self-Documentation	<ul style="list-style-type: none"> - Text and Picture Documentation (Figure 3.1b) 	<ul style="list-style-type: none"> - Text and Picture Documentation (Figure 3.4) - Connecting academic work with employers (Documentation is shareable) - Feedback system (Figure 3.5)
Empowerment	<ul style="list-style-type: none"> - Ubiquitous Documentation (The application is mobile) 	<ul style="list-style-type: none"> - Self-Assessment (Figure 3.4 — Evaluation part of Work Assignment) - Communication (Figure 3.7) - Individualized Learning (Individual follow up from teacher) - Student Managed Documentation (The students manages their own documentation)
Self-Efficacy	<ul style="list-style-type: none"> - Log Positive Experiences by Text, Pictures and Thoughts (Figure 3.1b) - Goal-Setting (Figure 3.2a) - Documentation of Achievement Feelings (Figure 4.2d) - Models (Techniques in figure 3.2b) 	<ul style="list-style-type: none"> - Learning Goal Orientation by Setting Competence Aims (Figure 3.3)

Table 3.1: Application to Concept Mapping

Method

Continuing on from the previous chapter where the outline of the research process was presented, this chapter will describe in detail the methods employed in order to conduct the research. The strategy chosen for the research will be presented first, followed by the data collection and analysis methods.

4.1 Strategy

Substantial theoretical background for the research strategy and methodology for this thesis was found in Oates (2005). An overview of the strategy for this research can be found in figure 4.1, where one can see that the literature review presented in chapter 2 and field research performed as part of this thesis laid the ground work for a workshop designed by the authors. As illustrated by the figure the results and findings from the workshop are represented by the blue and red connectors. The blue connector represents the contributions to theory from this research, whilst the red connector represents contributions to practice in the form of wireframes.

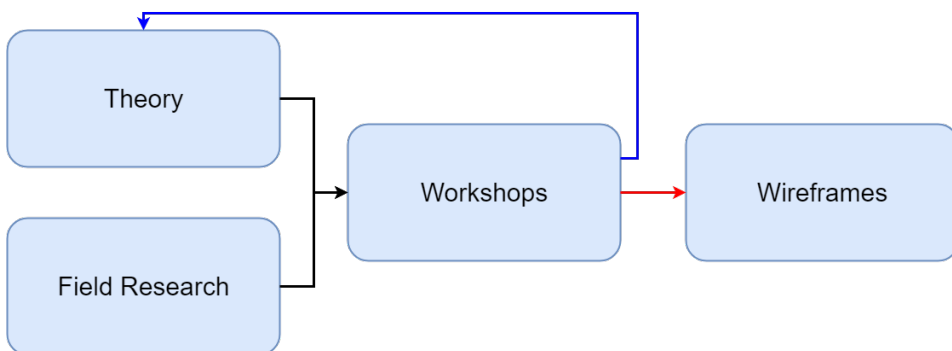


Figure 4.1: The Strategy employed in this Research

4.1.1 Design and Creation

A design and creation research strategy was employed in this research, as it aligns well with the chosen research questions. Focusing mainly on *RQ1* and *RQ2*, a design process including intended users of self-documentation tools was deemed appropriate in order to answer this question. Emphasis was put on the wishes and preferences of the user group, underlining design-concepts that they prefer. Oates (2005) talks about a Design and Creation strategy ultimately producing an IT artifact of some sort. This artifact may be any of the following: constructs, models, methods or instantiations. Furthermore, an example of a scenario where a wireframe can be used for illustration is described: "A project where the contribution to knowledge is based on a literature review and/or field research, but the conclusions drawn from this work are illustrated via a prototype IT application. ...". The type of research that will be presented in this thesis falls directly into this description. The authors present a literature review in chapter 2, and the results from field research will be presented in chapter 5. Ultimately, to answer *RQ2.1*, the authors sought to incorporate the findings from the field research into several wireframes illustrating the concepts found. The focus of the design process was put in the Workshop held with students, while the creation part of the strategy constituted the creation of wireframes based on the findings from the Workshop.

Based upon findings in the literature review presented in chapter 2 and previous field work, a workshop was developed in order to facilitate design proposals from high school students having used and still using Dokker. As mentioned in chapter 3, the students were also given the opportunity to get to know the self-betterment application Mindfit, as to acquaint them with an application specifically designed to increase Self-Efficacy.

4.2 Data Collection

For ease of comprehension the data sources and participants for each data source will be presented in table 4.1. The table presents data sources from work performed during this research. The authors have conducted interviews/meetings with the CEOs of both Learning Moment (Dokker) and Mindfit. These interviews were performed mainly to acquire knowledge about the two applications that the companies make, described in chapter 3. No results from these interviews will be presented as they do not serve as primary data sources for this research. An interview with a student and teacher having used Dokker was also conducted. Excerpts from these interviews will be supplied in chapter 5 together with results from the Co-Design Workshop.

<i>Data Source</i>	<i>Participants</i>	<i>Time of Capture</i>	<i>Duration</i>
<i>Interview</i>	CEO of Mindfit and Supervisor	September 2017	1 hour
	CEO and CTO of Learning Moment (Dokker)	October 2017	1 hour
	CEO of Learning Moment (Dokker) and CEO of Mindfit	February 2018	1 hour
	Chief Pedagogical Officer of Learning Moment (Dokker)	November 2017	45 minutes
	One teacher and one student having used Dokker	November 2017	1 hour 30 minutes
<i>Questionnaire</i>	33 students using Dokker	November 2017	15 minutes
<i>Workshop</i>	Two groups of 5 students having used both Dokker and Mindfit	April 2017	1 hour 35 minutes

Table 4.1: Data Sources

4.2.1 Interview

Interviews that were conducted with the CEOs of Learning Moment — creators of Dokker — and Mindfit were unstructured as the authors wanted to have an open mind. The goals of interviewing these CEOs were mainly to gather information about the applications and systems that were to be investigated, as well as getting to know the goals of the applications themselves. Furthermore, these interviews served as excellent sources of informants and other persons that could be of use when looking for participants for interviews and workshops. Additionally, the interviews served as a means of coordinating the efforts of the authors and the companies, as to make work regarding research easier.

The person responsible for pedagogy in Learning Moment, thus responsible for all pedagogical aspects of Dokker, was interviewed by both authors. The goal of the interview was to learn about the intended use of Dokker, and to get an understanding of relevant inquiries and questions that could be posed to the users of the application. Similarly to the aforementioned interviews, this was performed in an unstructured manner, and a demo of the software was conducted followed by a Q&A session.

An interview was held with a high school teacher and student having used Dokker for approximately five months at a school in Norway. The objective of the interview was to learn

first-hand how students and teachers employ Dokker. The interview was semi-structured, as to allow the interviewers and interviewees greater flexibility in the themes and questions that were brought up. The questions that were prepared beforehand was based on the knowledge gained from the previous interviews held with the CEOs of Learning Moment and Mindfit, as well as with the Chief Pedagogical Officer of Learning Moment.

4.2.2 Questionnaire

In addition to conducting an interview with a teacher and student having used Dokker, questionnaires (Appendix A) were given to 32 students of the same school as where the teacher and student were working. The questions that constituted the questionnaire were created mainly based upon the information that the authors gained from interviewing the Chief Pedagogical Officer of Learning Moment. The questionnaire was employed in order to compound the information that was received through the interview, as well as to receive information from a broader set of participants and obtain standardized data (Oates, 2005). The questions asked in the questionnaire regarded the frequency at which the students used the documentation tool, in what part they participated in the planning of a work assignment, as well as the students' perceived usefulness of the planning, execution and self-assessment parts of the program. Lastly, the questionnaire inquired the students about their thoughts on daily goal-setting and positive self-reflection as new features in Dokker. This question was grounded in features found in Mindfit that specifically support Self-Efficacy, which can be seen from table 3.1. Due to the evolvement of the research direction one particular question in the questionnaire emerged as more relevant than the others; namely the students' perceived usefulness of self-reflection.

4.2.3 Co-Design Workshop

In connection with the research questions and the Design and Creation strategy adopted in this research, a Co-Design Workshop methodology became an obvious choice as the main source for data collection. When designing and creating an IT artifact for a specific audience, co-designing with the intended users provide valuable information from the users' perspective. The goal of this methodology was to involve stakeholders of the IT solution—in this case end-users and researchers (the authors)—to generate opinions from different standpoints.

When starting designing the workshop it was quickly decided that an iteration based approach best suited the goals of the method. By dividing the workshop into iterations one can extract results and interesting findings from distinct parts of the workshop instead of getting results all over the place without clear and logical separation. Another reason for dividing the iteration based approach was to make it easier for the participants to retain focus. In order to make the most of the workshop, the authors discussed the workshop structure with Associate Professor Yngve Dahl at the Department of Computer and Information Science at NTNU. Due to past workshop experience, main interest in Human-Computer Interaction (HCI) and research on user-centered design he provided valuable information on how to efficiently and productively run a design-workshop. Consequently,

the structure of the workshop consisted of three iterations in addition to a warm-up exercise, all of which are listed below with their contents. King et al. suggests in *Co-Design: A Process of Design Participation* (1989), cited in Al-Kodmany (1999), that "visualization is the key to effective public participation because it is the only common language to which all participants—technical and nontechnical—can relate". Taking this suggestion into account, all iterations of the workshop contained a common artifact to visualize the problem and promote cooperation and participation.

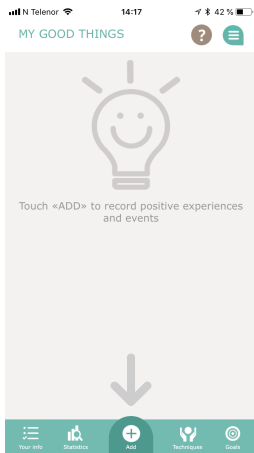
The workshop was held at a high school in the Trøndelag region of Norway with ten students participating. As person identifiable information could be unveiled during the workshop, all participants signed a consent form (Appendix B). In the following, students and participants will be used interchangeably. The students were divided into two groups of five, each facilitated by one of the researchers (authors). The duration of the workshop was set to 1 hour and 35 minutes, with the bulk of the time given to iteration 3 where the actual designing happened. Including a ten-minute introduction and a ten-minute break before iteration 3 the remaining time was spread out among the three remaining parts. The duration of each part is stated next to its heading.

Warm-up exercise (10 minutes)

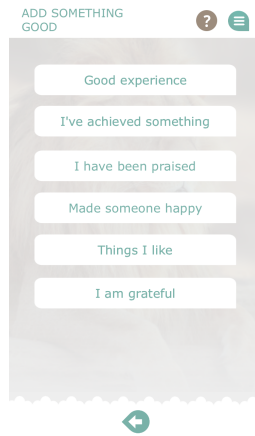
In order to get the students going, the workshop started off with a warm-up exercise. As Self-Efficacy is a pivotal concept of this research, each student received a post-it note where they were asked to write down what Self-Efficacy meant to them. Having already done research on Self-Efficacy in different settings and made up own opinions, the authors were interested in opinions on the concept by the target audience of the research. The students' definitions of Self-Efficacy would be used as reference points later in the workshop. The warm-up concluded with each student presenting to the group what they had written down to engage all participants orally early in the process.

Iteration 1 - Ranking Mindfit Features for Self-Efficacy (10 minutes)

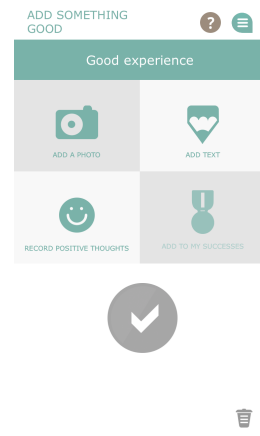
Having given the participants the ability to use Mindfit a while before the workshop as described in section 3.2, the first iteration of the workshop consisted of ranking the features of this application with regards to Self-Efficacy. To make the features more relatable to the participants and thereby making the ranking easier, screenshots of the application (Figure 4.2) were used to represent and visualize the features.



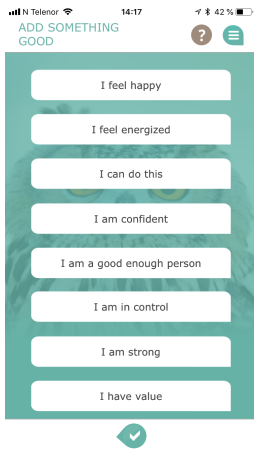
(a) Home Screen



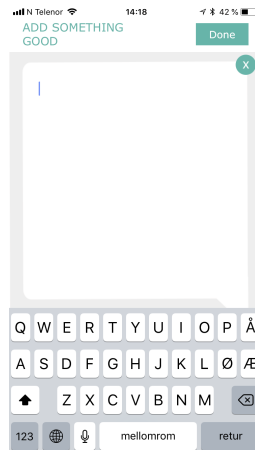
(b) Add Something Good



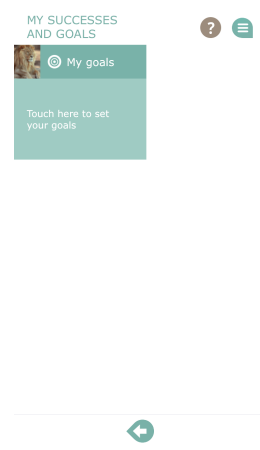
(c) Document Good Experience



(d) Add Positive Thoughts



(e) Add Text



(f) Successes and Goals

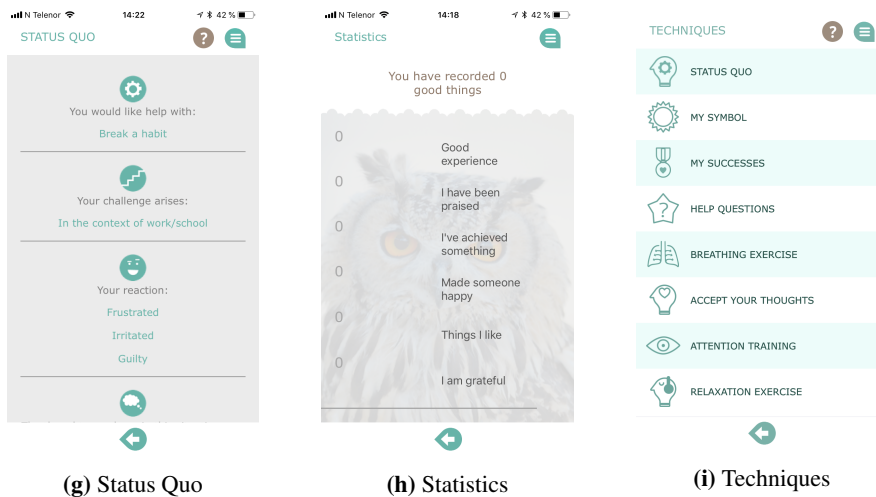


Figure 4.2: Mindfit Screenshots for ranking of Self-Efficacy Features

To better visualize the importance of each feature compared to one another, a bullseye session was used to rank the features. A bullseye board (Figure 4.3) worked as a common artifact together with the screenshots in order to follow King et al.'s suggestion to visualize the problem and engage the students in participating. Each screenshot was placed onto the bullseye board and the closer to the center the screenshot was placed the higher the rank. This method allows for a more floating ranking, as features are not ranked 1, 2, 3 etc., but by their placement on the board, e.g. a screenshot can be placed slightly less centered than another and thereby be slightly less important.

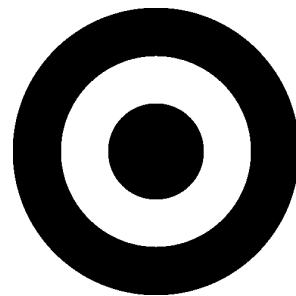


Figure 4.3: Bullseye Board (Illustration image)

Iteration 2 - Students' User Journey of Self-Documenting with Dokker (20 minutes)

The purpose of this iteration was to identify challenges, bottlenecks, and possible improvements to the current solution of Dokker. To this end, the students were asked to draw their user journey when using Dokker, all the way from getting the assignment from the teacher to documenting the assignment at the end of the day. In other words, a timeline of a typical day of interacting with the self-documentation tool. Though the goal of the research is not to improve Dokker itself, the interactions with it as a self-documentation tool and its challenges provide valuable information about such programs in general.

This iteration was suggested by previously mentioned Associate Professor Yngve Dahl. Later, when designing the iteration the authors were inspired by Mears (2013) and his elaboration of the User Journey concept. This specifically concerned one of the ways he

suggests a user journey could be used, namely "Demonstrating the way users currently interact with the service / website / product".

Iteration 3 - Conceptual Design (30 minutes)

The third and final iteration constituted the largest part of the workshop. With their definitions of Self-Efficacy, ranking of Mindfit features and their Dokker user journey the students were now going to create a conceptual design of an application that promoted Self-Efficacy through Self-Documentation. Due to the difficulty of focusing on three concepts and a vague definition, Empowerment was not stressed during this workshop. One can, however, say that Empowerment is stressed implicitly by Self-Documentation. In addition to kraft paper, markers and Mindfit screenshots, props (Figure 4.4) were given to aid in the idea generation.



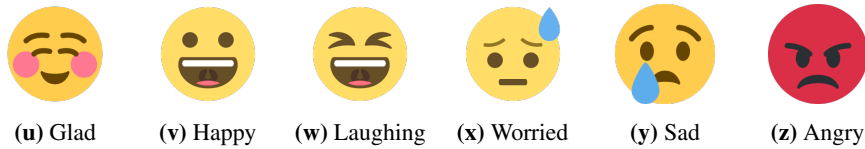


Figure 4.4: Idea generation Props

Some of the props in figure 4.4 needed attributions. These are shown in table 4.2 below.

<i>Figure</i>	<i>Attribution</i>
Figure 4.4b Figure 4.4t	Font Awesome by Dave Gandy — https://fontawesome.github.com/Font-Awesome
Figure 4.4f	http://icons8.com/license/
Figure 4.4j	Edward Boatman, from The Noun Project
Figure 4.4v Figure 4.4w Figure 4.4x	Emoji icons supplied by EmojiOne
Figure 4.4u Figure 4.4y Figure 4.4z	Twitter — http://twitter.github.io/twemoji

Table 4.2: Prop Attributions

4.3 Data Analysis

This section will present the data analysis methods used in this research. The mode of registering results from the fieldwork conducted was through audio recordings and thus a qualitative analysis approach was chosen. All audio recordings were transcribed and analyzed through thematic analysis.

4.3.1 Transcription

Audio recordings from the interviews and workshop were transcribed onto Google documents, stored on Google drive. The main reason behind this method of storage is the fact

that it makes collaboration seamless between the authors. To maintain the anonymity of the participants that chose to work with us no names or other identifiable information was indicated or saved in cloud services. All audio recordings made of interviews were transcribed in their entirety, as the entire dialogue between researchers and participants was deemed relevant to the research. A greater degree of sifting was done on the fly when transcribing the audio transcription of the workshop as more casual talk was detected here. As stated earlier all participants were given generic identifiers when their dialogue was transcribed, that is to say that one person would have the same identifier throughout the transcription.

4.3.2 Content Analysis

The textual content of the transcriptions made of the audio recordings were thematically analyzed through an inductive approach. This decision to look at the data inductively was inspired by analytic theory written by Oates (2005) and Pope et al. (2000). The data was analyzed by reading through the transcripts and categorizing dialogues from the interviews and workshops into themes. As this analysis was done through an inductive approach the themes were chosen based on what had emerged through the dialogue, and not based on predetermined knowledge. Although the bulk of themes that the data were categorized into were found in the transcripts themselves, theoretical grounding from work performed during the literature review had an impact on the analysis. In such a case, one could say that the analysis performed in this research also had a deductive dimension to it. Ryan and Bernard (2003) present and explain a series of techniques for discovering themes in qualitative data. One such technique for identifying themes is that of repetition; underlining concepts that repeat themselves in transcriptions. This approach was used both in the interview text as well as for the workshops. The transcriptions were read through and different highlighter color was used for the different themes. This looking for repetition was employed as an initial theme identifier. Another technique presented in Ryan and Bernard (2003) is that of similarities and differences. Comparing phrases and lines in the transcriptions came naturally to the authors when going through the material. By comparing content to each other, themes become apparent as phrases differ from each other on a fundamental level.

After having categorized the textual content into a sufficient number of themes, a process of combining similar, small themes into bigger units was performed. This process was undertaken as to make the later stages of the analysis work more efficient and rigorous.

4.4 Wireframe Creation

As mentioned earlier a decision was made to make wireframe layouts of the most significant results from the Workshop. The reasoning behind choosing wireframes and not prototypes or mock-ups was grounded in the time schedule and focus of the research process. The main purpose of the wireframes was to act as illustrations for the results, not as live systems or applications of any sort. According to Treder (2016) there are distinct differences between the terms wireframes, mockups and prototypes. In short, a wireframe

is a static, low fidelity representation of a user interface. It serves as both an illustrative tool as well as documentation. In contrast, a prototype offers the user some sort of interactive capability, as well as a more polished look. A prototype is categorized as a middle to high fidelity entity. Lastly, a mock-up could be looked at as a polished version of a wireframe. It is similar in the fact that it is static, but it shows design choices much more clearly through extensive use of colors etc. Thus, based on the aforementioned features of the different entities, it was decided that a wireframe was a fitting tool for illustrating conceptual designs.

Based on the concepts presented in table 6.1 in chapter 6 different wireframes were made. The concepts that went under the theme of Self-Efficacy was deemed to be the differentiating factor between the illustrations, and thus the main focus of each wireframe. An online tool was chosen as the platform in which the wireframes were made, called Balsamiq (Balsamiq, 2018).

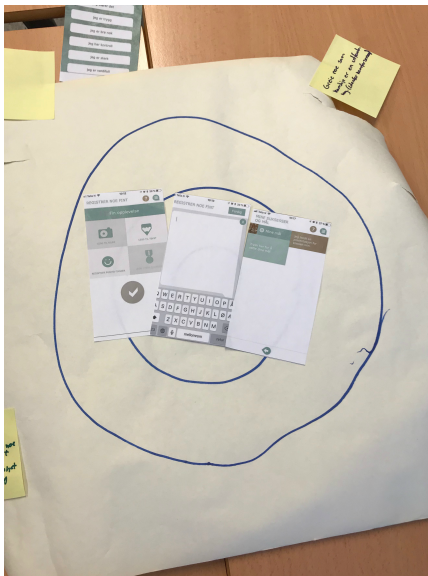
Chapter 5

Results

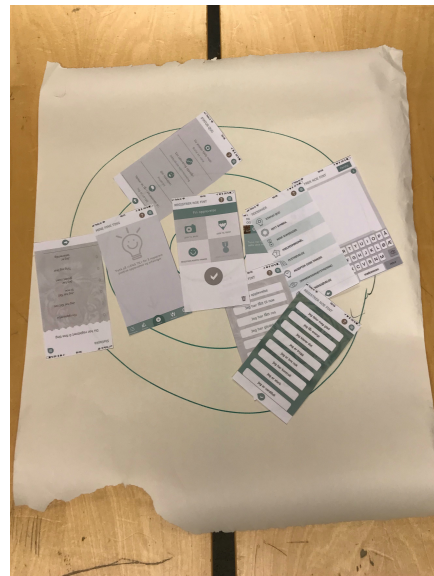
In this chapter the results from the workshop sessions described in chapter 4 will be presented. The results will be grouped based on the themes that were found according to the data analysis method described in section 4.3. These themes are as follows: Documentation Modals, Goal-Setting, Self-Assessment, Aspects of Current Self-Documentation Tool, Domain Suggestions, User Engagement and finally Communication. Each of these themes as well as themes emerging through the presentation of their results can be categorized under one of the three main concepts Self-Documentation, Empowerment and Self-Efficacy. This categorization is presented in table 6.1 in chapter 6 and discussed in greater detail throughout that chapter. In the dialogues presented in this chapter, group 1 and group 2 from the workshop will be abbreviated to G1 and G2 respectively.

5.1 Documentation Modals

One of the aims of the workshop was to elicit from the participants their preferred ways of documenting the work that they perform. Presented in this section are results from the workshop that included suggestions about documentation modals as well as elaboration around these suggestions. Many of the suggestions regarding documentation modals were brought forth in the bullseye session of the workshop which is presented in figure 5.1.



(a) Ranking Group 1



(b) Ranking Group 2

Figure 5.1: Ranking of Mindfit Features

The bullseye session produced both corresponding and different results between the two groups. Apparent from Figure 5.1a group 1 ranked "logging a positive experience with text" as the most Self-Efficacy promoting feature. This choice is grounded in dialogue 1 presenting reasoning for the ranking.

Dialogue 1: Best logging Method for Self-Efficacy

G1 Interviewer: Logging by text vs. pictures vs. feelings, what promotes Self-Efficacy more?

G1 Student 4: It is perhaps the text you write that expresses more what kind of Self-Efficacy you felt.

G1 Student 5: Yes, by text you can better express what you mean and what it entails. As opposed to pictures you can describe the smallest details.

G1 Student 4: You can write down challenges you faced in order to complete something.

G1 Student 1: [Write down] Feelings you had.

Group 2 produced a more complete ranking by utilizing all of the screenshots as shown in Figure 5.1b. Similar to group 1 they ranked the features of goal-setting and "adding pictures and positive thoughts" as most important, with the latter being in the center. Dialogue 2 justifies the choice of the top ranked feature.

Dialogue 2: Pictures and positive Thoughts

G2 Interviewer: Just speak your mind, say what you think of the screenshots. What is good and bad with them?

G2 Student 1: This is a good feature [Pointing at the screenshot in the center]. You can add pictures and register positive thoughts.

G2 Interviewer: Is this something you feel would increase your Self-Efficacy?

G2 Student 1: Yes.

There were, however, an evident difference between the two groups in the ranking of one particular feature. Group 1, as mentioned, ranked "logging a positive experience with text" highest, while group 2 placed this feature at the edge of the outer circle ranking it near the bottom.

In the conceptual design session group 1 (figure 5.2a shown on the next page) quickly added Camera (Prop 4.4a) to the design to be able to log a positive experience with pictures. This is made apparent through dialogue 3 and in connection with the camera, they added the keyboard (Prop 4.4e) to represent logging by written text.

Dialogue 3: Design: Pictures and Text

G1 Student 4: What should be included is the ability to add pictures, e.g. straight into a text.

G1 Student 4: And if you add the keyboard you can take notes. This can help you in your work assignment by having made small notes of what you have done throughout the day.

As can be seen from figure 5.2b group 2 also added the Camera (Prop 4.4a) as well as the Keyboard (Prop 4.4e), similarly to group 1, but they also added the Microphone (Prop 4.4c) and Video File (Prop 4.4g) as means to log their experiences. Dialogue 4 gives reasoning on this addition.

Dialogue 4: Design: Microphone

G2 Interviewer: What are your thoughts on the microphone?

G2 Student 1: You can record what you do rather than writing it.

Also supported in the warmup exercise:

G2 Student 1: It's easier to record than to write or take a picture.

As is made apparent by the dialogues presented above the workshop attendees had an array of design inputs regarding documentation modals. Suggestions were made for both including modals they were used to using, as well as novel features.

5.2 Goal-Setting

The students attending the workshop had feedback on the goal-setting features that were already in place in Dokker as well as suggestions for how goal-setting could be used in

conceptual designs. The conceptual designs that the two group ended up creating are presented in the figure below.



(a) Design Group 1



(b) Design Group 2

Figure 5.2: Conceptual Designs from Co-Design Workshop

As can be seen from dialogue 5 presented below, the students had feedback regarding the nature of the competency goals that the students link with their documentation. The goals that the students can link with their documents are taken from the curriculum set by the Educational Department. The students give positive feedback on the possibility of setting personal goals private to them regarding the work that they do in school.

Dialogue 5: Goal-Setting in Dokker

G1 Interviewer: That aspect of the program could be setup in small goals that you set yourselves, not just based on the tasks you are given by your teacher, but on personal skills you want to improve, I understand that Dokker does not support that?

G1 Student 4: You have competency goals that you check, where you rate them with stars.

G1 Interviewer: With regards to the educational goals?

G1 Student 4: Yes.

G1 Interviewer: Do you include those goals together with your teacher?

G1 Student 4: We setup the goals on our own at first, then we ask the teacher to review them, and at that point the teacher is able to adjust the goals based on what he/she believes fits the current task.

G1 Interviewer: So those goals have to be oriented towards the educational plan, and not personal goals?

G1 Student 4: Yes.

G1 Interviewer: Is that something that you miss in the current system?

G1 Student 4: It would have been nice, that way one could gain greater insight into what you have achieved.

Some additional details about competency goals and how these are chosen can be found in dialogue 6.

Dialogue 6: Competency Goals and educational Plan

Interviewer: We have understood that a student links learning goals from the curriculum to an assignment, is that something that you do by yourself?

Student: We do that together? Don't we? (Asks teacher)

Teacher: Yes, we do that together since they (the students) are not as acquainted with the curriculum yet. But they are going to do it by themselves gradually, especially when they are working as apprentices.

Interviewer: So in this assignment you have not added a learning goal?

Student I think it kind of depends, I have not done it here.

From what was described from the interview one can see that the competency goals that are currently implemented in Dokker are strictly linked to the curriculum which the teachers and students set together. This is made apparent from both the workshop and the interview. Furthermore, from the interview one can learn that competency goals are not chosen for every assignment, but where it seems fitting.

From the conceptual design session group 1 included the Goal/Target (Prop 4.4i). The ability to set goals apparently emerged as the centerpiece of the design. Together with this prop, they drew lines representing the goals and whether they were checked or unchecked. Additionally, group 2 also added a prop representing goal-setting (Prop 4.4r) which they placed in the top-left corner. Dialogue 7 presents group 1's thoughts on this feature with regards to school assignments. Both conceptual designs can be found in figure 5.2.

Dialogue 7: Design: Goal-setting

G1 Student 4: [After adding goal prop] And then you have how the assignment was for you. How you were able to achieve your goals. Because you already have set your goals, you can comment how you achieved them. And in addition, you can rate yourself with stars (Adds the Rating Stars (Prop 4.4h)) based on how well you solved the assignment.

G1 Interviewer: In which setting will this be used?

G1 Student 4: It's very simple. You don't have to write that much; you have several goals simultaneously which can be checked and rated by stars or emojis (Adds Emoji (Prop 4.4v)).

Insight into the use of pictures and attachment of goals to these pictures arose from the bullseye session at the start of the workshop. Dialogue 8 shows a statement about the combination of pictures and goal-setting.

Dialogue 8: Connect Picture with Goals

G1 Student 4: When you take a picture of something you have achieved, you can connect that picture to your goals.

The students in group 1 provided further insight into how goals could be used to increase their Self-Efficacy. This insight is presented in dialogue 9.

Dialogue 9: Design for Self-Efficacy

G1 Interviewer: How does this [the design concept] promote Self-Efficacy?

G1 Student 4: You get to show the goals you set for yourself, progress towards achieving your goals, and the resulting feeling of Self-Efficacy when you see how much you have achieved in a short duration of time.

Group 2 took rewards into account when making design choices in the last part of the workshop. They added the Trophy (Prop 4.4j) to visualize this reward in the application. They argue in dialogue 10 reasons for including it.

Dialogue 10: Design: Trophy Reward

G2 Interviewer: What are your thoughts on the trophy prop?

G2 Student 3: If you have managed something, set goals and achieved them; then you get a trophy.

As the students of group 2 make apparent, rewards could be included with goal setting to make the achievement of goals more motivating.

5.3 Self-Assessment

Adding to dialogue 7 where group 1 adds the Rating stars and Emoji props to rate yourself regarding your goals and assignments, group 2 also included these props in addition to the Like (Prop 4.4p) as a means to rate or assess ones work or progress. Dialogue 11 presents thoughts on this matter.

Dialogue 11: Design: Assessment

G2 Student 1: Assessment, being able to assess ourselves. (Brings up Rating stars)

G2 Interviewer: What would you like to make an assessment of?

G2 Student 1: Of a day perhaps.

G2 Student 1: You also need likes.

G2 Interviewer: What are your thoughts regarding likes?

G2 Student 1: If you have achieved something you can give yourself a like.

To further address the concept of assessment both groups also included the Person (Prop 4.4s) in their designs. The idea of this prop was to represent a profile for the person using the application. Group 1 reasons for the design choice in dialogue 12.

Dialogue 12: Design: Person/Profile Feature

G1 Student 4: You can have this as the person using the app (puts out the person prop). If you have achieved many goals you can watch your progress and see that you sit pretty well in connection to what you wish to achieve.

G1 Interviewer: Like a personal overview of all the small goals you have set?

G1 Student 4: Yes. In addition, if you struggle with something or there's something you haven't achieved you can see what kind of Self-Efficacy you feel by e.g. using emojis as representation for this feeling.

Here too the students brought up the notion of emojis to represent a rating. This time the rating concerned what Self-Efficacy feeling you had towards your goals, and thus, assessing yourself through emojis.

Moreover, in order to comprehend the notion of Self-Assessment with regards to Dokker a questionnaire was given out to the students of the class that participated in the workshop. The students were asked at what rates they used Dokker as well as how they perceived different aspects of the system. On the question of "What is your perceived usefulness of self-reflection in Dokker" the students gave answers summed up in Figure 5.3.

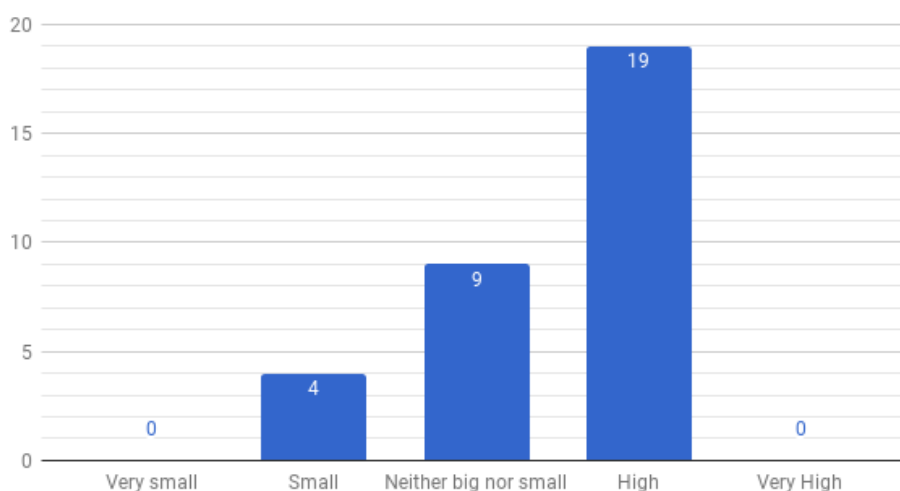


Figure 5.3: Perceived Usefulness of Self-Reflection in Dokker

The value of self-reflection from the view of the students is made apparent in the chart as a majority of them report a high usefulness of the self-reflection functionality. Furthermore, the students were asked to consider aspects of the currently employed Self-Documentation tool (Dokker) with regards to Self-Efficacy, aiming to challenge them to think about what could be done differently in order to support this. Opinions on this issue are presented in the following dialogue.

Dialogue 13: Documentation and Self-Efficacy

- G1 Interviewer:** With respect to Self-Efficacy, that you wrote down on the post-it notes in the warm up exercise, are there anything regarding the documentation process that could help improve this?
- G1 Student 4:** I could increase my feeling of Self-Efficacy by writing better documentation. E.g. if you write that you are improving your feeling of Self-Efficacy, it would perhaps be possible to better explain what you are working towards; that you are performing better at a certain task.
- G1 Interviewer:** Is there focus on bettering yourselves in the documentation process the way it is done now?
- G1 Student 4:** There could for example be an additional column for Self-Efficacy, alongside Planning, Execution and Self-reflection.
- G1 Interviewer:** For example, the activities that increased your feeling of Self-Efficacy?
- G1 Student 4:** Yes.

From dialogue 13 we see that the students have thoughts about what the current system supports and possible augmentations that could be added to it. The main focus of the suggestions regards the assessment part of the tool. It is suggested by one student that one could add a column/area/field to the document that is solely focused on Self-Efficacy, where the students can reflect about what actions they perform that help increase their feeling of Self-Efficacy.

5.4 Aspects of current Self-Documentation Tool

The following section will present results regarding aspects of the Self-Documentation tool (Dokker) that the students currently used at the time that the Workshop was held. The feedback made by the students can be categorized into two themes: feedback on the use of the tool and challenges regarding the use of the tool.

5.4.1 Usage

A significant portion of the workshop was delegated to investigating the current use of Dokker. The students gave thoughtful insights into how the tool is employed by them. A user journey that group 2 drew of a typical day at school is presented in figure 5.4.

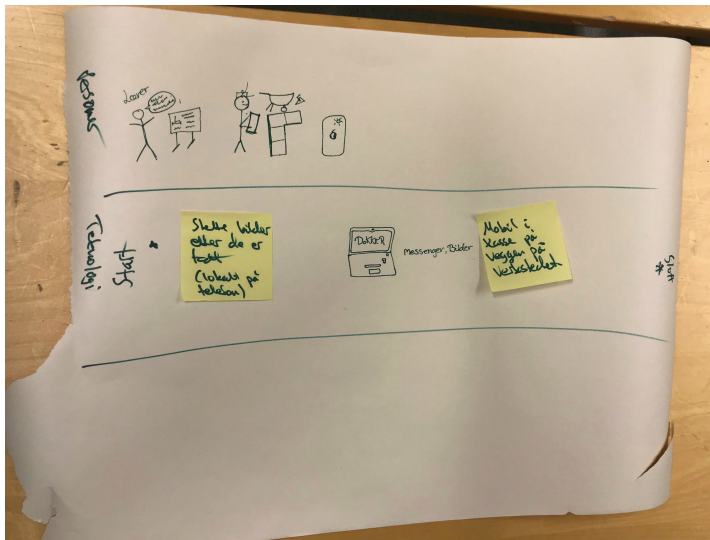


Figure 5.4: Dokker User Journey created by Group 2

Apparent from the figure above, lanes are drawn to represent people and technology. It is shown that a typical day starts out with the instructor giving directions for the day in plenary. Here material lists and general instructions are given regarding the work to be done that day. It continues with showing the students working with their project, taking pictures throughout the day, represented by the phone drawn in the middle lane. The day ends with the students gathered in a classroom to write on their documentation using a laptop.

Details regarding the manner in which the documentation is performed on a day to day basis using Dokker is presented in dialogue 14.

Dialogue 14: Day to Day use of Dokker

G1 Student 5: (Referring to the setup of documents in Dokker) We start out by setting up the Dokker document, what subject we are documenting, what teacher we have and point-checking for self-assessment.

G1 Student 3: We use a three part structure for the project report: planning, execution and self-assessment. Within planning we plan the entire project and for the execution a similar three part report for each day that we work on the project.

Evidence that supports the findings presented in dialogue 14, as well as evidence of the students having evolved their documentation skills is presented below.

Dialogue 15: Setup of Work Assignments in Dokker

Interviewer: Could you show us a work assignment in Dokker? Through our understanding there are three parts to the documentation: planning, execution and self-assessment?

Teacher: We do this a bit differently than what is the standard, because if you look at a work assignment in Dokker (shows on his own laptop) the headings for Planning, Execution and Self-Assessment have already been entered, but the students do not conduct as much of the planning by themselves because they are so new to the software.

Interviewer: I see.

Teacher: They write it as a log, a day by day entry where planning, execution and self-assessment are all combined in one continuous text.

The passage presented in dialogue 15 sums up the ways in which the students used to setup a document for a work assignment in their first six months of using Dokker. The teacher indicated that due to the fact that the students were so new to the software, a lot of the setup of documentation was supervised in the classroom.

Additional information about the user journey that the students drew is presented in the dialogue below. Details regarding the use of mobile phones is presented together with what parts of the work that are documented with pictures.

Dialogue 16: Documenting Work in the Workshop

G1 Interviewer: In the workshop, how do you document your work?

G1 Student 1: We take pictures of what we do.

G2 Interviewer: When do you use your telephones during the day? Is it when you are done working in the workshop?

G2 Student 1: No, we use it when we are working.

G2 Interviewer: Okay, so for example when you are laying the bricks? (Referring to the user journey)

G2 Student 1: Yes.

G2 Interviewer: Do you take pictures continuously when you work?

G2 Student 1: We take pictures of the most important things.

G2 Student 4: We take approximately three pictures during our work in the workshop.

Explanations for modes of documentation is made by the workshop attendees in dialogue 16. The dialogue presented here relates directly to the smart phone drawn in the technology lane in figure 5.4. The students report that they use their smart phones to take pictures of the work that they perform during a particular school day. These details are confirmed by dialogue 17 presented below.

Dialogue 17: Inserting Pictures into Documents in Dokker

Student: Here it says "add picture or file." I just hit this button, then a box comes up where I can choose a picture from my computer.

Interviewer: You have to transfer the pictures from your phone to the computer?

Student: We usually take pictures with our phone, then we send them to ourselves using Facebook Messenger, and then we just add them.

From dialogue 17 it is made apparent that the students have to transfer the pictures they take on their phones over to the computer they use for documentation. It is reported that some students conduct this transfer with the aid of Facebook Messenger.

5.4.2 Challenges

In addition to feedback and insights given on the current use of Dokker, the students had several opinions on which parts of the tool which could be made better. Lessons were also learned regarding the organization of the school day in cooperation with the use of the documentation tool.

The authors of this thesis were already aware that there existed a reliability issue with the Dokker system, and this issue was reiterated by the students during the workshop. Some comments that the students made regarding the reliability of the system are presented in dialogue 18. Furthermore, other challenges regarding the user journey that the students drew are presented.

Dialogue 18: Challenges with current System

G1 Interviewer: With regards to Dokker, do you see any potential improvements for it? Are there any challenges with the current system?

G1 Student 3: Some documents disappear all of the sudden.

G2 Student 4: What is bad with Dokker is the fact that some documents disappear.

G1 Interviewer: Based on the user journey that you have described, do you see any bottle necks, challenges or improvements that could be made?

G1 Student 5: Queues, e.g. when you are supposed to measure materials.

The timeliness of documentation, i.e. at what times the documentation takes place, was brought up during the workshop. The students had several opinions regarding the trade-off between being able to document their work in-place, versus the current work order where the students write their documentation at the end of the school day. Insight into challenges regarding the timeliness of documentation can be seen in dialogue 19 shown below.

Dialogue 19: Timeliness of Documentation

G1 Interviewer: (Talking about the topic of remembering what the students have done during the day) Are you able to recall what you have done during a day?

G1 Student 4: There are times when we have to speculate about what we have done, for instance when we have forgotten to take a picture of something, but we are able to remember things quite well.

G1 Student 4: (Continuing on the same theme) We do not always remember things, so there are numerous times when we forget things and they do not end up in the report, that I am pretty sure of.

G1 Student 5: One has to take mental notes.

G1 Interviewer: The documentation takes place at the end of the day, resulting in you having to remember all the things that you did with the aid of pictures, and you (Student 5) mentioned that you need to take mental notes. What do you guys think of that? Is it the best practice? That the documentation happens at the end of the day?

G1 Student 4: That is in essence what we have to do, or else there will be little time to actually perform the work that we have to do.

G1 Interviewer: What about a briefer documentation, bullet points or something in that direction?

G1 Student 5: I would not mind that.

G1 Student 4: I guess that is okay, but one has to keep in mind that you have to put all the things that you are working on down and go grab your smart phone so that you can write down what you are thinking. Additionally we have a certain amount of work we have to do in a limited time space.

G1 Interviewer: I see, so in a way it would be a hinder to spend more time documenting than working?

G1 Student 4: Yes.

The students raise the possible difficulties of remembering the details of the work they have done when writing their documentation at the end of the school day. The trade-off of writing notes/bullet points on the phone is also elaborated, where one student indicates that it would be helpful to write more details down as they work, whilst another student indicates that this could be a significant disruption in their work flow.

Another bottleneck that the students highlighted was the way in which the students capture and transfer pictures. Information about how pictures are taken and transferred to computers are confirmed. Details about this elaboration is presented in dialogue 20.

Dialogue 20: Challenges regarding Documentation

G1 Interviewer: How do you handle the pictures? How do you insert them into your documents?

G1 Student 4: We send them using Facebook Messenger, save them and insert them into the documents in Dokker.

G1 Interviewer: Is that cumbersome for you?

G1 Student 4: Yes.

G2 Interviewer: Is there anything that is cumbersome here? (Points towards the smart phone drawn on the paper)

G2 Student 2: If there is not enough space on the smart phone.

G2 Student 3: So you have to delete the pictures afterwards.

G2 Student 5: Those students that are not present receive the pictures from other students.

G2 Interviewer: From my understanding you usually use Facebook Messenger in order to transfer the pictures from your phone to your computer?

G2 Student 3: Yes.

G2 Interviewer: Do you usually send them to yourself?

G2 Student 2: I usually send them to myself.

G2 Interviewer: Could this be done in a more fluent way?

G2 Student 3: I would like to see it be done in an easier way.

G2 Interviewer: If you were to sum up this user journey, what do you think is the most cumbersome activity that you do in it?

G2 Student 1: I would say it is the transfer of pictures from the phone to the computer. It would have been easier if we were allowed to write our documentation on the phone, instead of using the bulky computer. I usually write on the phone.

G2 Student 2: The website tends to crash on my phone.

G2 Student 5: For me as well, it crashes if I click on one wrong part of the screen.

G2 Student 3: It is a bit annoying that we are not allowed to have our phone in our pocket down in the workshop. For every picture I have to go and fetch my phone, take the picture, and go put it back again.

G2 Interviewer: The phones reside in a rack on the wall of the classroom?

G2 Student 3: Yes.

As can be seen from dialogue 20 the students report some downsides with the current documentation routine with regards to the taking of pictures and the transfer of them to their computers. In order to insert pictures into their documents they have to upload them to the website where the documentation is captured. Pictures can only be uploaded from the computer locally, i.e. all pictures used have to reside on the computer. Secondly, the students report that there exists a challenge with regards to space on their smart phones, mainly the fact that the pictures they take of their work can at times crowd the storage on their phones. There is mention of the mobile version of the website for Dokker, and one student says that he/she uses it, but this raises contrary opinions from two other students reporting that they find the mobile version quite unstable. Furthermore, another student reports that they are not allowed to have their phones on their person when conducting work in the workshop. The authors learned through their visits to the high school that as a rule the students have to put their phones in a rack on the wall in their classroom.

When asked about what the students would want to change about the current practice, various answers were given. It was learned that time management could be a challenge for the students, as well as a confirmation on pictures being a significant hurdle for the students. These answers are shown below in dialogue 21.

Dialogue 21: Aspects to change about current Practice

G1 Interviewer: If you could change something about the way you work today, what would that be?

G1 Student 4: If you are pressed for time it can be hard to write good documentation. It can be hard to formulate the work you have done.

G1 Interviewer: I see, so in some sense you have to be good in Norwegian in order to get a good grade in Carpentry?

G1 Student 4: Yes, it kind of is that way. The worse you are in Norwegian, the worse the documentation you write become, and the less you are able to show what you have done.

G1 Student 1,2,3: The pictures.

The dialogue presented below presents some interesting insight into the motivation behind using the self-documentation tool. A student elaborates the fact that writing good documentation may not be done for one's personal sake, but because it is to be shown to teachers and thus being the basis from which the teachers set their grades.

Dialogue 22: Motivation for Documenting Work

G1 Student 4: For the most part there is a teacher per 12-13 students in the workshop, and he does not necessarily catch all the things that you do. Therefore you have to document the things that you did well.

G1 Interviewer: So the main goal of writing the documentation is not for you to see what you have done, but to show your teacher what you have done?

G1 Student 4: Yes.

G1 Interviewer: So there is less focus on your Self-Efficacy?

G1 Student 4: Yes, you have to write about the things that you did well, so that the teacher can see that you were able to do them. The teacher may not catch the things that you did well if you write poor documentation, thus giving you a worse grade.

5.5 Domain Suggestions

Evidently, there were several jointly utilized props between the two groups during the design phase of the workshop. Among them were Home and School (Props 4.4n and 4.4o). Both groups added these props in order to highlight the domain where the application could be used; namely at school and at home. Argumentation for these design choices are found in dialogue (23).

Dialogue 23: Design: App Domain; Home and School

G1 Student 4: (Adds the Home prop) With the Home prop you have the ability to set goals at home, e.g. do the dishes. And next to it you get the School prop, here at the top. If you e.g. have set yourself a goal the night before in the "Home tab", you can get a message concerning this and that for achieving that goal.

G1 Interviewer: So not just set goals at school but at home as well? That you can set goals regarding e.g. house chores or more personal goals that you wish to be better at?

G1 Student 4: Yes.

Group 2 in the context of work assignments:

G2 Student 1: And you also need Home and School (Adds the props).

G2 Interviewer: Is there a difference in the application use in the two domains?

G2 Student 2/5: It's the same.

G2 Interviewer: Because you have to work on this at home too?

G2 All Students: Yes.

G2 Student 1: Yes, so you have the ability to work on it both at home and at school at your own choosing.

In conjunction with application domain, the topic of application platform arose, e.g. best fitting technological platform for documentation. Evidently, the mobile platform emerged as consensus among the students as the best documentation platform due to its ubiquity, and is argued for in dialogue 24.

Dialogue 24: Design: Documentation Platform

G1 Interviewer: What platform is better for documenting what you do? Mobile phones or your computers as you currently do? (Referring to documenting with Dokker)

G1 Student 4: The best way would be to start documenting on your phone as we have designed here (points at the design concept). Building on your phone notes you can create a more comprehensive documentation on your computer afterwards.

G1 Interviewer: Because it's a bit more handy to use this [the design concept] in i.e. the workplace or outside the school. Then you don't need to drag your computer everywhere.

G1 All students: Yes.

G1 Interviewer: Do you agree that the mobile phone is a better documentation platform?

G1 All students: Yes

G1 Student 4: If you want to document something quickly then mobile is the best platform because you usually have your phone in your pocket.

5.6 User Engagement

Additional results regarding the engagement and motivation for using Mindfit were given by group 2 and concerned colors and design, time usage, and usefulness. The following dialogue (25) presents some of the students' thoughts on the matter.

Dialogue 25: Reasons for not using Mindfit

G2 Interviewer: Are there any reasons for not using Mindfit?

G2 Student 1: You need the time to use it.

G2 Student 3: I am a bit unsure if it actually works.

G2 Interviewer: Is it hard to see the usefulness of the app?

G2 Student 3: And I feel that I don't have the need for it.

G2 Student 1: I don't know, but maybe if you had made it [the app] a bit more exciting.

G2 Student 3: More colors.

G2 Student 1: More colors, yes, perhaps.

G2 Student 3: It would make it more interesting.

Evident from this feedback is the importance of an attractive user interface as well as motivation in order to use it frequently.

5.7 Communication

Lastly, the final design choice of note were the Message (Prop 4.4q) included by group 2. As apparent through dialogue 26 they felt that a way to communicate with your class mates were important to include.

Dialogue 26: Design: Communication

G2 Student 1: It should be possible to connect to the people in your class within the app, and thus being able to communicate with them.

G2 Interviewer: Are you asking each other what has happened during the class etc.?

G2 Student 3: If somebody is absent they may wonder what happened.

G2 Student 1: It's possible that if somebody is absent they can ask here in the app what happened during the class.

Chapter 6

Discussion

In this chapter a discussion of the results described in chapter 5 will be presented. The goals of the discussion are to explain in greater details the impact of the results as well as to show how the results contribute to answering the research questions listed in chapter 1. The themes discovered in the qualitative analysis will be discussed in light of the theoretical framework presented in chapter 2. Based on the themes that were discovered a set of concepts is presented first, followed by elaboration and discussion around these concepts. Additional findings will follow the general discussion of the most relevant results, and lastly wireframes illustrating key findings will be presented and described. Limitations of the research are found in the last section of this chapter.

Table 6.1 is read in the following way: There are three main rows, one for each concept presented in chapter 2. Each main row is divided into two sub rows, the top sub-row contains the concepts that were found in both the literature and the workshop, for clarity, in this row the columns for theory and workshop are merged into one cell. The bottom sub-row encapsulates the concepts that were found in only one of the two; either theory or workshop. The table serves as a summary of concepts, as well as a comparison medium for concepts that arose in both the literature review and the Workshop. No concepts were only found in the Workshop results, most likely due to the fact that substantial concepts have already been described in academic work.

	<i>Theory</i>	<i>Workshop</i>
<i>Self-Documentation</i>	<ul style="list-style-type: none"> - Text, video, picture, audio and symbol documentation - Web 2.0 technology features (YouTube, Facebook, Twitter, Flickr) 	
	<ul style="list-style-type: none"> - Connecting academic work with employers - Peer-assessment of e-portfolio work - Co-Authorship of content - Feedback system (E-portfolio) 	
<i>Empowerment</i>	<ul style="list-style-type: none"> - Self-Assessment - Communication - Ubiquitous Documentation - Individualized Learning - Student Managed Documentation 	
	<ul style="list-style-type: none"> - Peer assessment - Self-Managed Information retrieval - Co-Authorship - Extended audience - Microworlds 	
<i>Self-Efficacy</i>	<ul style="list-style-type: none"> - Log positive experiences by text, pictures and thoughts - Goal-Setting - Rewards - Documentation of Achievement Feelings 	
	<ul style="list-style-type: none"> - Feedback - Mental Effort - Learning Strategy - Models - Enjoyment - Learning Goal Orientation 	

Table 6.1: Design Concepts

6.1 Self-Documentation

The act of Self-Documentation permeates throughout the workshop results. Based on the concept chain presented in chapter 2, many of the findings that would fall under the theme of Self-Documentation could easily fall under either Empowerment or Self-Efficacy. Due to this fact only the findings strictly concerning Self-Documentation will be discussed in this section. The nature of how the students use their Self-Documentation tool will be discussed first, followed by challenges that the students indicated with using this tool. Lastly the conceptual design inputs that the students reported in the last iteration of the workshop will be discussed.

6.1.1 Usage of Self-Documentation Tools

Although investigating the nature in which the students use Self-Documentation tools does not directly answer any of the Research Questions presented in chapter 1, the authors feel that an understanding of this nature will help build later arguments in this chapter. An avenue of approach that the authors found interesting was that of looking at how two applications — Mindfit and Dokker — could generate new design outcomes. Because of this, it was deemed necessary to gain a thorough understanding of how the students use the Self-Documentation tool that the school employs (Dokker). Based on interviews and the workshop conducted in this project a substantial understanding of how this tool is used can be made. In the workshop the students were asked to draw up their experienced user journey with the program, as well as try to identify possible bottlenecks that they experience using the tool. It is from this second iteration of the workshop that the main understanding of the use of Dokker can be found.

Before the students actually write their documentation in Dokker they need to document their work wherever this work is performed. Usually this work is done in the workshop that is located in the school building. As can be seen from dialogue 16, the students use their smartphone to take pictures of the work that they perform in the workshop. One could argue that the smartphone as a platform is underutilized in this context, as there are opportunities for the students to perform more of their documentation on this platform. Conversely, a majority of the Self-Documentation tools that have been presented in chapter 2 are implemented in a desktop/laptop environment, which is inline with the state of computers in education, especially in Norway. Furthermore, the trend in software created for the educational domain suggests that the smartphone as a platform will not be utilized to a large degree in the foreseeable future.

The students' use of Dokker has evolved when comparing it to the findings from the interview conducted approximately 4 months before the workshop. It can be seen from dialogue 15 that the students, when they were still new to the program, wrote a day by day log in Dokker. While through the workshop one can learn that the students are using Dokker in a way that much more closely resembles the way in which the creators of the program suggest that one uses it. From dialogue 14 one can see what the students report about their use of the program as of when the workshop was held. It is thus reasonable to say that the students are getting more out of the Self-Documentation tool after having

used it for a longer period of time, as would be the likely case for the majority of software tools. Critically, by letting the student use the Planning, Execution and Self-Assessment setup, they are able to take greater responsibility for their education.

Challenges with Documentation

There are mainly two issues that the participants in the workshop raised as what they would think of as the most hindering in their daily use of Dokker: the capture and transfer of pictures. Firstly, the students report that they have to employ their personal smartphone to take pictures of the work they do. Seeing as a substantial part of today's youth have a smartphone, this fact may not be too hindering for the students. However, as mentioned in dialogue 20 and further supported by dialogue 17 we see that the students are bothered by the potential lack of space on their devices, as well as the nature of the transfer of pictures from their phones to the computer at which they document their work. The students report that they would rather see the transfer of pictures happening over another medium than what they are currently employing. Possible mechanisms for the capture and transfer of pictures will be presented later in this thesis, through the presentation of wireframes, based on the design inputs given by the students. Looking again at the smartphone as a platform, it is made evident through dialogue 20 that the mobile version of Dokker can be unreliable at times. It is implemented as a web view of the web site, and the students report that they find that documenting on it is cumbersome due to the fact that the text input field may crash if the user clicks on a wrong part of the screen. What one can learn from this is the necessity of robust software in order for users to enjoy and use it. However, there is an important trade-off between time spent implementing a native application and the substantially shorter time spent implementing a mobile version of a web site. Further on in dialogue 20 it is mentioned that the students are not allowed to carry their phones on their person, rather they have to keep them in a box-like contraption on the wall of the workshop. This fact will further hinder the students' possibility of using the smartphone as a platform for documenting their work.

Speaking for the use of the smartphone as a potential documentation platform is the timeliness of documentation. Since the students are currently writing their documentation at the end of the school day, details about how the work was done and what feelings the students had about the work could be lost, due to the students not remembering those details at the end of the day. Through dialogue 19 one can learn that the students have to take mental notes of their experiences conducting school work. Some participants reported that they could see benefits of noting keywords regarding what they have done on their phones. Conversely, other students were concerned about having to stop what they are doing and picking up their phone in order to write something down. Here we have another trade-off, between the timeliness of documentation and fluency of work. It will be challenging for a software designer to enable users of a Self-Documentation tool to capture the essence of the work they perform without interrupting the work itself.

In addition to the aforementioned challenges there was also mention of the motivation behind documenting one's work in the first place. As can be seen from dialogue 22 one student raises the issue of whom the documentation is created for. Ideally, it would be

the case that users of self-documentation tools creates documentation for their own betterment. However, it is made apparent that this may not be the case. Since grades are given based on the documentation that the students create, the motivation for creating good documentation may lie in the desire to receive good academic results.

6.1.2 Design Concepts for Self-Documentation

Based upon the new understanding of how a Self-Documentation tool is employed by students and the bottlenecks identified through gaining this understanding, a groundwork is laid to discuss the Self-Documentation design inputs given by the students. This section will in great part contribute to answering *RQ1* presented in chapter 1. The authors of this research are of the opinion that understanding in what ways students prefer to document their work at school is paramount in being able to conclude on software artifacts that can help increase their Self-Efficacy.

Text and Pictures

An understanding of what documentation modals the students prefer can be gained from the workshop dialogues presented in chapter 5 together with the photographs of the conceptual designs the students created. Looking at figure 5.2, one can see that the two workshop groups chose many similar documentation modals, and that group 2 chose to include some additional ones. Based on information gained from dialogue 3, an explanation is given for why text is preferred by some students. Textual documentation gives the user the ability to express themselves in depth, maybe more so than the expressive power of pictures, audio and video. One student also indicated that he/she could increase his/her feeling of Self-Efficacy by writing precisely what the reason was why they felt this increase (dialogue 13). This observation helps indicate that text is a valuable tool for the students when expressive power is preferred. Furthermore, it is interesting to see that the students pick out a feature that already exists in Dokker; the ability to include pictures in text. It may be the case that the students enjoy features that they are already familiar with, which make them easier to use and comprehend. Picture handling also comes back to the bottlenecks that the students discussed, how pictures are captured and transferred. The topic of platform suggestions for Self-Documentation tools and discussion around this is presented in section 6.2.

Audio and Video

Pictures and text could be looked at as quite standard modals for documenting work, and group 2 in the workshop suggested in their design to include alternative means for documentation. Audio and video documentation modals were suggested by this group, mainly justified by their ease of use and quick capture. The students did not elaborate further on why these documentation modals would serve them any better than the existing methods

of text and picture. The main emphasis was put on the ease of use of audio and video. There are important trade-offs to the documentation modals discussed so far. On the one hand, textual documentation augmented with pictures can offer precise expression of work methods, feelings and experiences, whilst audio and video offer much larger information gathering potential. While using audio and video, the user is able to capture a lot of information, but often these documentation modals demand of the user the ability to distill this information into meaningful documentation.

Web 2.0

Elaboration on emojis as a documentation method, and the possible effects this may have, is discussed in section 6.3. A thing to note about emojis, together with audio and video capture of work is the fact that these modals align better with the current technological state. From theory presented in chapter 2, it is made evident that Web 2.0 technology may be a significant stepping stone for e-portfolios and maybe Self-Documentation tools in general. Therefore, it is interesting that the students that participated in the workshop chose to pick out these artifacts, suggesting that they prefer these more modern documentation modals. Furthermore, it may be the case that since the students use a wide array of social media software/applications/web-sites, they are more familiar with these means of expressing themselves. Therefore, to summarize Self-Documentation as a concept in light of the results found in this research, one can say that it is important to find ways for the students to quickly and easily document the work they do, in ways that they are familiar with.

6.2 Empowerment

The concept of Empowerment was not explained or focused on explicitly in the workshop that the authors conducted with students. This decision was made due to the fact that Empowerment can be difficult to explain, both for the authors as well as for the students themselves. Additionally, due to the length of the workshop, there was a fear that the focus of the workshop would become divided, so that the results would be less fruitful. Nonetheless, there are valuable lessons that can be learned from the workshop results regarding Empowerment, especially from the designs that the students created. Furthermore, based upon the chain of concepts presented in section 1.1, increasing user Empowerment will have an effect on the Self-Efficacy of the user. Therefore, it was deemed important and necessary to consider possibly Empowering aspects of the results from the workshop. Details of the designs will be discussed in comparison with the theoretical background presented in chapter 2, together with table 6.1.

Self-Assessment

It is shown through theory presented in chapter 2 that giving users the ability to self-assess themselves, and encouraging this to happen, will have an empowering effect. The stu-

dents are already familiar with self-assessing their own work through their use of Dokker, and through the conceptual designs that they created in the workshop they included Self-Assessment into the designs. Concepts that support Self-Assessment are found in the designs as rating stars and like-buttons, where one can find elaboration on this inclusion through dialogue 11. It is, for the sake of this research, very interesting to see the students include the abilities to self-assess their own work. As described in the previous section concerning Self-Documentation, the students chose to include an array of documentation modals. Having this wide choice in how to express themselves give the students potent capability to self-assess their work.

Communication

Communication between students in a group or class has been available in Dokker, however the students reported that they employed Facebook Messenger in order to communicate with each other. The ability to communicate with fellow classmates was included by group 2 in their design, as can be seen in dialogue 26. Being able to communicate with your fellow classmates has been proven to empower students through academic work referenced in chapter 2. The students highlighted the ability for students being absent to catch up with what happened on a specific day etc. Therefore, including the ability for users of a Self-Documentation tool to communicate with their peers should result in empowering the user.

Ubiquitous Documentation

The issue of what platform to conduct documentation on has already been touched upon in earlier subsections of this discussion, but it is worth taking a closer look at the advantages and disadvantages of platform choices for Self-Documentation tools. By looking at this issue from the view of accessibility, the mobile platform would grant the user greater freedom in using a documentation tool. Further, a link between ease of access and Empowerment is made in chapter 2, thus suggesting that a tool implemented on a mobile platform would empower the users of such a tool. From dialogue 24, captured through the work of group 1, one can see that the students suggest a two-pronged approach, starting out by quickly noting down keywords on the phone, and then continuing on a laptop. Group 2 were also quick to decide that the mobile platform was the way to go. The fact that it is quicker to pull up a smartphone, and easier to quickly note things down on it, are given as main arguments for why the smartphone is a good platform for a Self-Documentation tool. The main takeaway from platform choice in regards to Empowerment is the fact that users can ubiquitously document their experiences, in contrast to a laptop that has to be operated on a table or similar. A challenge regarding the mobile phone as a platform in the educational setting is the set of rules that educational institutions bestow on the students. In the case of the high school that the authors visited, the students were not allowed to have their phone on their person whilst in a classroom or workplace. In order for the smartphone to be a viable platform choice in education, rules set by the school have to be renewed.

Aside from platform choice, from dialogue 23 it can be observed that there is a desire to be able to use a Self-Documentation tool both at home and in school. Students could

set goals that apply to everyday life at home, which can be tracked, linked to documentation and finished by them. Thus, a Self-Documentation tool that supports this kind of use may empower its users even more by permeating not only their educational process, but throughout their day.

Individualized Learning

The individualized nature of the learning that the students go through is brought on from their experiences with Dokker into the designs that they created. Group 2 included in their design the ability to have a personal space in the tool, much like what is already implemented in Dokker. The ability to see all of the work that the user had completed, and the work that was ongoing, was included. Together with feedback functionality, communication capabilities and the possibility to self-assess ones work give the conceptual designs the possibility of giving the user a highly individualized learning experience. By giving the students the ability to be more easily seen by their teachers, through the work that they perform and thoughts they have on this work, there are grounds to say that the students will be empowered.

Student Managed Documentation

The last concept to be considered in light of Empowerment is that of Student Managed Documentation, and by this it is meant the student's ability to manage his/her documentation. At the heart of the designs that the students created is the assumption that this tool is to be used with the student in mind. Additionally, the documentation that is to be captured in the tool is entirely managed by the student. This is seen as an important aspect of the designs created as it sets the student in the center of their own learning process, giving them power over their own learning. Furthermore, through observations and interviews performed during this research, it was learned that the students enrolled at the high school that was studied are primed to make use of a Self-Documentation tool when they work as apprentices. This is an important finding as the students will be all on their own, working in a business and still using the same Self-Documentation tool (Dokker). As a matter of fact, a majority of the schools where Dokker has been deployed have educations where one or more years of work in a business is a required part of the education. This is an important factor as it acts as a foundation for a tool such as the one outlined by the students to empower its users by giving them the ability to take control over their own learning process.

6.3 Self-Efficacy

This section will mainly contribute to answering *RQ2* grounded in chapter 5 supported by theory. When reviewing theory on how to achieve Self-Efficacy one come across several concepts proven to be a contributing factor, all of which are mentioned in the Self-Efficacy section of table 6.1. This research provide support for these concepts and contributes mainly with concepts intersecting with theory and thus supporting the theoretical claims. Through the iterations of the workshop several themes regarding Self-Efficacy

were brought up. In essence, these themes can be categorized into four main topics described through this section: "Log positive experiences by text, pictures and thoughts", "Goal-Setting", "Rewards" and "Documentation of Achievement Feelings".

Log positive Experiences by Text, Pictures and Thoughts

This topic is mainly generated from iteration 1 of the workshop drawing on concepts from the Mindfit application. Grounded in psychological theory Mindfit is proven to increase Self-Efficacy as described in section 3.1.1. Due to focusing on student Self-Efficacy the authors wanted student views and perspectives on ways Mindfit works in order to achieve increased Self-Efficacy; hence the inclusion of ranking Mindfit features in the workshop. Evidently, the results show three interesting findings with regards to logging methods; namely text, pictures and thoughts. Dialogue 1 and 2 show that there is a correlation among the two groups as to which logging method they prefer. They agree upon the ability to both log their experiences with pictures and thoughts as they placed those features close to the bullseye center. However, a deviation in the correlation appears when looking at the textual logging method. Group 1 supported textual logging by arguing for the level of detail the method gives, while group 2 prioritized ease of use and quickness which pictures and predefined thoughts or feelings give. The ideal logging method would then perhaps be a combination of the two which offers the option to quickly log a positive experience through pictures and thoughts as well as the option to elaborate with text. Consequently, the three logging methods — text, pictures, thoughts — prove to be important aspects to include when designing software for student Self-Efficacy.

Goal-Setting

Possibly the most widespread concept for increasing Self-Efficacy is the ability to set goals. This claim is grounded in a wide array of theoretical articles (see section 2.3) as well as applications grounded in psychology (Mindfit) and results from the field work during this research. Continuing the latter statement about field work, goal-setting quickly emerged as one of the most important aspects for increasing Self-Efficacy already in the first iteration of the workshop. Both groups ranked this feature as the second most important behind the three logging methods. But, as apparent from dialogue 8 the logging methods usually connect to a goal which overall may indicate that goal-setting is the most essential part of a self-documentation tool aiming to increase Self-Efficacy. This claim is further substantiated in the design process of the workshop when both groups brought up props to design for goal-setting. As previously stated in chapter 5 and argued by dialogue 7 the goal-setting aspect emerged as the centerpiece of group 1's design due to the substantial amount of time and effort concerning this particular concept. It became evident that all other design props somehow was connected to the goal-setting prop, i.e. rating stars to rate your goal progress, logging methods connected to goals, emojis representing your feelings regarding your goals, and goal-setting both at home and school. Furthermore, the importance of goal-setting was demonstrably stated when the students of group 1 were asked how their design concept promote Self-Efficacy in dialogue 9. The answer indicates that the ability to set goals and monitor the progress towards them may be the most important feature for achieving Self-Efficacy. A supporting statement to this answer

occurred in dialogue 5 where the students suggested an improvement to their own Self-Documentation tool (Dokker) by adding functionality to create personal goals that they monitor themselves.

Following the above arguments regarding goal-setting given in the workshop it is evident that many of the statements are supported by theory; including self-set, short-term goals and the impact of goal progress. In addition, theory states that feedback on goal progress promotes Self-Efficacy and that the goals need to be learning oriented, specific, challenging and attainable.

Rewards

Getting recognition for achievements is widely known to be a motivational and Self-efficacy boosting factor in everyday life. Whether it be an Olympic gold medal, coins in video games or just encouraging words, the recognition is a proof of a positive outcome. Such recognitions, or rewards, are proved both by theory and this research to be an important concept when designing software aiming to increase Self-Efficacy. During iteration 3 in the workshop, group 2 introduced the Trophy prop to represent the reward feature. According to dialogue 10 the group suggested that you get a reward — in this case a trophy — when you achieve your goals. Backing this design choice they brought up examples from applications they used on a daily basis. One such example was the Snapchat application and its "Snapstreak" feature. In short, this feature is about two friends sending pictures (Snaps) to each other via the application for several consecutive days and obtaining a streak of such days. This concept is known as **Gamification** which Deterding et al. (2011) defines as "the use of game design elements in non-game contexts". Gamification connects to Rewards in that the latter can be considered as a game design element within a non-game context when put in a Self-Documentation tool. Following this, the reward concept can be viewed as a sub-concept of gamification. Support for the finding of gamification with regards to Self-Efficacy is found in a study by Banfield and Wilkerson (2014). They found that Self-Efficacy increased when students are being taught using gamification pedagogy. Furthermore they added that Self-Efficacy is vital for creating aptitude and that gamification pedagogy dramatically increases Self-Efficacy. This is inline with theory concerning rewards stated in section 2.3 in that rewards convey student progress and motivation due to positive outcomes as well as the rewards being performance-contingent.

Documentation of Achievement Feelings

Expressing your feelings towards experiences and achievements was found in the workshop to be an indicator on the Self-Efficacy you felt regarding your goals. Evidently this is inline with theory through Mindfit as this application is grounded in psychological theory. To represent this concept both groups introduced the Person prop and group 1 specifically gives reasons for this choice in dialogue 12. They added emojis to represent the feelings towards goal progress which Mindfit similarly supports through adding positive thoughts (Figure 4.2d). In addition, during the ranking of Mindfit features both groups ranked the ability to register positive thoughts highly. To this end, one can conclude with that the concept of documenting your feelings when achieving a goal contributes to the enhancement

of your Self-Efficacy and that various ways of doing this, e.g. with emojis or text, engages a larger audience by appealing to their desired documentation style.

6.4 User Interface

The workshop produced additional results regarding the appearance and user interface of Mindfit and Dokker. This information is valuable when considering the user interface of new applications in connection to student engagement and attractiveness. In addition, the educational domain comprises a wide array of people with different prerequisites and ability. Thus, with increased usage of digital tools in education, the concept of Universal Design might be the solution to incorporate the various levels of student capability.

Engagement and Attractiveness

The appearance of Mindfit became a topic for discussion during the first iteration of the workshop. Dialogue 25 presents thoughts on why some of the students resisted using the application. They questioned the usefulness of the app as well as setting aside time to use it. When asked about any improvements concerning the application's appearance they brought up enhanced excitement through e.g. colors. This improvement would make the application more interesting. Furthermore, through iteration 3 it became evident that the students were keen on bringing "modern" and "youthful" concepts into the design, i.e. elements that they recognized through mobile applications they used themselves. One such example is the use of emojis as representation for feelings.

The main takeaway from this is that in order to engage students one needs to consider creating the user interface attractive for the intended user — in this case the student — in order for them to use it. This is perhaps an obvious statement, but could be particularly important with students as target audience due to the vast amount of applications out there reaching out to this particular group. In order to "compete" the application needs to be attractive.

Universal Design

Due to the diversity in the educational domain regarding abilities it may be difficult to include all students into a common digital tool; i.e. making sure all students have equal opportunity to use it. From personal experience by the authors, this specifically comes to show through the deployment of Learning Management Systems (LMS) in schools. Such systems are purchased by the public sector, and although being designed for school usage they are not tailored to take various student disabilities into account. Students can e.g. have reading and writing difficulties that prevent them from intuitively and quickly interacting with the system. Although not being an LMS per se, this is also relevant for Dokker due to some similarity in features. The public sector is the customer of Dokker which distributes the system to the applicable school(s). Consequently, the students — the actual users of the system — are not directly involved in the process. This may lead to a sub-optimal solution due to the lack of end-user involvement in design and development. To this end,

a proposed solution is to incorporate the concept of universal design when developing such systems. As Iwarsson and Ståhl (2003) defines: "Universal design is synonymous to 'design for all' and represents an approach to design that incorporates products as well as building features which, to the greatest extent possible, can be used by everyone". With this in mind the developers and designers have a greater chance to reach out to all levels of technological competence.

6.5 Wireframes

Regarding Research Question *RQ2.1* concerning how the aforementioned design concepts can be combined into software applications, this research will present several wireframes. The wireframes draw on concepts found in theory and the results of this research — presented in Table 6.1 — as well as concepts from the two Self-Documentation applications Mindfit and Dokker. It is important for the authors to stress the fact that the wireframes are meant to only serve as illustrations for the most important findings of this research, not as designs for fully fledged software applications.

The wireframes presented here seek to illustrate the most important conceptual design artifacts that the students highlighted in the workshop. All of the concepts found in the literature review presented in chapter 2 and those that were found in the results from the workshop are presented in table 6.1. This table also serves as a basis for the focus of the different wireframes. There is one main focus of each wireframe based on the Self-Efficacy concepts presented in the table: Rewards, Feedback, Feelings and Mental Effort. The concept of Mental Effort consists of the concepts Mental Effort, Learning Strategy and Models. Firstly four general wireframes will be presented that are common to all of the wireframe themes.

It was decided that the most central concepts that the students underlined the heaviest would feature throughout all of the wireframes. Furthermore, based on the fact that the workshop outcome could be seen in light of the students' experiences with Dokker, the authors wanted to include the tool's ability to serve as an assessment tool that could be used in education in the wireframes. Common for all of the wireframes is the feature that all documentation that is done with the envisioned application can be linked to goals that has been set by the user. Furthermore, all of the documentation modals that the students brought forth in the workshop are included in the common wireframes, thus applying to all of the sets of wireframes. Lastly, the wireframes all include the ability for the user to self-assess his/her work and experiences.

6.5.1 Common Wireframes

In this section common wireframes will be presented which encapsulate envisioned design elements that are common for all of the wireframe concepts presented later on in this section. Apart from the Documentation Page (figure 6.2b), the following wireframes apply to all of the specialized wireframe concepts presented in later sections. The Documentation Page is common for all except for the "Feelings" wireframe concept (section 6.5.4).

The common wireframes include general features and concepts that were central in the results from the workshop, as well as some functionality that is usually found in current applications. Each wireframe will be described briefly with accompanying justifications for elements that are included in them.



Figure 6.1: Common Wireframes: Profile and Messaging

The first wireframe among the Common Wireframes is found in figure 6.1a. This wireframe shows what elements could be included in a profile page. Apart from general information about the user, there are two key elements that capture self-assessment features: the emojis below the profile icon as well as the rating stars. The thinking behind the emojis is that they can be used by the user as a status tool for their general feelings. The user can select a fitting emoji that can represent their general mental state in the moment. The other self-assessment element found in the wireframe is the rating stars accompanied by a weekly overview showing how the user rated the days of the current week. The rating stars directly captures the concept that the students wanted to include, while the weekly overview of ratings as well as the emojis serve as extensions to this desire.

In figure 6.1b the communication concept is shown through a messaging page. This is

accessed through the message icon located at the bottom end of the screen. Here the user has the ability to message class-mates and friends, through looking up past conversations or searching for names in the search field provided at the top of the page.

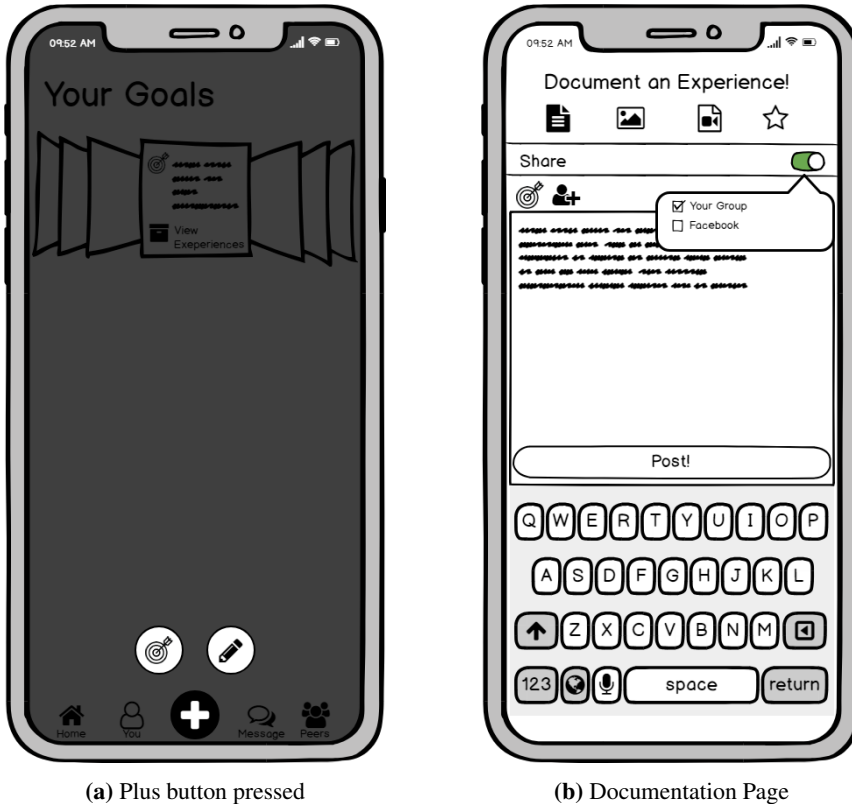


Figure 6.2: Common Wireframes: Plus Button and Documentation

The third of the common wireframes is found in figure 6.2a. This wireframe simply shows how a page could look like directly after the user hits the pluss button in the bottom center of the wireframe. Two buttons appear, and the rest of the screen is blacked out to highlight these two buttons; a button with a target on it, and one with a pencil. The target button sends the user to a page where he/she can create new goals. The pencil button sends the user to a page where he/she can create a new documentation entry, this page is called the Documentation Page and is shown in figure 6.2b.

The Documentation Page consists of several ways of documenting an experience or work, together with a concept of linking a documentation entry to one or several goals. The linking of a documentation entry to one or several goals is represented in the wireframe with a target with an arrow in it, identical to the one that shows up in wireframe 6.2a. The concepts that are the most central in this wireframe are the four icons on the top of the page. They represent the different ways in which a user can document an experience.

From left to right they are: text, image, video and icons. The documentation modals that are included in this wireframe come directly from the workshop and the discussion presented earlier in this chapter. It is envisioned that the page will change based on what icon the user touches. In the case of the wireframe shown here the user has hit the text-file icon in the upmost left corner of the page. Additional things to note about the wireframe is the fact that it includes a share toggle button on the right hand side, just below the documentation mode icons, as well as an "add collaborators button" directly to the right of the target with an arrow in it. Both of these elements are unique to the set of wireframes associated with the Feedback-concept and these elements will be explained in greater detail in section 6.5.3.

6.5.2 Rewards

This section will present the wireframes for the Rewards-concept. The main focus of these wireframes is to highlight the concept of gamification which includes the feature of receiving rewards when achieving goals. In addition to being a strong factor in theory this feature captures the students' wish to bring rewards based on goal achievements into the design. Furthermore, it brings about competition and competitiveness which optionally can be added by the user if he/she wants to compare him-/herself to friends.



Figure 6.3: Rewards Home Page

Figure 6.3 illustrates the home page of the Rewards-concept. Evidently, the page is separated into two main parts. At the top the user can see a swipecable cover flow view displaying all the goals the user has set. By pressing one of the cards the user views all documented experiences and work connected to that goal. This feature is common on the home page throughout the wireframe concepts described in this chapter due to the impor-

tance of goal-setting when aiming to increase Self-Efficacy.

Next, on the second part of the page three different views are spread across a "swiping menu" illustrated through the dots and arrows that represent swiping left making the menu go right. The leftmost wireframe displays a circular progress bar showing how many goals the user has left to achieve in order to get their next reward. Placing this as a main element on the home page gives the user a constant reminder on their progress. By swiping left (menu goes right) a highscore list appears. Having enabled the element of competition, i.e. making the number of rewards public, the user can view how many rewards he/she has received compared to other users and friends. A possible effect of this feature is increased motivation to achieve ones goals. The more goals you achieve the higher you climb the list. Finally, swiping left once more uncovers an overview of the user's collected rewards. These can be all sorts of rewards, e.g. awarded by the teacher if the reward connects to educational goals.

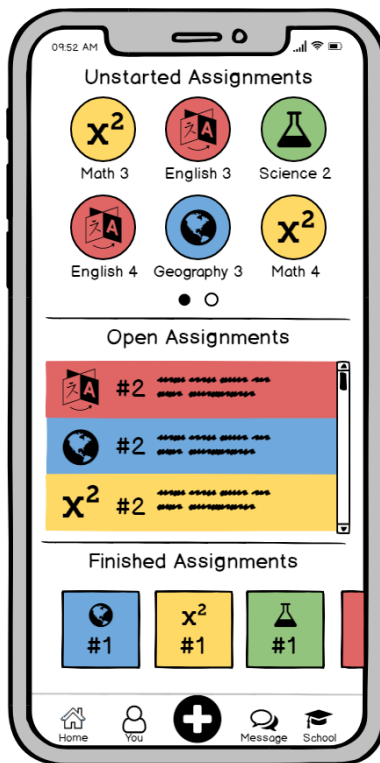


Figure 6.4: Rewards School Page

Adding to the home page wireframes, the last wireframe of the Reward-concept is the school page illustrated in figure 6.4. This page represents the school aspect of the envisioned application and displays assignments the user has received from the teacher. This particular wireframe is shared with the Feelings-concept described in section 6.5.4. As

made apparent by the figure the page is divided into three parts. The uppermost section presents assignments not started yet displayed by the same dotted swiping menu as on the home page. Secondly, the middle section shows assignments the user has begun inside a scrolling menu providing a more detailed presentation of the assignments. Lastly, an overview of finished assignments is displayed through a continuing swiping menu at the bottom of the page.

The color scheme is used to separate the subjects into groups due to the amount of information presented on the page. Thus, less text is required which makes the page more lucid and aesthetically pleasing.

6.5.3 Feedback

The "Feedback" wireframes focus on giving the user feedback on his/her work. The wireframes shown below are set apart from the other sets of wireframes mainly by the communicative nature of them. Some contextual information is needed to understand the wireframes. To encapsulate the concept of "Feedback" the authors decided to include elements such as peer-review and co-authoring into the wireframe concept.

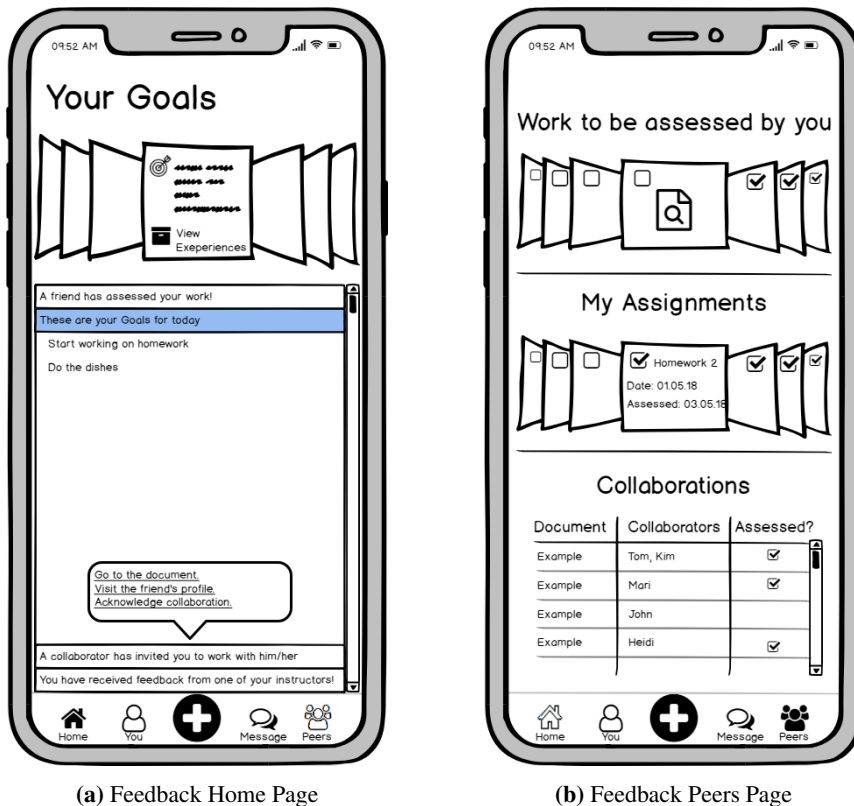


Figure 6.5: Feedback Wireframes

Figure 6.5a shows how a home page of the Feedback-concept could look like. The largest element in the wireframe is a feed showing the latest events that have happened in the user's network. The idea behind this feed is to show all events that could be of interest to the user, e.g. that someone has assessed their work, a brief summary of the user's goals etc. The second to last event shown in the feed gives the user information that a person in their network has invited him/her to collaborate on a document. The pop-up dialog that is shown above this entry contains three choices: "Go to the document", "Visit friend's profile" and "Acknowledge collaboration". The reasoning behind centering the home page around a feed of events is that by being connected to many peers, there is a possibility for many events taking place in the user's network. The authors believe that by including such a feed, the user is able to better keep track of what is happening.

The second wireframe of the Feedback-concept is shown in figure 6.5b, and it illustrates the peer page. The purpose behind this wireframe is to give the user an overall view of all the work that the user is taking part in. The page is divided in three, where the top most part shows a cover flow containing work that the user is supposed to assess. Work that has been assessed is represented with a check mark. The middle cover flow shows the user's own work, where the check mark indicates the same as the top cover flow, that it has been assessed. The bottom part of the page contains a list view of the collaborative work that the user is a part of. Each row contains information about the name of the document, other users that are members of the collaboration as well as the same check mark as in the previous elements of the wireframe.

6.5.4 Feelings

The second to last set of wireframes belongs to the Feelings-concept. What separates this concept from the others is the focus on logging the user's feelings throughout the day and when documenting experiences. This idea is grounded both by theory through Mindfit and by the workshop where students suggested representing feelings with emojis. To this end, two main features are added to this concept to support this idea; illustrated by figure 6.6.

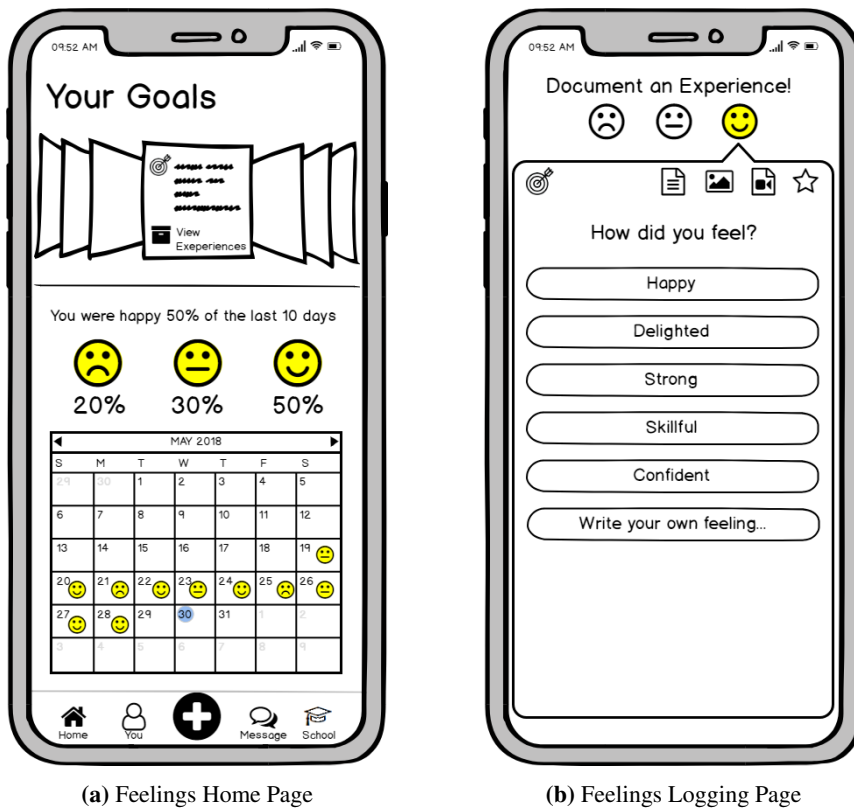


Figure 6.6: Feelings Wireframes

Figure 6.6a presents the home page of the concept. The user is instantly met by an overview presenting a distribution of how he/she has felt the last ten days. These percentages are based on the last ten days of the calendar shown below. The amount of days to calculate from can be changed by the user, e.g. to one month. As the calendar shows, each day has an emoji representing how the user felt that day. These emojis are based on the emoji the user chose when logging his/her feelings regarding an experience as illustrated by figure 6.6b, which is the documentation page of this wireframe concept. Evidently from this wireframe, the main focus when documenting an experience is the feeling the user had. By selecting one of the three emojis at the top the user is prompted to specify their feeling by either choosing one of the given feelings or writing their own. In addition to the specified feeling the user chose, he/she may also connect the documentation to a goal by pressing the target icon in the top left corner below the emojis or selecting additional logging methods, e.g. text or pictures, as displayed in the top right corner.

6.5.5 Mental Effort

The last set of wireframes to be presented are those illustrating the concept of "Mental Effort". These wireframes seek to incorporate elements of learning models and strategies,

thus motivating the user to use mental effort in order to complete their goals.

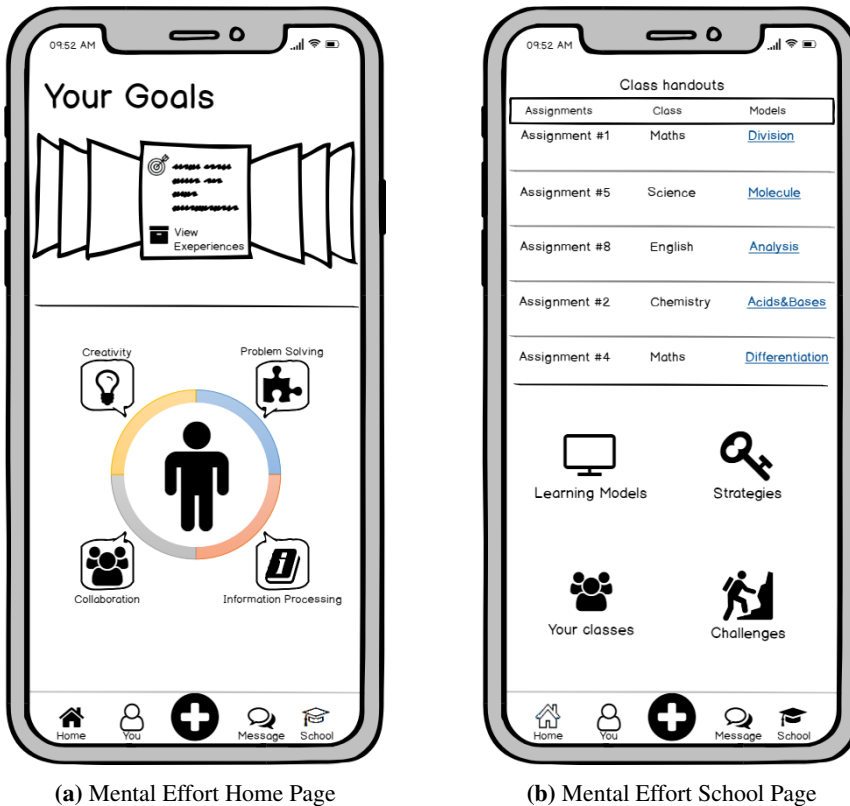


Figure 6.7: Mental Effort Wireframes

The wireframe presented in figure 6.7a shows how a home page for this concept could look like. Similarly to the Feedback- and Feelings-concepts there is one main element that sets this home page apart from the other concepts. This element is the person icon surrounded by a circle with different colors. Attached to these colors are tool tips describing what the colors represent. The choices behind what the colors should represent is not grounded in theory, but serve as illustrations for the fact that the circle is supposed to show to the user the distribution of his/her skills. In this wireframe one can see that "Creativity", "Problem Solving", "Information Processing" and "Collaboration" are shown. The idea behind the skill distribution illustration is that the user can see how his/her skills pan out as he/she works on and finishes assignments. Furthermore, reasoning behind the use of icons and colors is directly relatable to the feedback that the students gave regarding user engagement. The use of colors and symbols to illustrate features may engage the user to use the application more frequently.

The wireframe shown on the right hand side, in figure 6.7b, shows the page that would appear if the user hits the school button on the bottom end of the screen. This page is

meant to contain all school related information that the user would need. The top half of the page contains a list of assignments that are given out by the instructors that the user has. Each assignment has a name, is part of a subject and in addition has a relevant learning model/strategy attached to it. The idea here is that an instructor can link to relevant methodologies/models/strategies that the student can use when working on the assignment. In the bottom half of the page one can see four icons: "Learning Models", "Strategies", "Your Classes" and "Challenges". The "Learning Models" and "Strategies" icons link to respective areas containing learning models and strategies relevant to the student. The "Your Classes" icon links the user to a page showing all of her/his classes, and lastly the "Challenges" icon links the user to a page showing him/her available challenges that he/she can complete. The reasoning behind the challenges is grounded in the Mental Effort-aspect, wherein the challenges can be used to give the user exercise in using mental effort.

6.6 Limitations of the Research

Some limitations presented themselves during this research. This section will address them and provide reflection regarding choices made as well as pointers on how to overcome such limitations in the future. There were mainly three limitations which concerned the number of design workshops, frequency of use of Mindfit by the students, and how the wireframes were developed; all discussed below.

First of all, the number of design workshops were limited to one. Ideally, several iterations of design workshops would provide a better foundation for design choices in the wireframes. This way the researchers could have assessed each workshop, improved the design, went back and gotten more design feedback from each workshop producing a more rigorous design outcome. In addition, having workshops with different people would make common findings more credible and providing a safer ground for stating them in the research. Although all of these are desirable outcomes the researchers focused on including a rigorous state-of-the-art review of the three main concepts (chapter 2) and supplementing this with field work with the intended user of the application. Consequently, the design process was held at a conceptual level with the wireframes exemplifying how the conceptual design choices could be combined. Furthermore, the researchers were novices regarding leading the workshop and facilitating the students. Having had more experience in this field would increase the number of relevant questions and tasks given; making the resulting outcome more applicable. Thus, for future workshops, this experience comes in hand to increase efficiency.

Secondly, as a part of the preparation for the workshop the students were supposed to get familiar with the Mindfit application. It turned out that not as many used the application as frequently as the researchers had hoped. Dialogue 25 presents some thoughts on why some resisted. However, there were variations in the frequency of use among the students; some had used it more than others. As a consequence, this may have skewed some of the results from the workshop due to some of the students expressing more opinions regarding the application. Looking forward, a different and more engaging approach

could be applied in order to motivate a larger part of the students. The researchers could for instance be actively involved in the deployment weeks by following up the students in the application use. In addition, the initial presentation of the application could have been better prepared towards the motivation of using it.

Finally, the third known limitation of the research concerned the development of the wireframes. Based on features found in theory and field work the researchers designed how these features could be combined into several mobile application wireframes. Ideally, with the co-design approach applied in this research the wireframe design process should have involved the end-users of the application to a greater extent. The current wireframes are the researchers' interpretations of the students' designs and may thus be biased through the researchers' opinions. This limitation connects to the earlier stated limitation about the number of workshops conducted during the research. End-user involvement in designing the wireframes would demand additional workshops as well. Thus, the same reasons goes for this limitation as the previous one, namely that the main focus was to produce a rigorous review of theory in addition to field work to identify important concepts and artifacts that combined into software applications may improve student Self-Efficacy. Moreover, further development of the application would go in the direction of involving end-users to evaluate wireframes and later participate in developing and testing prototypes. This is elaborated further in chapter 7.

Conclusion

This chapter will present concluding remarks for the research presented in this thesis as well as a subset of possible avenues for future work. Key insights presented in the previous chapter will be used to shed light on how the work presented in this thesis help to answer the research questions outlined in chapter 1.

7.1 Concluding Remarks

The research presented in this thesis was organized as a qualitative study with the aim of investigating possible conceptual designs for Self-Documentation tools incorporating Self-Efficacy enhancing features. The motivation behind this aim was to help students and other users of Self-Documentation tools to be better equipped in handling challenges. The study consisted of a literature review of the current state-of-the-art of the concepts Self-Documentation, Empowerment and Self-Efficacy. Furthermore, it involved a workshop where conceptual designs were elicited from high school students using a Self-Documentation tool. The study concluded with an overview of all Self-Efficacy increasing design concepts found in theory and workshops as well as a discussion on the ones that were found in the intersection between theory and workshop. These design concepts are illustrated through wireframes and serve as suggestions for applications with the main goal of increasing user Self-Efficacy.

As presented in chapter 1, three research questions were posed to facilitate the research. These are reiterated below along with a condensed answer to give a brief overview of what the research discovered.

***RQ1* What documentation modals are preferred by users of self-documentation tools?**

It is shown through workshop results presented in this thesis that high school students already using a Self-Documentation tool had several opinions on doc-

umentation modals. Compared to the modals they were already using, the main difference can be seen in the variety and novelty of the suggestions they made. Text and images were implemented in the documentation tool that they were used to using, but when asked what documentation modals they wanted to include in their design concept, they quickly added video, audio and symbols. Probably the most interesting finding for this research question is the desire to use symbols to express feelings about experiences and school work. Included in the symbol documentation modal are emojis; small icons portraying everything from facial expressions to everyday objects. These icons are integrated in many smartphone keyboards, as well as part of many messaging platforms and social networking sites. Thus the students are in many ways already quite familiar with their use, and therefore want to see them included in software used in their educational setting. To summarize, the most important takeaways concerning documentation modals that are preferred by students are that there should be several choices for documentation, as well as modern modals that reflect the technological features that the users are used to.

***RQ2* What are important design concepts in digital self-documentation tools that promote student self-efficacy?**

Starting out with the goal of increasing student Self-Efficacy through educational software, the notion of Empowerment emerged as an important factor to this end. In addition to being among several factors having a direct influence on Self-Efficacy, Empowerment is considered to be a more diffuse and higher level concept needing its own elaboration. Through elaborating Empowerment in the educational context it became evident that the notion of Self-Documentation emerged as a way to empower students through digital Self-Documentation tools. Establishing these main concepts created the backbone of the research on which several specific design concepts on how to achieve each of the three could be placed. Consequently, this led to the idea of an application based on Self-Documentation, Empowerment and Self-Efficacy incorporating these design concepts. To this end, through reviewing theory on the three main concepts in the context of education and ICT as well as conducting a workshop with students this thesis provides design concepts on how to achieve each of the three main concepts. These design concepts are summarized in table 6.1.

***RQ2.1* In what ways can these design concepts be combined in software applications**

This thesis provides suggestions to ways in which concepts important for improving user Self-Efficacy could be combined in software applications. Due to the connection between Self-Documentation, Empowerment and Self-Efficacy described above, the illustrations are divided into sets where each set focuses on one aspect aimed at improving Self-Efficacy. These main foci are Rewards,

Feedback, Feelings and Mental Effort; presented as wireframes in section 6.5. They represent the main design concepts concerning the improvement of Self-Efficacy. Main takeaways from these design suggestions are not ways in which elements could be put on a screen, but merely what concepts that are important for achieving improvements in user Self-Efficacy.

7.2 Future Work

The research presented in this thesis have interesting possibilities for future work to be done. There is research that could be conducted that build upon the findings of this thesis, as well as tangents based on interesting results from the field work.

Implementing a Self-Documentation tool that brings the illustrated concepts into the hands of users would give valuable feedback on design choices as well as possible confirmation for the concepts found in this research. This could be done through implementing one or more of the wireframe sets presented in chapter 6, or to take the concepts presented and implementing them in totally different ways than illustrated.

As a direct answer to one of the identified limitations of this research, namely that only one workshop with students was held, future work could include holding more workshops to gain a wider data foundation. This would be interesting as it could unveil new ways in which Self-Efficacy enhancing concepts could be implemented in software.

New research into how youth and students appropriate technology, especially based on engagement through design, would be interesting to conduct. Based on some limited feedback on one of the applications studied in this thesis, hints were given to why a student may not want to use a type of software or application. Delving into the vast area of software engagement and appropriation is a huge task, but it can bare many fruits if trends in this subject are found. One area that may be interesting to investigate is that of gamification in order to grab users' attention. Based on feedback received from participants in this thesis, game concepts could help with user retention, especially with younger students. One way of studying gamification would be to include Self-Documentation, Empowerment and Self-Efficacy enhancing features into gamification concepts.

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Appendix **A**

Questionnaire

Spørreundersøkelse om bruk av Dokker

1. Hvor ofte bruker du Dokker i løpet av en uke?

Markér bare én oval.

- Bruker ikke hver uke
- 1-3 ganger i uka
- Flere enn 3 ganger i uka
- Flere ganger om dagen

2. Til hvilken grad tar du del i planlegging av aktiviteter i Dokker?

Markér bare én oval.

- Svært liten grad
- Liten grad
- Hverken liten eller stor grad
- Stor grad
- Svært stor grad

3. Hvor stor nytte har du av planleggingen av et arbeidsoppdrag?

Markér bare én oval.

- Svært liten nytte
- Liten nytte
- Hverken liten eller stor nytte
- Stor nytte
- Svært stor nytte

4. Hvor stor nytte har du av gjennomføringen av et arbeidsoppdrag?

Markér bare én oval.

- Svært liten nytte
- Liten nytte
- Hverken liten eller stor nytte
- Stor nytte
- Svært stor nytte

28.11.2017

Spørreundersøkelse om bruk av Dokker

5. Hvor stor nytte har du av egenvurderingen av et arbeidsoppgave?

Markér bare én oval.

- Svært liten nytte
- Liten nytte
- Hverken liten eller stor nytte
- Stor nytte
- Svært stor nytte

6. Hva liker du best med Dokker?

7. Hva liker du minst med Dokker?

8. Vi har sett på muligheten å lage en funksjon i Dokker som gjør det mulig å sette opp delmål som kan hjelpe deg i å gjennomføre arbeidsoppgaven. Denne funksjonen vil la deg skrive ned positive opplevelser under gjennomføringen av oppgaven, som kan knyttes opp mot delmålene. Hvor stor nytte ville du hatt av denne funksjonen?

Markér bare én oval.

- Svært liten nytte
- Liten nytte
- Hverken liten eller stor nytte
- Stor nytte
- Svært stor nytte

Drevet av
 Google Forms

Appendix **B**

Consent Form

Forespørsel om deltakelse i forskningsprosjektet

”Mestring gjennom styrking og egendokumentering”

Bakgrunn og formål

Formålet med denne studien er å undersøke elevers inntrykk og bruk av Dokker som dokumenteringsprogram samt brukere av Mindfit og deres oppfatning av Mindfit. Vi ønsker å undersøke om det er egenskaper ved en applikasjon som Mindfit som kan øke nyttigheten av et program som Dokker. Dette arbeidet er en del av en masteroppgave som skrives våren 2018, denne oppgaven skrives ved Institutt for Datateknologi og informatikk ved Norges Naturvitenskapelige Universitet (NTNU) i samarbeid med Mindfit og Dokker.

For å komme i kontakt med brukere av både Mindfit og Dokker har vi tatt kontakt med daglige ledere i ansvarlige bedrifter for begge applikasjoner. Vi har fra disse daglige ledere fått kontaktinformasjon med kontaktpersoner som er mulige kandidater for intervjuer.

Hva innebærer deltakelse i studien?

En deltakelse i denne studien innebærer ett eller flere intervjuer som vil holdes anonymt. Dette innebærer at ingenting av det som blir sagt, skrevet ned eller tatt opp ved hjelp av lyd vil på noen måte være identifiserbart med den personen som har sagt dette. Spørsmålene som vil bli stilt i intervjuene vil omhandle brukerne av de respektive applikasjonene sine oppfatninger av bruken av applikasjonene og deres generelle oppfatning av dem. Det kan bli tatt lydopptak av intervjuene, disse lydopptakene vil bli slettet ved prosjektets slutt, den 1/7-18.

Vi vil foreta intervjuer med brukere av Dokker og Mindfit. Spørsmål som vil bli stilt vil dreie seg om bruk av disse to applikasjonene og om hvordan brukerne oppfatter applikasjonene.

Hvis du som deltaker skal være med på “workshop” vil det bli tatt opp lyd av denne “workshop”-en. Disse lydopptakene vil kun bli behandlet av prosjektets forfattere, samt hovedveileder. Lydopptakene vil bli slettet ved prosjektets slutt, 1/7-18.

Hva skjer med informasjonen om deg?

Alle personopplysninger vil bli behandlet konfidensielt. Ingen personidentifiserbar data som blir samlet inn i denne studien vil på noe tidspunkt bli publisert. Informasjon som du som deltager oppgir vil kunne kobles til deg som person av de personene som vil ha adgang til informasjonen. De personer som vil kunne ha tilgang til dataene vil inkludere de to oppgaveskriverne, Henrik Mørk og Jonas Løchsen, samt vår veileder ved NTNU, Babak Farshchian. Dataene vil bli oppbevart av oppgaveskriverne på sikrest mulig måte.

Prosjektet skal etter planen avsluttes 1/7-18. Dataene vil fortsette å være anonymiserte og vil på ingen tidspunkt være gjenkjennbare med de personer som har oppgitt dataene. Vi vil presisere at lydopptak vil bli slettet ved prosjektets slutt.

Frivillig deltakelse

Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli anonymisert.

Dersom du ønsker å delta eller har spørsmål til studien, ta kontakt med Henrik Mørk, tlf: 47851329 eller vår veileder Babak Farshchian.

Studien er meldt til Personvernombudet for forskning, NSD - Norsk senter for forskningsdata AS.

Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta

(Signert av prosjektdeltaker, dato)