Kasper Mikkelsen

Supporting Teacher Learning in Microlearning Platforms

An investigation of the learning impact of four tools in a microlearning platform

Masteroppgave i Lektor i realfag
Veileder: Monica Divitini
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ABSTRACT

This thesis presents a design science research project that investigates the support for teacher learning of digital skills. In the project, the microlearning platform DIGIVIDget is used as the basis for investigation. DIGIVIDget is a microlearning platform designed for helping teachers acquire digital skills. The study focuses on the development of four additional tools within DIGIVIDget, namely a lesson planning tool, a page saving tool, a notebook tool, and a learning goal mapper. These tools were specifically designed to facilitate the integration of digital curriculum from DIGIVIDget into lesson plans. The research project explores how each tool contributes to enhancing learning and motivation among pre- and in-service teachers for acquiring digital skills.

Drawing on data from a previous specialization project and established theoretical frameworks such as self-determination theory, Bloom's taxonomy, and the information processing model, the study examines the effectiveness of the tools in supporting teacher learning. A comprehensive literature review reveals a lack of dedicated lesson planning tools for incorporating digital skills into classroom instruction, emphasizing the novelty and importance of this research.

The project follows a two-part design iteration approach. In the initial phase, a paper prototype is developed based on the specialization project and theoretical foundations. Three separate interviews with pre- and in-service teachers are conducted to evaluate the prototype and gather valuable feedback. The insights gained from the evaluation inform the second iteration, where a wireframe prototype is created. This phase includes a focus group interview with three pre-service teachers, an interview with an in-service teacher, and an interview with a digital pedagogue.

The project has identified that the lesson planning tool was not useful for teachers, but that it showed some potential for increasing learning if it was to be used. The notebook tool and the page saving tool was found to be helpful for learning. Lastly the learning goal mapper showed the greatest potential increasing teachers' motivation to use microlearning, thereby increasing learning. The project has also identified implications for microlearning in general, implications for digital lesson planning tools, and for teacher professional development.

SAMMENDRAG

Denne avhandlingen presenterer et forskningsprosjekt innenfor designvitenskap som undersøker støtten for lærernes læring av digitale ferdigheter. I prosjektet brukes mikroinnlæringsplattformen DIGIVIDget som grunnlag for undersøkelsen. DIGIVIDget er en mikroinnlæringsplattform utviklet for å hjelpe lærere med å tilegne seg digitale ferdigheter. Studien fokuserer på utviklingen av fire tilleggsverktøy innenfor mikrolæring-plattformen DIGIVIDget, nemlig et verktøy for leksjonsplanlegging, et verktøy for lagring av sider, et notatverktøy og et verktøy for målsetting av læring. Disse verktøyene er spesifikt designet for å lette integreringen av digitalt læreplanmateriale fra DIGIVIDget i leksjonsplaner. Forskningsprosjektet utforsker hvordan hvert verktøy bidrar til å forbedre læring og motivasjon blant lærere som ønsker å tilegne seg digitale ferdigheter.

Basert på data fra et tidligere spesialiseringsprosjekt og etablerte teoretiske rammeverk som selvbestemmelsesteorien, Bloom's taksonomi og informasjonsbearbeidingsmodellen, undersøker studien hvor effektive verktøyene er i å støtte lærernes læring. En omfattende litteraturgjennomgang avdekker mangel på dedikerte verktøy for leksjonsplanlegging som inkorporerer digitale ferdigheter i klasseromsundervisningen.

Prosjektet følger en todelt designiterasjonsmetode. I den første fasen utvikles en papirprototype basert på spesialiseringsprosjektet og de teoretiske grunnlagene. Tre separate intervjuer med lærere i utdanning og yrkesaktive lærere gjennomføres for å evaluere prototypen og samle verdifulle tilbakemeldinger. Innsiktene som oppnås brukes i den andre iterasjonen, der en wireframe-prototype lages. Denne fasen inkluderer en gruppeintervju med tre lærere i utdanning, et intervju med en yrkesaktiv lærer og et intervju med en digital pedagog.

Prosjektet har identifisert at timeplanleggingsverktøyet ikke var nyttig for lærerne, men viste potensial for å øke læring hvis det ble brukt. Notatverktøyet og verktøyet for lagring av sider ble funnet å være nyttige for læringen. Til slutt viste verktøyet for målsetting av læring størst potensial for å øke lærernes motivasjon til å bruke mikrolæring, og dermed øke læringen. Prosjektet har også identifisert implikasjoner for mikrolæring generelt, for digitale leksjonsplanleggingsverktøy og implikasjoner for faglig utvikling av lærere.

PREFACE

Seven years of higher education has culminated in the writing of this master's thesis. While working and writing on one single text this entire semester feels like an anticlimactic ending to my time here at NTNU, it has been an interesting journey. I would like to express my sincerest thanks to my advisor, Monica Divitini, for all the support in both this master's thesis and in my specialization project last semester.

Further I would like to thank everyone who agreed to hour-long lunches everyday at 11:30. Without the social stimuli provided by these lunches, the writing of this thesis would be impossible. I also would like to thank the department of cybernetics for creating such a difficult study program, which made me realise that a degree in engineering was not really my passion. Thanks to Studentersamfundet i Trondhjem and all those who volunteer there, for giving me the social meeting point all these years. Especially thanks to KSG, Spritgjengen, and Fotogjengen for all the awesome memories, countless friends, and hangovers you have given me.

In this thesis I investigate methods for supporting learning of digital skills for teachers through different features. The research has been based on the microlearning platform DIGIVIDget, which is a collaborative project between NTNU, TU Graz, University of Graz, and TU Dresden. Through mostly qualitative investigation, I have evaluated a prototype tool for making lesson plans and additional features for facilitating learning.

As I conclude this master's thesis, I am filled with a sense of accomplishment and gratitude. The journey to this point has been a long and challenging one, but it has also been rewarding and enlightening. I am grateful for the opportunity to have explored my interests and developed my skills at NTNU, and for the support of my advisor and friends along the way. This thesis represents the culmination of my academic journey, but it is also the beginning of a new chapter. I look forward to continuing to a future in the classroom as a teacher myself, where I hopefully will have some use for the experiences I have made in this project.

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ABBREVIATIONS

- **DSR:** Design Science Research

- **ICT:** Information Computer Technology

INTRODUCTION

1.1 Motivation

This project aims to investigate methods for supporting teacher professional development in digital skills when learning through a microlearning platform. Microlearning is recognized as a learning method which has emphasis on teaching single, definable topics in short bursts of time (Jomah et al., 2016). In this project, the microlearning platform DIGIVIDget serves as the practical platform for conducting investigations. DIGIVIDget is a microlearning platform which focuses on improving the digital skills of teachers. The project serves as a continuation of my specialization project, *Microlearning for teacher professional education* Mikkelsen, 2022, which evaluated DIGIVIDget for potential for motivation and learning outcome for the users. Findings from this project are used as the entry point for this master's project, where four different tools are designed which intend to support the teacher in learning digital skills by utilizing curriculum from DIGIVIDget in school lessons.

The tools that are designed are introduced here, and explained in detail in chapter 5. Firstly, there is designed a lesson planning tool which is intended to support the user in creating a detailed plan to be used in school lessons, with facilitation for implementing curriculum the user finds in DIGIVIDget. Secondly there is a note taking tool and a page saving tool. The former lets the user take notes in the DIGIVIDget system, and the latter lets the user save pages in DIGIVIDget that they find useful, allowing for quick and easy access to these pages. Lastly there is a learning goal mapper, which lets the user input topics relevant for their professional practice and returns relevant courses in DIGIVIDget for these topics. All these tools are designed to support the user in bringing curriculum from DIGIVIDget into their classroom.

Digital skills is becoming increasingly important in the modern school system. In 2020 there was introduced a new teaching plan for the Norwegian school system. One of the major new additions to this teaching plan was the introduction of digital

skills as a foundational skill for Norwegian pupils, giving it equal importance to that of writing, reading, and calculating (Utdanningsdirektoratet, 2023). However, many Norwegian teachers believe that they do not possess the digital skills required to teach these skills to their students (UDIR, 2021), which poses a major barrier for the implementation of the digital skills as a competency aim for Norwegian pupils. This problem shows the importance of teachers developing proper digital skills.

The specialization project (Mikkelsen, 2022) concluded that microlearning could provide teachers a meaningful learning outcome, but that microlearning failed to properly motivate the teachers that participated in the study. While there were multiple reasons for the system providing low motivation, one of the reasons seemed to be that the teachers were more motivated to learn something new if it could be used directly in lessons with their pupils. This had to do with the preoccupation of teachers, making them prioritize other activities that are leaning more towards direct usage in the classroom. Another reason was the participants not feeling as DIGIVIDget was a platform made for teachers, but could be a general microlearning platform designed to provide learning in digital skills regardless of profession.

These findings serves as the entry point for investigating whether supporting the user in implementing curriculum from DIGIVIDget into their lesson plans can increase both motivation and learning for the users of DIGIVIDget.

1.2   Digital skills in education

In the project, when referring to *digital skills*, synonyms such as *digital literacy*, *ICT skills*, or *technological skills* can be used.

The Norwegian Directorate for Education and Training, defines digital skills as one of the fundamental skills that Norwegian pupils should acquire throughout their education (Utdanningsdirektoratet, 2023). In Norway, this directorate is commonly referred to as *UDIR*, which it will be referred to as well in this project going forward. According to UDIR, digital skills encompass *"gathering and processing information, being creative with digital resources, and communicating and interacting with others in digital environments"* (Utdanningsdirektoratet, 2023). They further describe digital skills as *"a natural part of the foundation for educational work both within and across academic subjects"* (Utdanningsdirektoratet, 2023). UDIR also explains that digital skills are developed through the use of digital resources, which involves using these resources to acquire academic knowledge and demonstrate one's own competence (Utdanningsdirektoratet, 2023).

UDIR further separates digital skills into five main categories:

- Using and understanding digital tools and resources.

- Finding and processing information.

- Producing digital products.

- Communicating and interacting.

- Digital judgement.

Each key area has five levels of increasing competence as objectives for pupil learning.

1.3 Microlearning

This section is the same as in Mikkelsen, 2022.

Microlearning is a method of learning where a user accesses short courses which focus on a single definable idea or topic, typically lasting no longer than 15 minutes (Leong et al., 2021). "*The methods of micro learning are in line with the way that the learner's brain naturally takes in information, so that the body does not get stressed-out*" (Jomah et al., 2016) Microlearning has many benefits: Better retention of concepts, better engagement for learners, improved learner motivation, engagement of collaborative learning, and improvement to learning ability and performance (Leong et al., 2021). Microlearning has further advantages for the learner: By being performed in short time bursts, and by involving simple or narrow concepts, it requires less effort from the learner (Jomah et al., 2016). Another benefit of microlearning is that it fits well with the decreased attention spans of modern society due to its short duration when compared with traditional learning methods (Leong et al., 2021).

There are however shortcomings of microlearning. Microlearning is not efficient when the learner needs to acquire complex skills, processes, or behaviors (Jomah et al., 2016), such as programming or learning a new language.

In most cases, in a microlearning system, it is up to the user to freely engage with the system. Therefore, intrinsic motivation is an important factor for keeping users interested and engaged with the system (Göschlberger and Bruck, 2017).

1.4 Research questions

In this section, a set of research questions is presented that focus on the integration of microlearning curriculum with pedagogical tools to enhance teachers' learning and teaching of digital skills. These questions explore different aspects of the integration process and its impact on teacher professional development. The tools designed in the project are the basis for the research questions. By answering these research questions, insights are gained into how these tools contribute to learning, motivation, and the overall improvement of teaching digital skills.

- **RQ1:** To what extent does the integration of microlearning curriculum with pedagogical tools enhance teachers' learning and teaching of digital skills?

The first research question serves as the overarching research question, and explores the overall impact of integrating microlearning curriculum with pedagogical tools on teachers' learning and teaching of digital skills. It aims to provide insights into the effectiveness of this instructional approach, informing the development of more effective strategies and tools for supporting teachers' professional growth in digital skills.

- **RQ1.1:** To which extent can a lesson planning tool that facilitates connection between microlearning curriculum and lesson planning support teachers in learning and teaching digital skills?

This question focuses on the specific impact of a lesson planning tool that connects microlearning curriculum with lesson planning. It investigates the tools motivational factors and how such a tool supports teachers in learning digital skills and effectively incorporating digital skills into their lesson plans.

- **RQ1.2:** To which extent can a note taking tool assist teachers in learning and teaching the curriculum of a microlearning platform?

This question addresses the role of a note-taking tool in supporting teachers' learning and teaching of microlearning curriculum. It explores how a note-taking tool assists teachers in engaging with and utilizing microlearning content effectively, improving their interaction with, and ultimately learning of, the curriculum.

- **RQ1.3:** To which extent can a page saving tool assist teachers in learning and teaching the curriculum of a microlearning platform?

This question investigates how a tool which lets the user select pages to save for later use, affects the user's learning of curricular material from a microlearning service.

- **RQ1.4:** To which extent can a tool for mapping microlearning content to teaching relevant topics improve motivation to learn from a microlearning platform?

This question investigates the impact of a tool that allows users to input topics or situations commonly encountered in teachers' professional practice, and which displays relevant microlearning courses based on that input. The question investigates how the tool affects the teachers' motivation to to engage with microlearning resources, supporting their continuous growth in digital skills.

1.5   Research method

For this project, the *design science research* method will be used. Design science research is research organized around the production of an artifact to solve problems, and rigorous testing of the artifact and evaluation of what works (Dresch et al., 2015). Hevner (2014) described the three major cycles of DSR which define the nature of the methodology (figure 1.5.1). Firstly is the *relevance cycle*, which aims to connect the environment in which the artifact will function, and the design process of the artifact itself, by finding artifact requirements as well as acceptance criteria for research results. Then there is the *rigour cycle*, which connects the artifact with the existing knowledge base. Lastly there is the *design cycle*, which is *"the heart of any design science research project"* (Hevner, 2014). It draws on the requirements from the relevance cycle and the theoretical knowledge from the rigour cycle, and involves the continuous process of building and evaluating artifacts.
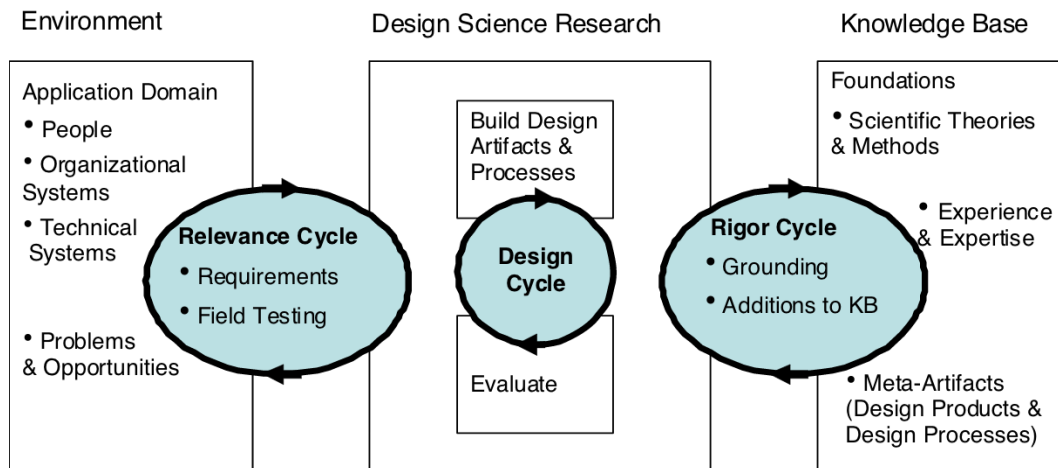
Figure 1.5.1: The design science research cycles (Hevner, 2014)

In the beginning stage, this project will take place in the relevance cycle utilizing data from the specialization project (Mikkelsen, 2022). After this, the project will mostly be in the design cycle, where the artifact will be designed, have its design evaluated through testing, and redesigned according to the feedback. Lastly, the project will be in the rigour cycle, providing contributions to the knowledge base.

Figure 1.5.2 breaks the project into distinct sections.

Paper prototype   Wireframe prototype

Theory/
specialization project   Conclusions

Iteration 1   Iteration 2
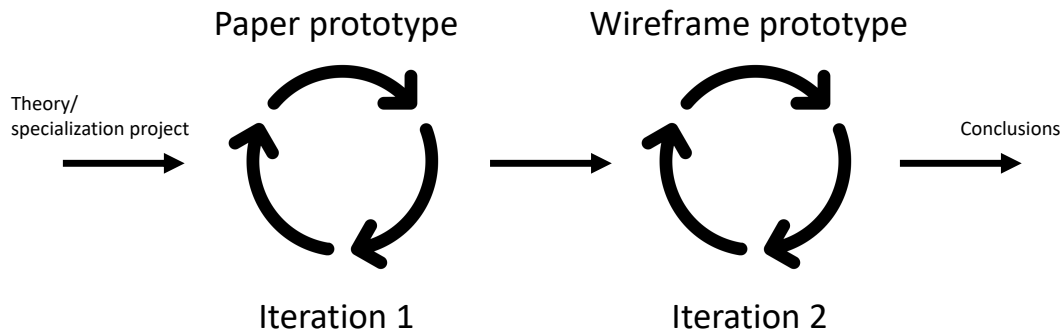
Figure 1.5.2: Description of the different stages involved in the project.

To guide the evaluation stage of the project, the FEDS framework will be used. FEDS (Framework for Evaluation in Design Science) is a framework which typically is used for evaluating artifacts in DSR projects. It is based on three steps (Venable et al., 2016):

1. **Explicate goals:** The goals of the evaluation process can be either *rigour*, *risk reduction*, *ethics*, or *efficiency*.

2. **Choosing strategy:** Based on the goals of the evaluation, a strategy is chosen. The strategy choice also depends on heuristics such as design risks, evaluation cost, whether the artifact affects people directly, and the complexity of the design.

3. **Determine the properties to evaluate:** This means selecting specific features, requirements, or properties the evaluation intends to find. This step has four heuristics:

   3.1 Find potential properties to evaluate.

   3.2 Align potential participant groups with the properties of heuristic 1.

   3.3 Consider whether the evaluation is artificial of naturalistic. If it's the former then there should be fewer properties to be evaluated, and they should reflect the risks we are trying to reduce.

   3.4 Choose the properties for evaluation based on the three former steps.

4. **Create individual evaluation episodes:** This step has the following heuristics:

4.1 Identify and analyse constraints such as time, people, cost, equipment, etc.

4.2 Prioritize the above constraints.

4.3 Decide an plan and how many particular evaluations there should be.

1.6 Contributions

The project will contribute to the knowledge base on teacher microlearning services, teacher professional education, and digital tools for teacher lesson planning. Additionally the project will answer the research questions described in section 1.4.

1.7 Professional relevance

This master's thesis is highly relevant for the teaching profession, as it encompasses digital professional development of teachers and thereby also digital education of pupils in the school system.

1.8 NSD approval

The project got approval for data gathering by NSD. The approval from NSD is in appendix A. The consent form used for the first round of evaluation is in appendix B. The consent form used for the second round focus group and teacher interview is in appendix C. The consent form used for the interview with the digital pedagogue is in appendix D.

TWO

THEORETICAL BACKGROUND

This chapter introduces the theories used in this project, namely the information processing model, motivation, Bloom's taxonomy, reflection, and lesson planning. These theories form the basis for designing the four different features and are also relevant to the subsequent discussion.

2.1 Information processing model

Instructional design is defined as *"the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation"* (Richey et al., 2011). Centrally in instructional design is the *information processing model* which states that sensory, working, and long-term memory all coordinate to encode incoming information (Khalil & Elkhider, 2016). In learning, there are two major categories of activities that students engage with: Maintenance rehearsal and elaborative rehearsal. The former is the act of reading something many times and is effective for learning in the working memory. The latter is the organization of information and is effective for storing information in the long term memory (Khalil & Elkhider, 2016).

Further there are five principles in instructional design that promote learning (Khalil & Elkhider, 2016):

- The learner is solving real world problems.

- Existing knowledge is activated.

- New knowledge is demonstrated.

- New knowledge is applied by the learner.

- New knowledge is integrated into the learner's world.

2.2   Motivation

This section is the same as in Mikkelsen, 2022.

Motivation can either be *intrinsic* or *extrinsic*. Intrinsic motivation involves activities that one does for one self's sake or for one's inherent interest and enjoyment (Ryan and Deci, 2020). This type of motivation can be linked to "the natural inclination towards assimilation, mastery, spontaneous interest, and exploration that is essential to cognitive and social development, and that represents a principal source of enjoyment and vitality through life." (Ryan and Deci, 2000).

Extrinsic motivation is the contrast to intrinsic motivation. Extrinsic motivation involves activities that one does for other reasons than one's interest and enjoyment. These reasons can be external rewards or punishments, or avoidance of anxiety, guilt, or shame. A subcategory of extrinsic motivation is *autonomous extrinsic motivation*, where an individual is motivated to perform an activity based on realizing the activity's *value*, without performing the activity due to one's own interest or enjoyment(Ryan and Deci, 2020).

A framework that describes factors that lead to the facilitation of intrinsic motivation or autonomous extrinsic motivation, is *self-determination theory*. Self-determination theory revolves around the idea that autonomous forms of education will lead to enhancement of engagement, learning, and well-being, and that support of *basic psychological needs* facilitates such motivation (Ryan and Deci, 2020). Self-determination theory identifies these basic psychological these needs as *autonomy*, *competence*, and *relatedness*, where autonomy is the feeling of agency or acting in accordance with one's goals and values, competence is the feeling of being able and effective, and relatedness is feeling connected to others or a sense of belonging (Peters et al., 2018). While all three basic psychological needs are required for well-being, relatedness does not need to be served by every technological experience (Vansteenkiste and Ryan, 2013).

Self determination theory makes its way into the field of user interface design as well. In design of instructional multimedia, a poorly designed user interface will cause the students to not be intrinsically motivated (Stoney and Wild, 1998). Poor usability will lead to *need frustration* (Peters et al., 2018), which is a sense of frustration caused by the *thwarting* of SDT needs (Vansteenkiste and Ryan, 2013).

2.3   Reflection

Reflection has many definitions. Dewey considered reflection to be a special kind of problem solving, where one carefully links ideas together with its predecessors (Hatton and Smith, 1995) Boud states that reflection is *"those intellectual and affective activities in which individuals engage to explore their experiences in order*

to lead to new understandings and appreciations" (Boud 1985). In other words, *reflective learning can be seen as the conscious re-evaluation of past experiences with the goal to learn from them in order to guide future behaviour* (Fessl et al., 2016). Another definition involves reflection appearing when deliberation is encouraged for an extended time about the purpose of action in order to implement the action in the future (Hatton and Smith, 1995). Schön differs between two types of reflection: Reflection-in-action, which is reflection that happens simultaneously as the experience, and reflection-on-action, where the reflection happens some time after the experience has concluded (Ploderer et al., 2014).

Fessl et. al. (2016) has performed a literature review on facilitation mechanisms for reflection. The different types of reflection mechanisms they found was:

- Prompts: in-action reflection with popup prompts appearing to encourage the user to reflect

- Journals: on-action reflection where the user writes their reflections in a journal/diary.

- Visuals for reflection: Visualizations showing actions taken in the past.

There are two important takeaways in regards to reflection prompts which need to be taken into account (Fessl et al., 2020): First, *"Reflection is a cognitive process based on the individual's intrinsic motivation and cannot be directly enforced. However external impulses can be given to stimulate learner's motivation"* and secondly *"...the content of a prompt needs to be carefully considered, thus, it should be related to the user's context..."*

2.4 Bloom's taxonomy

Bloom's taxonomy is a framework used for the classification and organization of learning objectives. It is a hierarchical model which consists of levels, where the learner has a higher level of competence the higher level in the taxonomy the learner is able to achieve. The levels are, in rising order: knowledge, comprehension, application, analysis, synthesis, and evaluation. Each level is subsumed by higher levels, meaning that a student that has mastered evaluation, also has mastered all the lower levels (Forehand, 2011).

2.5 Lesson planning

Lesson plans consists of what the students need to learn and how it will be done effectively within the allocated time ("Strategies for Effective Lesson Planning Stiliana Milkova Center for Research on Learning and Teaching", n.d.). For making

a lesson plan, teachers engage in some method of *curriculum development*. There are multiple models for curriculum development, namely Tyler's four basic principles, Taba's induction model, and Wheeler's circular model (Bhuttah et al., 2019). The model of Tyler - The four basic principles - focuses on four areas that the teacher will need to assess when developing curriculum (Bhuttah et al., 2019):

- Goals and objectives: What should the students learn?

- Content: How can the students learn these objectives?

- Learning experiences: How can the learning content be organized effectively?

- Evaluation: How can one figure out whether the students have learned the given goals and objectives?

Experienced and inexperienced teachers engage in different levels of lesson planning. Inexperienced teachers typically rely on scripting and preparation of materials, while experienced teachers will value larger concerns such as management of the classroom, learning organization, and flexibility (John, 2006). Furthermore, experienced teachers typically engage in long-range planning, and inexperienced teachers will tend to plan in the short-term (John, 2006).

THREE

PROBLEM ELABORATION

3.1 DIGIVIDget

This section will explain the DIGIVIDget microlearning platform to the reader, in terms of content organization, curriculum, and user interface design. As it is the same platform as used in the specialization project (Mikkelsen, 2022), the text will be mostly identical with only minor changes.

3.1.1 Content organization

The content on DIGIVIDget is organized into hierarchical levels. The hierarchy is visualized in figure 3.1.1. Firstly, there are the *modules*, which encompasses a larger theme of curriculum. All of the modules have several *topics*, which is enclosed to a definable subject within the module. Lastly there is the *learning goals* which defines specifically what competency the user is expected to attain from completing the microlearning course.

3.1.2 Curriculum

The curriculum is a central part of DIGIVIDget. As the platform aims to teach digital skills, the curriculum is focused on digitally related fields. To give the reader a notion of how the curriculum appears, table 3.1.1 has been provided, which contains the topics and learning goals of *module 1: Basic digital literacy*. There are a total of five modules available at the time of testing.

3.1.3 User progression

DIGIVIDget places an emphasis on the user marking their own progression through the curriculum, as a method to engage the user in reflection. The progress is separated into every learning goal, and the progression is set on a 0 - 100 % scale. The user is able to evaluate their own progression on every learning goal. There

Category	Learning goal name	Learning goal ID
Information search	You are able to use search engines for (online) materials and digital content for instruction.	1,1,1
	You are able to search for information on the internet in a targeted way.	1,1,2
	You are able to evaluate search results for relevance and quality.	1,1,3
Sources of information for school and private purposes	You are able to name and use reliable sources of information for school and personal purposes on the Internet.	1,2,1
	You are able to apply criteria to critically evaluate information for its truthfulness and quality.	1,2,2
Digital Media I (Basics)	You are able to use appropriate applications and methods for editing digital media in the form of text.	1,3,1
	You are able to use appropriate applications and methods for editing digital media in the form of image.	1,3,2
	You are able to use appropriate applications and methods for editing digital media in the form of audio/sound.	1,3,3
	You are able to use appropriate applications and methods for editing digital media in the form of film.	1,3,4
	You are able to name, use, and evaluate common programs for presenting and visualizing content.	1,3,5
Communication and collaboration	You are able to name social media platforms and know for what purpose you can use them. (e.g. Facebook, Twitter, LinkedIn,...)	1,4,1
	You are able to use common programs (e.g. Google Drive, DropBox, Microsoft Teams) to share content, materials, etc.	1,4,2
	You are able to use common programs (e.g. Microsoft Teams, Skype) to communicate.	1,4,3
	You are able to use programs, software, and apps designed for collaboration (e.g. Google Docs, Microsoft Teams, Mural...)	1,4,4
Data Management and Security	You can protect your privacy on the internet (to a certain extent)	1,5,1
	You can explain the concept of digital identity and handle it responsibly and manage it securely.	1,5,2

Table 3.1.1: Learning goals of module 1: Basic digital literacy in DIGIVIDget.
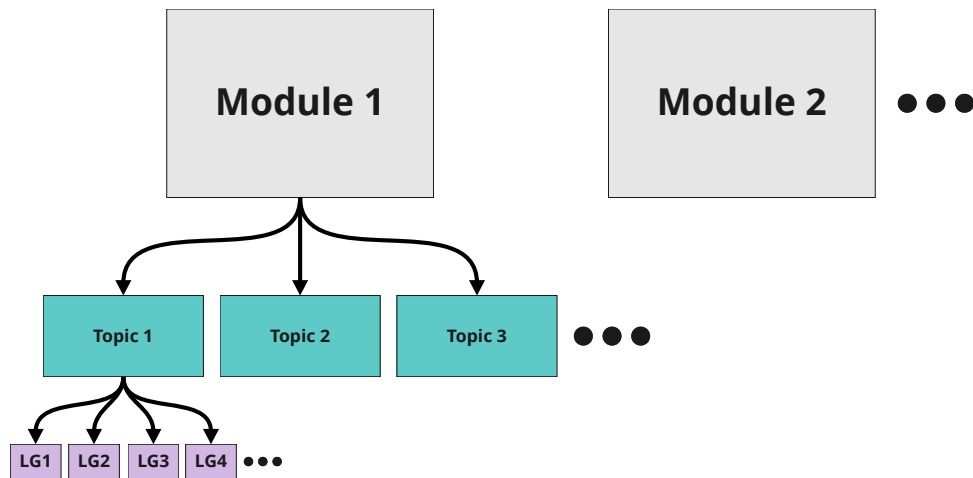
Figure 3.1.1: The hierarchical levels of content on DIGIVIDget.

is a different method for setting one's own progress in the sunburst view and the rainbow view.

The sunburst view offers a vertical slider (figure 3.1.2), where the learning progress is set on a scale from low to high. The rainbow view offers a horizontal slider (figure 3.1.3) where the learning progress is set on a scale from 0% to 100%.
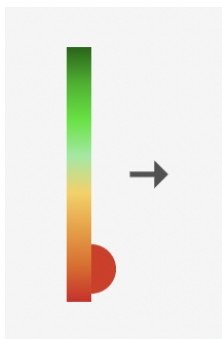
Figure 3.1.2: The sunburst view progression slider.

You are able to use search engines for (online) materials and digital content for instruction.

4%
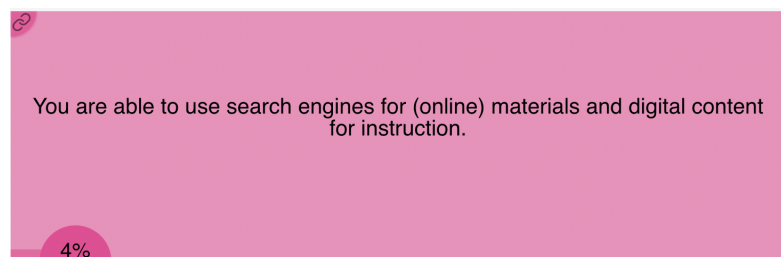
Figure 3.1.3: The rainbow view progression slider.

3.1.4   Reflection diary

The final main page of DIGIVIDget is the reflection diary. This is a page where users can write their reflections on each learning goal. After finishing a course, the user is encouraged to go to the reflection diary to reflect in what they have learned.

Figure 3.1.4: Page from the reflection diary.

3.1.5   Types of content

3.1.5.1   Text lessons

These short lessons consists of several slides containing text and pictures. There are arrows at the bottom of the slides which takes the user between slides. Some text lessons are only one slide.

3.1.5.2   Quizzes

At several locations the user will encounter short quizzes about the content they just read. There can be multiple choice questions or questions with one correct answer. There are also drag-and-drop quizzes. See figure 3.1.5).
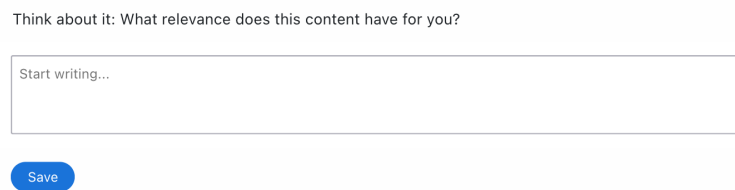
Figure 3.1.5: Multiple choice question in DIGIVIDget.

3.1.5.3   Reflection prompts

To engage the user in reflection, there are prompts which asks the user to reflect on their learning outcome of the last few pages of content (figure 3.1.6).

Think about it: What relevance does this content have for you?

Start writing...

Save

Figure 3.1.6: Example of reflection prompt which appears in the courses in DI-GIVIDget.

3.2   Summary of specialization project

For the specialization project of autumn 2022 (Mikkelsen, 2022), an evaluation of the microlearning platform DIGIVIDget was performed. For this, two groups of pre- and in-service teachers participated in a diary study lasting a week, and one in-service teacher participated in a usage test and a subsequent interview. In addition to assessing general feedback on the system, the project also assessed the research questions of *whether the system provided sufficient intrinsic motivation to keep users engaged with the system over longer time*, *whether voluntary reflection enhanced intrinsic motivation for the users*, and *whether the microlearning resulted in a meaningful increase of knowledge in digital skills*.

Results showed that DIGIVIDget failed to promote sufficient intrinsic motivation to keep the users returning to the system. The voluntary reflection did not result in increased motivation. However, the reflection was still perceived as useful for the participants in terms of knowledge gain. The microlearning platform also showed to provide a meaningful increase in learning for the participants, but only if they spent a sufficient amount of time using the system.

Another finding was that the participants seemed more interested in utilizing the knowledge directly in their lessons than in using the system for their own professional development.

3.3   Proposed solution

Due to the shortcomings of DIGIVIDget identified in Mikkelsen (2022) , there will be attempted to create solutions that both can increase engagement with the platform and increase motivation to use the system. The proposed package of tools, is hypothesized to solve these problems. The four tools: The lesson planning tool, the notebook tool, the page saver tool, and the learning goal mapper are

intended to make it easier for the teacher to relate the curriculum of DIGIVIDget to their professional practice, increasing motivation.

The conceptual reasoning for creating a lesson planning tool for solving this problem takes use of many different theoretical aspects. The first being that a using a lesson planning tool can increase the intrinsic motivation by strengthening the feeling of *relatedness* by planning and putting the curriculum directly into practical use. The need for *autonomy* should also be increased due to having support for using the curriculum in their classroom can make it so the teacher acting in a way that is more aligned with their professional practice. Theoretical knowledge of the information processing model is also applicable, as the aspect of using the curriculum directly into lessons can promote learning since the *learner is solving a real world problem* by planning an actual lesson for future use, and *new knowledge is applied by the learner and integrated into the learner's world.*

Further potential for increased learning can also be explained by Bloom's taxonomy. In the original form of DIGIVIDget, the user only needs to be able to recite the curriculum, which is equivalent to the level of *knowledge* in Bloom's taxonomy. By using the package of tools in this project, especially the lesson planning tool, the user is forced to visualize how the curriculum can be used in an actual context, which is equivalent to the level of *application* in the taxonomy. According to the theory on Bloom's taxonomy (section 2.4), this should result in increased learning outcome for the users. The notebook and page saver are also intended to facilitate this process, by helping the user in bringing curriculum from DIGIVIDget to their lesson plans.

RELATED WORKS

For the related works section, existing lesson planning tools will be presented in the first section. The second section will feature a literature review for articles closely related to the research questions of this project.

4.1   An overview of existing lesson planning tools

In this section, already existing lesson planning tools will be described. The lesson planning tools mentioned are tools created for scientific purposes. Lesson planning tools created for only for commercial purposes have been excluded.

Keong et al. (2022) created *"a prototype system for generating lesson plans for secondary school teachers"*. The prototype system was tested by five Malaysian teachers. The article concluded that *"the prototype lesson plan generator is useful and has huge potential in helping the users in digital lesson plan creation."*

Craft and Bland (2004) explored the effectiveness of utilizing a Lesson Plan Resource (LPR) to implement curriculum changes in the classroom. The LPR is a collection of lesson plans created by teachers, which includes the learning outcome, teaching methods, student activities, assessment methods, level of mastery, alternative teaching strategies, and enrichment teaching strategies. The results indicated that the LPR helped teachers to scrutinize each component of the lesson and achieve the desired outcomes.

Kuono et al. (2002) developed a Lesson Plan Making Support System (LPSS) that resulted in teachers being able to create sound and integral lesson plans.

Shao et al. (2010) created a web-based lesson planner that aimed to reduce the workload for pre-service teachers by minimizing the time required to create evidence-based lesson plans and enhancing professional teaching skills. The lesson planner featured functionality for creating, modifying, deleting, and viewing lesson plan templates, a search system for finding computer-assisted coding systems (CACS), and a system that enabled the user to search for scientific papers through the university database. The results showed that users were able to find

relevant information three times faster. The authors concluded that this tool is advantageous for facilitating effective and efficient teacher training and takes users closer to implementing research to practice.

Huang et al. (2010) developed a lesson planning system that recommended lesson plans based on input restrictions such as learning objectives, available time, student abilities, classroom facilities, and activities. The system recommended lesson plans, and the user could edit the proposed activities as needed.

Susantini (2022) investigated whether an app providing knowledge about higher-order thinking skills and associated learning strategies could help teachers design lesson plans that incorporated these skills. The study found that the application was feasible for improving the learning outcomes of the lessons.

Ramancutty et al. (2018) created the Looma lesson planner, a lesson planning tool designed for rural Nepal, that provided access to textbooks, activities, and digital media to meet curriculum requirements. The tool included a web interface for utilizing these resources to create lesson plans. The study concluded that this lesson planner improved the educational experience for the students and improved the teachers' ability to teach using mixed media and student involvement.

Mohammed and Lee (2007) created an online repository for teachers to store and find pedagogically sound multimedia learning objects. The tool featured an online repository and a dynamic lesson plan template that facilitated lesson planning based on the multimedia learning objectives in the repository. The teacher could select the area, topic, and level of the lesson, and the tool would guide the teacher in selecting multimedia learning objects for their lesson.

Sanders et al. (2021) designed a lesson planner to help teachers create consecutive lesson plans, and the study concluded that teacher education programs should provide examples of lesson plans early and scaffold upon that throughout the program.

Quieros et al. (2018) tested an information system for sharing lesson plans with open educational resources in terms of usability and attractiveness. A low-fidelity prototype of the information system was created based on research on the professional activities involved in the execution of lesson plans. The prototype was tested on 18 high school students, and the results showed problems with usability and satisfaction, but the application was recognized as important by the participants.

The tools described in this section are summarized in table 4.1.1, along with a column describing if and how the tools support knowledge gain for the user. With support for learning being the main point of the lesson planning tool created in this project, knowing how support for learning has been implemented in other tools is important. Further, these articles are used to evaluate whether creating a lesson planning tool is a worthwhile endeavor for supporting the implementation and learning of digital skills for teachers. As the tools described to varying degree proved to be successful for either helping teachers create lesson plans or share

lesson plans through collaborative means, it provides a basis for the creation of a
lesson planning tool going forward.

Article	Lesson planner tool	Support for learning
Keong, 2022	graphical Qualitative	None
Craft and Bland, 2004	Lesson plan repository	Implementation of new curriculum
Kouno et al., 2002	Lesson planning	None
Shao et al., 2010	Web based lesson plan creator	None
Huang et al., 2010	Automatic lesson plan creator	None
Susantini et al., 2022	HOTS-link mobile application	Implementation of higher-order thinking skills
Ramankutty et al., 2018	Looma lesson planner	None
Mohamed and Lee, 2007	Resource pool of multimedia objects, dynamic lesson plan template	None
Sanders et al., 2021	Consecutive days lesson planner	Scaffolding for reflection
Queiros et al., 2018	Lesson plan sharing	None

Table 4.1.1: Summary existing lesson planning tools described in section 4.1.

4.2   Systematic literature review

While the overview in section 4.1 showed that there have been made many different lesson planning tools, none of these tools provided data on lesson planning tools for the support of digital skills. Due to this, a systematic literature review was conducted to find all relevant articles on this topic. More specifically, the systematic review focuses on finding articles related to assisted lesson planning as a method for intergrating digital skills in instructional material.

4.2.1   Method

The following query was made:

```
"Lesson plan*" AND ("digital skills"
OR ICT OR "digital literacy" OR "computer skills")
```

To narrow the search, these criteria were applied to the results of the queries:

- The article must be peer-reviewed.

- The article discusses the usage of lesson planning in regard to implementing digital skills or technology in the classroom or other types of education.

The queries were used in the following databases:

- ACM

- IEEE explore

- Scopus

4.2.2   Results

Database	Number of results	Number of results after filtering
ACM	107	5
IEEE Explore	8	2
Scopus	129	10

Table 4.2.1: Query results for systematic literature review.

The initial queries resulted in 17 articles that fit the selection criteria. After removal of duplicates, there were a total of 13 articles left. After a closer inspection of these 13 articles, 6 were removed for having irrelevant content. Thus 7 articles remained, and are presented below:

Almareta and Paidi (2020) investigated *"the suitability of planning and implementation of ICT-based learning by biology teachers"* concluded that the skills for implementing ICT-skills in lessons is inseparable from the ICT-skills of the teacher.

Cheon (2002) created an lesson planning tool which enabled teachers to put together curriculum, ICT-related learning acitivites, and ICT-materials into a complete lesson plan. The ICT-activities and ICT-materials were found in separate repository databases. could use to share, store, and use ICT material in their classes. Results indicated that teachers using the system showed positive responses. The effectiveness of planning was increased when planning electronically, and practical use of ICT resources was increased.

Janssen et al. (2019) investigated how the information format of pedagogical and technological support affect teachers' integration of technology material in their lesson plans. In the experiment, pre-service teachers were given preparatory information which either contained pedagogical support and technological support separately, or preparatory material where both these supports were integrate together. Later the participants created lesson plans that had to contain two ICT-elements from the preparatory material, along with justifications. While the results showed that teachers receiving the integrated support material had better justifications for their design of technology integration, the study was not able to confirm that the support lead to qualitatively better integration of technology.

König et al., 2022 A literature review, investigated papers on teacher skills in integrating ICT into their lesson plans. Key finding were that ICT integration in lesson plans is an increasing demand for the teaching profession, and that teacher explicating and reflection on the choice of methods for ICT integration is a necessity.

Onyango et al., 2017 utilized Kolb's experimental approach to lesson planning, a collaborative reflection based lesson planning method, as well as the TPACK integration model to create technology aided classes. Conclusions were that pre- or in-service teacher technological training is important, and that this training should bridge learning and technology - as keeping these separate gives the impression that technology *"is a skill based field of study that is independently conceptualized outside the content of learning"*.

Price and Roth, 2011 is a metastudy investigating how universities can include ICT-teaching in their pre-service education. The study found that useful methods for this was utilizing lesson plan development with the use of technology rich activities where teachers or pupils use technology to support specific components of a learning activity.

Rahmi, 2020 investigated using a blended learning support system for assisting pre-service teachers in improving their digital literacy. This system contained pre made lesson plans for the teachers to utilize in classes, in addition to other means of support. The report concluded that such a system can be used and tested for

improving the digital literacy of the users.

4.2.2.1 Conclusion

From the literature review it is evident digital lesson planning tools have positive effects on teaching ICT or including ICT-related activities in the classroom. There still has not been much research with the focus on lesson planning as a means to improve teacher digital skills or inclusion of digital skills in the classroom. There are also no research related to lesson planning as a method for learning and utilizing content from a microlearning platform. This provides some basis for going forwards with this project in order to provide data to the knowledge base on lesson planning for teacher professional development in digital skills.

FIVE

DESIGN: ITERATION 1

This section describes the first iteration of the prototype design, creation, evaluation, and a subsequent discussion of the findings.

5.1 Design

The first stage in a design project is to gather data to find requirements for the application. In order to define the requirements, one must first discover the *user characteristics*, *contextual tasks*, and the *work environment.* User characteristics is a description of the specific user relevant for interface design, and contextual tasks are the user's current tasks and workflow patterns (Mayhew, 2009).

This phase usually involves extensive data gathering using means such as questionnaires and interviews. Ideally the same should have been done in this project, but for time saving reasons, many of these categories has rather been extracted from the data of the specialization project (Mikkelsen, 2022). The data has been used to create personas, use case scenarios, and high level requirements.

5.1.1 Personas and use case scenarios

Participants in the specialization project were all pre-service or young in-service teachers. In the interviews of the specialization project, there was voiced concerns about the distinction in digital needs between younger and older teachers. Therefore, these two types of teachers were used as the basis for personas to be used in the design of the lesson planning tool (figure 5.1.1 and 5.1.2). The first being young, inexperienced teachers, with a medium level of technological literacy. The second being older but experienced teachers, with a low level of technological literacy. This was used as the starting point for creating the personas for this project (figures 5.1.1 and 5.1.2). The remaining traits of the personas were found from implications in the interview data from the specialization project and from personal experience of these teacher groups.
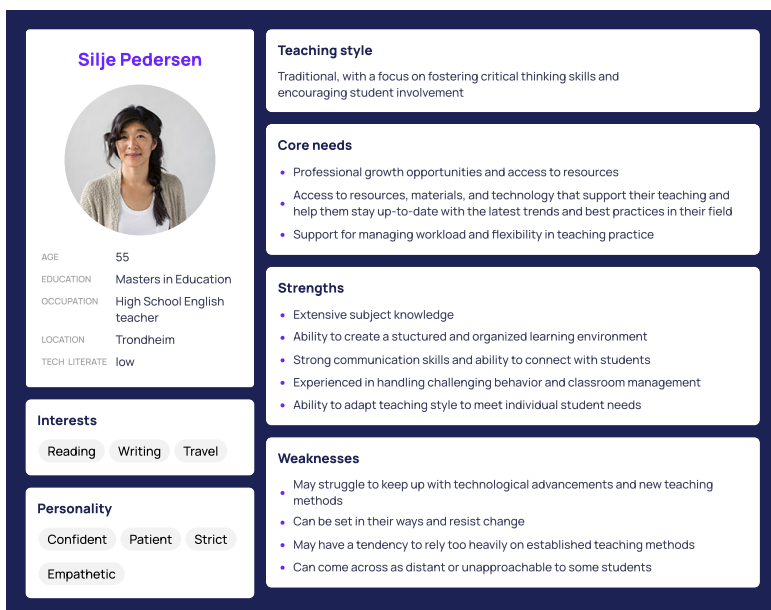
Figure 5.1.1: Persona for Silje Pedersen, an experienced teacher.
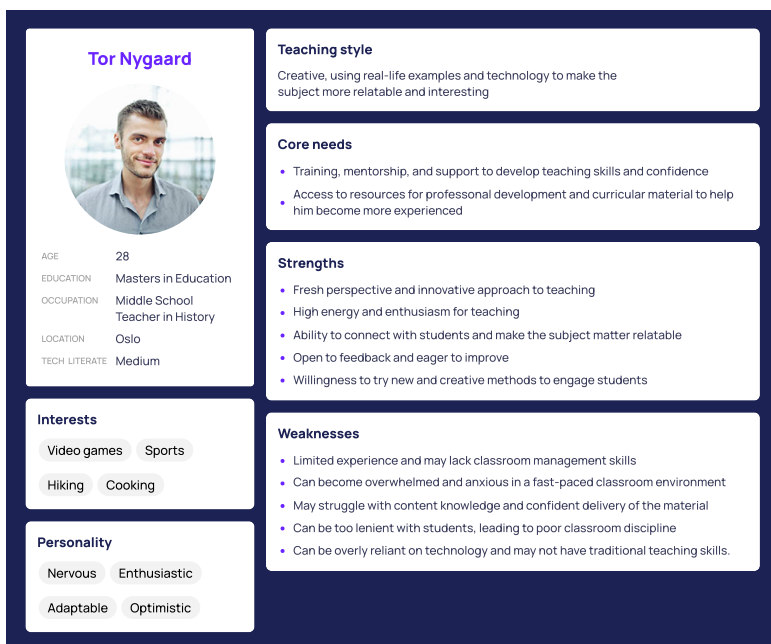
Figure 5.1.2: Persona for Tor Nygaard, an inexperienced teacher.

These personas were used for creating the use case scenarios below:

Use case scenario - Silje Pedersen

Silje is an experienced teacher who has been teaching for many years. She is planning her next lessons in English and she wants to include some digital competencies in the lessons. She logs into DIGIVIDget and finds a fitting learning goal. She then completes the course for that particular learning goal while marking which of the contents she wants to include in her lesson plan, and writes simple notes about the topic. She is brought to the lesson planning tool upon completion and makes a visual overview of how her lesson will look like. She then selects where to implement the curricular content on digital competencies she selected earlier, and the lesson planning system displays the selected content along with her notes. Silje is able to click on the content to go back to the course in case there is anything about the subject she finds confusing. She then extracts the relevant information and creates a learning activity for her pupils. While Silje is not concerned with the planning of the rest of the lesson, she still finds the tool helpful for planning the technology-specific part of the lesson.

Use case scenario - Tor Nygaard

Tor is a new teacher who is planning an upcoming project for his pupils in history. He thinks that before they begin this project, it is important for his students to be critical of their sources. For this, he finds the relevant course on DIGIVIDget and completes this while selecting the content he wishes to add to his lesson plan. As Tor has a medium level of digital literacy, he understands the content without many problems. Therefore he does not bother to write notes about the technological topics. Upon completing the course he is brought to the lesson planning tool. He then selects the material he wants to teach his pupils. He uses the tool to design his lesson from the ground up. Tor finds the structural interface of the lesson planning tool to be helpful in creating and fine-tuning the lesson.

5.1.2   Requirements

A requirement is a statement about how an intended product is expected to perform. The requirements are meant to guide the design process so that all intended functionality is included in the final product (Sharp et al., 2019).

From the analysis of the use case scenarios, the high-level requirements listed in table 5.1.1 have been identified. These requirements were derived from the findings of the specialization project and are considered essential for the development of the proposed solution. These requirements are believed to be sufficient to create tools necessary for mitigating the issues with DIGIVIDget mentioned in section 3.2 and for realizing the description of tools in section 3.3.

ID	Type	Requirement
HR1	Functional	The system should include functionality that helps the user mark content in DIGIVIDget which is interesting for re-use in lesson planning.
HR2	Functional	The system should have functionality that lets the user write their own notes on a specific topic.
HR3	Functional	The system should have functionality to visually arrange and re-arrange lesson setup.
HR4	Functional	The system should have functionality to export the lesson plan to pdf format.
HR5	Functional	The main graphical elements of the lesson planner should be: Learning objectives, elements of the lesson, and arrangement of the lesson elements.
HR6	Non-functional	The system should function through a web interface for the desktop environment.
HR7	Non-functional	The system should be visually simple.
HR8	Functional	The system should map digital learning objectives with learning goals of DIGIVIDget.
HR9	Functional	The system should utilize teacher progress tracking to help the teacher know which learning goals in DIGIVIDget to complete for a given digital learning objective.
HR10	Non-functional	The system should increase the learning outcome for the user's students as opposed to having no lesson planning tool in the DIGIVIDget system.
HR11	Non-functional	The system should increase user learning outcome and motivation to engage with the system as opposed to having no lesson planning tool in the DIGIVIDget system.

Table 5.1.1: High level requirements

In the development of the design, there has been a focus on creating a connection between the functionality of DIGIVIDget and the functionality of the proposed lesson planning tool. This means envisioning features such as **HR8** and **HR9**, which are not rooted in contextual data, but rather come as ideas for bridging this gap. The features will be assessed for relevancy in the first round of evaluation (section 5.2).

Theoretical data was also used for some of the requirements, such as **HR3 HR5**, which is based on the Tyler rationale (section 2.5). The information processing model (section 2.1) was also central development of the requirements.

5.1.3   Conceptual model

For the design of the application the following key items are used:

- **Marked content**: A page in a DIGIVIDget course can be marked for use in the lesson planning.

- **Marked content container**: The container contains all marked content.

- **Note cards**: The user can write text on a note card. One note card is connected with a specific slide in a DIGIVIDget course.

- **Notebook**: The notebook contains the collection of the user's note cards.

- **Lesson section item**: An item representing parts of a lesson plan, which can be labeled *lecture, discussion, activity*, or *tech*. Note cards can be inserted into the lesson section item. Free text can also be inserted in the lecture section items.

- **Planning timeline**: Lesson section items can be placed in the planning timeline. There is only one planning timeline per lesson created. The planning timeline can only contain lesson section items.

- **Lesson**: A lesson is the entire plan a teacher has made, consisting of the associated planning timeline, lesson section items, notebook, and note cards.

- **Learning objective mapper**: A tool which lets the user select a digital competence aim (section 1.2) and displays the relevant courses in DIGIVIDget for reaching that aim.

In order to better communicate functionality with the user, the metaphors of note lessons, cards, notebook, and timeline have deliberately been used.

The key items have the following actions connected to them:

- **Mark content for lesson use**: Marking a slide in a DIGIVIDget course adds that slide to the marked content container.

- **Access marked content**: Pressing a marked content item in the marked content container takes the user to the DIGIVIDget course page that the marked content refers to.

- **Write notes**: Writing a note adds a note card to the notebook.

- **Create lessons**: Creating a lesson makes a lesson item.

- **Add lesson section item**: Adding lesson section item will add a lesson section item of the respective label to the lesson timeline.

- **Add note cards to lesson section items**: In a lesson section item, note cards can be added. This creates an alias of the note card in the lesson section item.

5.1.4   Prototype

As prototyping strategy, the *iterative* strategy has been selected. The iterative strategy is defined as *"the sequential testing and refinement of a prototype "* (Camburn et al., 2017), and allows for *"the gradual achievement of requirements* (Camburn et al., 2017).

Using the high level requirements and the conceptual model, a low level paper prototype was created (figure 5.1.3). Creating a minimum viable prototype was a concern in creating the prototype (Camburn et al., 2017). In the creation of the prototype, keeping the design visually simple (**HR6**) has been central. As the lesson planning tool will feature as an addition to DIGIVIDget, keeping the design consistent between the two has been important.

Some main functions have been designed for facilitating using DIGIVIDget for simplifying teaching the curriculum to pupils and for supporting users in increasing their knowledge of the curriculum of DIGIVIDget. These features and the related requirements are listed in the table 5.1.2. **Ft-1** and **Ft-4** have an additional visual explanation in figure 5.1.4 and 5.1.5.

ID	Feature description	Reason for implementation	Theoretical groundwork	Design risks
Ft-1	**Lesson planning tool:** The user can put together lesson elements on a timeline to create a lesson plan.	This feature acts as the motivator for utilizing the features written below. The user will learn by utilizing information from DIGIVIDget.	Information processing model, section 2.1: Information processing model, section 2.1: Knowledge is applied by the learner and knowledge integrated to learners world. Blooms taxonomy, section 2.4: Learner is applying knowledge and should learn more that just reciting. Motivation, self determination theory, section 2.2: User is acting according to own needs.	The user might find planning the entire lesson to be unnecessary. The different types of lesson items can be too limited. The user might not understand how the timeline works. The user might not understand how the lesson items can be dragged to symbolize extension of its duration.
Ft-2	**Page saver:** This feature lets the user save specific pages from a DIGIVIDget course and access the page easily.	The user can return to pages that are relevant for the lesson they are planning. This will hopefully increase learning through repetition.	Information processing model, section 2.1. The feature will help with maintenance rehearsal, as it helps the user repeat curriculum.	The user might not bother to mark pages. The user might not use the function to return to the DIGIVIDget course page.
Ft-3	**Notebook:** The user can write notes for specific pages. The notes are saved and can be accessed later in the lesson planning tool. The notes can also be imported directly into a lesson section item.	The feature will make it easier to teach curriculum to pupils, as the user can write what is most relevant from the curriculum in the notes, as well as thoughts and reflections about the curriculum, teaching methods, specific needs, etc.	Information processing model, section 2.1. The feature helps with elaborative rehearsal, as the feature lets the user organize the information from the course. The feature can help the user reflect providing a location to write reflections.	The user might not understand how to use the notebook. The user might make notes for other reasons than lesson planning or professional development. The functionality of the notebook can be confused for the functionality of the page saver and vice versa.
Ft-4	**Learning goal mapper:** A feature that assists the user in finding relevant courses in DIGIVIDget based on the digital aim that they want to teach their pupils. The user selects a digital aim, then the relevant DIGIVIDget courses appear along with the user's perceived knowledge on those courses.	This feature creates a bridge between using DIGIVIDget as a learning platform and using the lesson planning tool for planning lessons. It emphasizes for the user that they should learn these curriculum items before having the lesson.	Information processing model, section 2.1: Promotes learning by taking the user solve real world problems by connecting learning to relevant problems the teacher may have.	The user might not understand that the courses contain curriculum that they should learn before planning the lesson. The user might be confused by the distinction between digital aims and the learning goals of DIGIVIDget. The user might not understand that the green and red slider is corresponding to their perceived learning outcome in DIGIVIDget on that specific course, especially if the user has not marked any perceived learning outcome yet.

Table 5.1.2: Experimental features of the lesson planning tool.
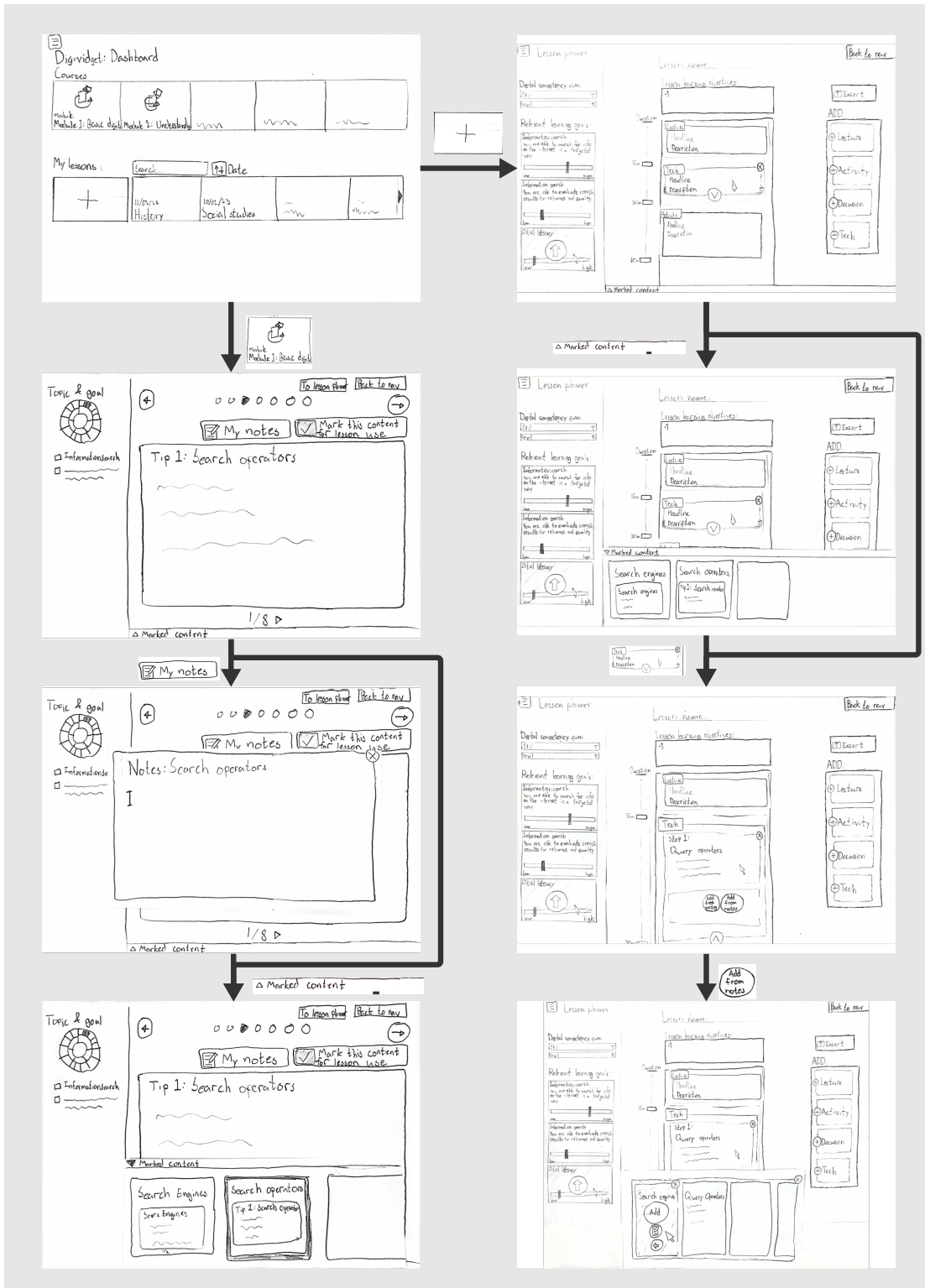
Figure 5.1.3: Paper prototype.

Lesson learning objectives
The user writes which learning objectives to achieve during the lesson

Lesson item
Item which is placed on the timeline. The items can be rearranged by dragging. The items can be scaled vertically to change its duration

Timeline
Displays the duration of each lesson item.

Add lesson item
The user presses one of the buttons to add a lesson item of the same label. The item appears on the bottom of the timeline.

Figure 5.1.4: Visual explanation of the lesson planner.

Select digital competency
Digital competency is selected by choosing skill and level.

Relevant learning goals
The system automatically displays relevant learning goals based on the digital aim selected by the user. Pressing one of the cards takes the user to that course.
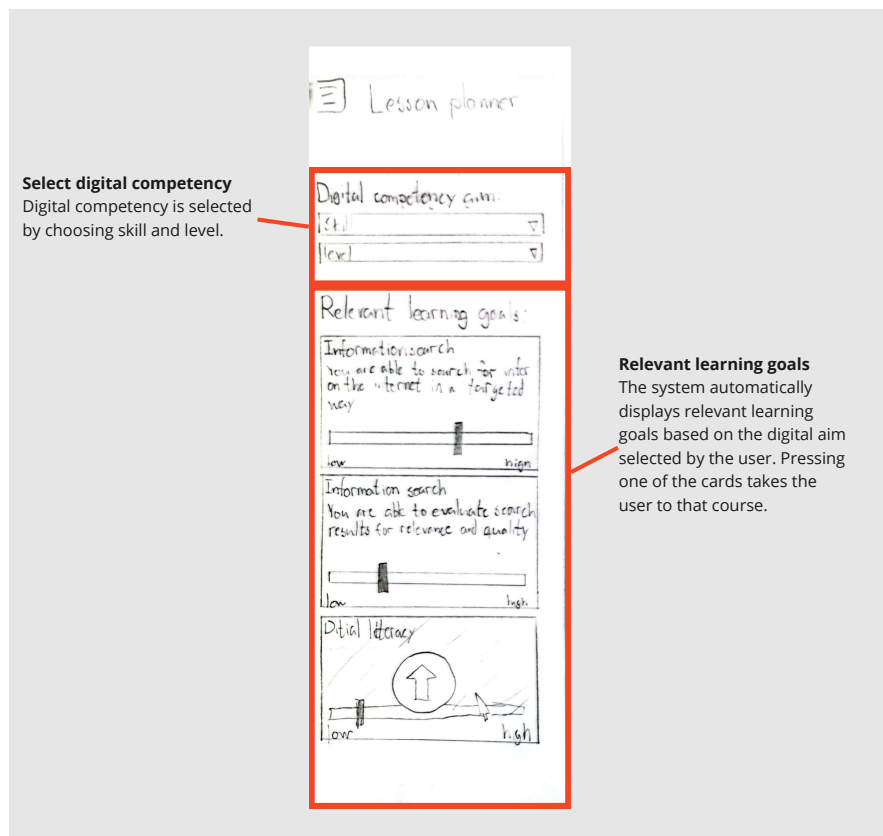
Figure 5.1.5: Visual explanation of the learning goal mapper.

5.2   Evaluation

The main purpose of this interview stage is the evaluation of the proposed design
and features for the lesson planning tool and ideation of new or different features.
The two main points are investigating whether the participants find the features
useful for implementing digital curriculum into their lessons, and whether they
find the features helpful for their own learning of these topics.

Utilizing the FEDS framework (section 1.5), the first step is identifying the
goals of the evaluation. In the first round of evaluation, the goal will be the
reduction of design risks, as it is necessary to understand whether the proposed
features in the lesson planning tool will function for the desired outcomes.

The second step is choosing the evaluation strategy. The strategy chosen is the
human risk & efficiency strategy (Venable et al., 2016). The strategy is suitable
for design risks which are user-oriented and when the design solves a particular
problem. In terms of *cost*, it is also a suitable strategy due to the accessibility of
pre- and in-service teachers, as well as the low cost of evaluating paper prototypes.

The human risk & efficiency is recognized by artificial formative evaluations in
the early stages, and progressing towards naturalistic formative evaluations later
on. *Artificial*, meaning the evaluation takes place in a controlled environment,
while *naturalistic* means the evaluation takes place in the real environment where
the artifact is to be used. *Formative* evaluation means that evaluation is used
iteratively to measure improvement in development progress. It has the counter-
part *summative* evaluation, which is evaluation used for measuring the effects of
a completed development (Venable et al., 2016).

The features and requirements that are chosen for evaluation are described in
table 5.2.1, along with the priority in terms of gaining feedback. Those require-
ments that are prioritized as high are requirements that have the highest design
risks associated with them. Those prioritized as medium are more related to the
usability of the system. While usability is important, it is more important in the
first evaluation to discover whether the functionalities bridging DIGIVIDget and
the lesson planning tool have the intended effects. The desired outcome of the
interviews is feedback on the design risks associated with each feature and on the
potential for learning that the features bring.

The final step is described in section 5.2.1 and 5.2.2.

Requirement	Feature	Desired feedback	Priority
HR1	**Ft-2**	Is the functionality relevant for utilizing DIGIVIDget content and for individual learning? Design risks.	High
HR2	**Ft-3**	IIs the functionality relevant for utilizing DIGIVIDget content and for individual learning? Design risks.	High
HR8	**Ft-4**	Is the functionality relevant for individual learning? Design risks.	High
HR9	**Ft-4**	Is the functionality relevant for individual learning? Design risks.	High
HR3	**Ft-1**	Is the functionality intuitive to use? Design risks.	Medium
HR7	all	Is the system visually simple enough for users of all technical competencies to use?	Medium
HR5	**Ft-1**	Does the graphical lesson planner contain the necessary components for planning a class efficiently and correctly? Design risks.	Medium

Table 5.2.1: Prioritization of features and requirements for first evaluation.

5.2.1   Target group

The target group of the first round of interviews is pre- or in-service teachers. Preferably, all participants should be in-service teachers. However, since in-service teachers can be hard to recruit due to them being occupied with work, some participants are pre-service teachers. The likely difference in needs of pre-service compared to in-service teachers is discussed in the limitations section, section 8.3.

5.2.2   Interview protocol

The evaluation will be separated into distinct parts. This is due to the artifact being an addition to the DIGIVIDget platform, as this requires the interviewee to get some familiarity with the platform in order to assess the artifact's relevancy. The process is described chronologically in the list below:

1. **Basic interview questions:** Regular interview questions are asked in order to attain data on the specific interviewee's skills and views in digital literacy and usage of digital tools in the classroom, as well as some basic questions about age, experience as a teacher, etc.

ID	Question
Q1.1	What is your age?
Q1.2	What is your job title? If teacher - which subjects?
Q1.3	How long have you been in the teaching profession?
Q1.4	Do you view your digital competency as sufficient for teaching the digital aims as described by the Department of Education and Learning to your pupils?
Q1.5	Have you participated in some sort of professional development in digital competencies?
Q1.6	Are you interested in increasing your digital competency?
Q1.7	In broad terms - How do you currently include teaching of digital skills in your lessons?

Table 5.2.2: Questions for first stage of evaluation.

2. **A demonstration of DIGIVIDget:** The DIGIVIDget platform will be shown to the participants. At first, the following parts of DIGIVIDget will be shown to the participant, either in the web application itself or as slides.

   2.1 A brief overview of the modules and topics in DIGIVIDget.

   2.2 The hierarchical setup of DIGIVIDget.

   2.3 How a typical learning goal course looks like.

   2.4 How the user can set their perceived learning progress.

   According to their time constraints, the interviewee will get the option to browse the DIGIVIDget application on their own. The interviewee will be asked if they have any questions about DIGIVIDget, and get the information they require.

3. **Assessment of the prototype:** The interviewee will be asked *"specific questions aimed at eliciting reactions to various design elements."* (Lazar et al., 2010). The design elements in this case will be the requirements in table 5.2.1. The questions of this section are written in table 5.2.3.

   As the paper prototype is designed as an addition to the existing DIGIVIDget, performing user testing is on the paper prototype is difficult. Due to this, the testing participant will be shown the paper prototype and its functionalities, and the user will be able to ask questions about the functionality when answering the interview questions of table 5.2.3. DIGIVIDget in its current state will also be used side-by-side for this demonstration to show how some features have been changed. The functionalities will be shown in the following order:

   3.1 **The notebook:** How to add notes. How notes are added as note cards.

3.2 **Marked items:** How to mark and unmark items. How the marked items function in terms of navigation.

3.3 **The lesson planning tool:** How navigation to the lesson planner is performed. How the lesson items work in relation to the timeline. How to access the notebook. How to access the marked items.

3.4 **The learning goal mapper:** How the mapper works to find learning goals related to the digital aims selected by the user. Here the distinction between digital aims and learning goals will be emphasized.

ID	Feature	Question
Q2.1	Ft-2	What are your initial thoughts on this feature?
Q2.2	Ft-2	Do you find or believe this feature to be useful in terms of learning the curriculum in the learning course?
Q2.3	Ft-2	Do you find this feature to be useful for helping you create lessons for for your students?
Q2.4	Ft-3	What are your thoughts on this feature? Please tell what you believe to be the purpose of this feature.
Q2.5	Ft-3	Did you believe this feature was different from the page saver? If yes - Do you think these functionalities can exist side by side in the application?
Q2.6	Ft-3	What would be you initial thoughts for how you would use the notebook? Please come with some examples of what you would write in the notebook.
Q2.7	Ft-4	Did you find the functionality to add your note cards directly to a lesson item to be helpful? Did you find it confusing in any way?
Q2.8	Ft-4	Was this functionality easy to understand? Please elaborate on how you would use this functionality.
Q2.9	Ft-4	What do you think of the way you selected the digital aims? Would you want it to be another way to select digital aims?
Q2.10	Ft-4	What is your interpretation of the slider at the bottom of each result in the lesson objective mapper?
Q2.11	Ft-4	Was the distinction between digital aims and the learning goals from DIGIVIDget clear for you?
Q2.12	Ft-4	Would you prefer if the digital aims were presented in a different way?
Q2.13	Ft-1	What do you think of the lesson planner? Is this a feature you would use?
Q2.14	Ft-1	Do you think that the different types of lesson items you can add are relevant?
Q2.15	Ft-1	Do you think the use of a timeline for organizing the lesson was easy to understand?
Q2.16	Ft-1	Would you have interest in using the lesson planner for planning an entire lesson, or would you prefer to use it for planning small sections only, or specifically sections covering digital skills?
Q2.17	Ft-1	Do you think it's useful to plan a lesson on a timeline like this?
Q2.18	Ft-1	Was it apparent to you that you are able to drag and extend the lesson items to change their duration?

Table 5.2.3: Evaluation 1: Prototype evaluation questions.

ID	Question
Q3.1	Do you believe that having assistance to planning lessons will help you including aspects of digital skills in your lessons?
Q3.2	Do you feel that having assistance to planning lessons will help you develop your own digital skills?
Q3.1	Do you believe that using a system like this will assist you in reflection on
Q3.3	Do you feel like this system including the lesson planner would motivate you to learn more about digital skills?
Q3.4	Do you feel that including digital competencies in your lessons is your responsibility as a teacher?

Table 5.2.4: Evaluation 1: Finalizing questions.

5.3   Results

The first round of evaluation resulted in 3 participants. Data about the participants are listed in table 5.3.1. Note that all quotations have been translated to English and are therefore paraquotations.

ID	Position	Subjects	Years of experience
1	Pre-service elementary school teacher	Norwegian, English	<1 year
2	In-service upper middle school teacher	Norwegian, history, social studies	>10 years
3	In-service	Religion	2 years

Table 5.3.1: Evaluation 1: Participants list.

On question **Q1.4**, participant 1 answered that their digital skills are partially sufficient. Participant 2 stated they used to have sufficient skills, but not anymore due to rapid technological advancements. Participant 2 also informed that they used to be a digital pedagogue, but not anymore, therefore they had stopped working on digital skills. Participant 3 stated that they could have better digital skills.

In terms of how participants usually include teaching of digital skills in their lessons, participant 1 stated it had mostly to do with digital equipment such as PCs and tablets. Participant 2 stated it mostly had to do with the usage of digital tools and about which tools work and which do not. Participant 3 stated that their teaching of digital skills is especially important in Norwegian as they did not use books, pupils need skills in how to use digital tools such as dictionaries, the Office platform, and the school's learning platform. Additionally the pupils need knowledge in how to combine information from multiple sources, source criticism, importance of citing sources, and choosing reasonable sources.

On question **Q1.6**, all participants expressed interest in learning digital skills. Participant 2 stated *"all teaching is done digitally through digital means"* and that *"teachers need to be able to handle abrupt technological changes such as chatGPT"*.

Participant 2 however had concerns about teachers not having enough time to learn digital skills, and stated that teachers need dedicated time from the administration in order to learn digital skills.

Only participant 2 had taken part in earlier professional development by using a nano-learning platform, and in a collaborative project with an e-book developer.

5.3.1   Results for Ft-1: Lesson planning tool

One of the most apparent features of feedback on the lesson planning tool was that in-experienced teachers perceived the tool as useful and experienced teachers perceived it as less useful.

When introduced to the tool, participant 2 stated: *"This is what you do when you are in your early years as a teacher"*. Further this participant stated that planning lessons step by step like this is useful for planning lessons on curriculum that one does not have confident knowledge of, elaborating that a lesson planning tool like this would be more useful for planning only the technology/digital competency part of the lesson. The participant still thought the premise using the curriculum in class is useful, stating: *"It's important that what we learn is angled to be used in class. If it is has value for the students it provides us motivation. Another similar tool we've used is not made for use in class, and it feels like a waste of time"*. Participant 2 eventually concluded that they would not use this tool, due to *"thinking a lot looser"* when planning classes, and stating that because of experience *"I have a repository of lesson activities in my mind"*.

Participant 1 stated *"I would use the tool if I was actually going to make a plan"*, implicating that they do not always have the need to make thorough plans for their lessons. This participant also believed that many teachers do not plan their lessons in detail.

Another problem with the lesson planning tool was the the meaning of the tools was not apparent to participant 2, who spend a notable amount of time understanding what the purpose of the tool was, first believing the tool was supposed to give complete lessons to the teacher or being a system where the pupils made sense of the DIGIVIDget curriculum. Further they stated that they believed the lesson planner would be impossible for elderly teachers to understand, also stating the paradox of using a technological platform to teach technology. For solving this the participant suggested having popup boxes that explains the purpose of the different items in the tool, stating that otherwise the usability will lead to frustration and then to quit using the program.

When asked whether they would prefer using the tool or planning the entire lesson or just the digital competency specific part, the responses were varied. Participant 1 stated they would use the tool for planning the entire lesson because they did not want to have two separate plans. Participant 2 wanted to use the tool for planning only the digital competency specific part because of the added

confidence planning gives when teaching something one is unsure of. Participant 3 would also only use the tool for planning the digital competency section. However this participant thought that using the tool would be too time consuming in the everyday workday, further stating that *"I would only use the tool if it is for sharing the lesson plan or storing it for reuse later. Those are the only ways it would justify the time spent"*.

The timeline metaphor was positively received and was easily understood by participants 1, 2, and 3. The variety of lesson elements was perceived by participant 1 to be lacking, as *"there are other types of contents in our lessons like having a break or going outside"*. Participant 3 also thought there could be a higher variety of labels. Participant 2 added that it would be useful to be able to add screenshots to the lesson elements.

When it came to whether the participants believed if the tool would be useful for learning about digital skills for their own sake, participant 1 stated that it *could* be useful, but that they already know a lot about digital tools for use in lessons, further stating *"The system could be useful if you want to learn more about digital skills"*, implicating that individual desire to learn is necessary.

5.3.2   Results for Ft-2: Page saver

The page saver was perceived as a useful feature. The participants stated that all parts of the DIGIVIDget courses might not be equally useful. Also, that some courses could contain complicated material. Therefore, saving those pages one perceives as most important or useful was stated to be interesting. Participant 2 stated that it would still be useful with a popup box that explained the function. When asked whether this function would help the participants learn about digital skills for their own sake, the participants agreed due to the aforementioned reason.

When asked whether the functionality would help for implementing digital curriculum in lessons, participant 2 stated that it could be specifically useful when trying to learn a complicated program since one can have the instructions easily available. Participant 3 stated that they would use the page saver to save the pages which they believed to be most important for their students.

5.3.3   Results for Ft-3: Notebook

The notebook was also perceived by the participants to be useful. When asked about whether **Ft-2** and **Ft-3** were confusing, participant 1 stated that if the notes you make are similar to the pages you have saved, you could get redundant information. Participant 2 stated that it was confusing at first, but that they understood it after some time. Participant 2 also voiced concern that this confusion could be greater in elderly teachers, and lead to a lowered motivation to use the system.

Participant 3 believed that the main advantage of the feature would be to save time and would mostly use the feature to translate to Norwegian or write tips to oneself for use in lessons. In terms of learning for ones own sake this participant believed that taking notes is helpful for learning. However this participant would not prioritize this due to time restrictions.

5.3.4   Results for Ft-4: Learning goal mapper

Generally perceived as the most useful function. The participants all agreed that the functionality provided a useful way to learn about the relevant topics, and that it connected the curriculum of DIGIVIDget to the methods of teaching that Norwegian teachers use. Not all participants agreed that the selection criteria in the tool needed to be the digital competency aims of UDIR. Participant 1 was satisfied with choosing UDIR's digital competency aims for finding relevant learning goals, stating *"When you are a teacher in Norway you always use UDIR"*. This participant suggested that UDIR should be explicitly written in the headline for the selection criteria section of the page. Participant 3 believed however that *"The comptency aims of UDIR is not explicitly used when planning lessons. These aims are meant to guide the general direction of curriculum planning, not for guiding individual lessons"*. This participant suggested that the selection criteria could be different challenges that you face in the classroom. Participant 3 wanted the selection criteria to be the competency aims of individual subjects, meaning that the user for instance could select a competency aim from social studies and based on that get the relevant learning goals in DIGIVIDget.

There were some problems related to the usability of the learning goal mapper. The first being positioning of the tool making the participants believe that the tool was directly related to the lesson planning tool. Another issue was that some participants did not understand the purpose of the perceived learning outcome slider.

5.3.5   General impressions and other implications

When asked if they believed if the proposed system with all the features they had been shown (**Ft-1, Ft-2, Ft-3, Ft-4**) could help them in integrating digital skills into their lessons, the participants gave positive answers. Participant 1 stated *"yes, to some extent. But I already know about many digital resources that I can use in my classes"*. Participant 2 believed that the system would help them in implementing the parts of their lessons that contain teaching about digital skills only. However this participant stated that the system would provide increased motivation for including digital curriculum in lessons, stating *"The combination of features in the system would help motivate me because it gives order to a field I perceive to be caotic"*. Participant 3 believed that the proposed features would

help in this area, but only if the schools provided dedicated time to work with the system, and that it would be more tempting to use the system in collaboration with other teachers. Collaboration was argued to be more motivating and also time saving.

The participants agreed that the features would be helpful for learning digital skills for one's own sake. The reason for this was the participants finding it motivating to learn when the curriculum is angled towards use in classes. Participant 2, due to experience, would not use the lesson planning tool, but would use the learning goal mapper in teaching practice.

There were also results not directly related to the proposed features or DIGIVIDget's functionalities. The first has to do with teachers perception of what "digital skills" mean. Participant 2 stated *"When teachers think of digital skills, they mostly think of digital resources. Learning digital skills means learning how to use digital resources, meaning digital skills are not a goal in it self"*. One example of digital resources provided by both participant 2 and 3 was Microsoft OneNote and the Microsoft Office package in general. The reasoning behind this was that these are programs that they use a lot in classes, and therefore teaching the proper skills in how to use these programs were seen as important.

Participant 2 also stated that they believe teachers generally do not have a sufficient understanding of the digital competency aims from UDIR. Participant 2 also stated that they believe teachers should have a greater understanding of these competency aims. Both participant 2 and 3 believed that while it is every teacher responsibility to teach digital skills, most teachers "push" this responsibility ahead of them, hoping that someone else will do this teaching.

5.4   Discussion

The purpose of the evaluation was to mitigate design risks associated with the features of the system, as well as finding issues with the features related to answering the research questions. Implications that can help answer the research questions will also be written here.

Although there are few participants in this round of evaluation, is seems like the results indicate that teachers are only interested in learning digital skills if it is somehow related to their teaching practice, and that they have little interest in learning digital skills just for the sake of learning. It seems that the proposed features in the prototype were perceived as helpful for learning for one's own sake due to this reason, as all features provide the user with some degree of utilizing the curriculum of DIGIVIDget for use in lessons. This is similar to the conclusion of Mikkelsen (2022), so that one of the major takeaways from this evaluation could be that facilitating curriculum for use in practice is important for teacher professional development. This possible takeaway will be further researched in the second round of evaluation.

In terms of design risks and changes that can be made to the system, the following changes can be made: The page saver and notebook feature can be intertwined, meaning that they do not require individual graphical elements. Having these exist as the same feature could minimize user confusion. As not all found the lesson planning tool to be helpful, the lesson planning should not be made mandatory but rather kept as a voluntary feature. The lesson planner should also be made such that the user can choose to only implement the digital skills-specific section of the lesson. The lesson planning tool should be visually simplified in order to minimize user confusion, especially in elderly, non-tech savvy teachers. Explicit guiding popups should also be added to the different features and design elements of the system.

As there seemed to be low enthusiasm for using a lesson planning tool, it could be indicated that the need for such a tool might not be significant. As this implication stems from this first round of evaluation, it is still too early to determine confidently if this is the case. Therefore the project will still investigate the desire for using such a tool for the reasons of utilizing knowledge and increasing motivation for learning for one's own sake.

Since the learning goal mapper was perceived as the most useful tool, it is also interesting to expand upon the feedback for this feature given in the evaluation. The proposed changes to search criteria and feedback on how the user's perceived learning progress is displayed will be taken into account for redesign. The features should also exist separately from the lesson planning tool since feedback showed that this feature was desirable even when not intending to plan a lesson.

SIX

DESIGN: ITERATION 2

This chapter consists of the design and evaluation of the wireframe prototype of the learning support tools. A major change from the paper prototype, is that the lesson planner, notebook, and learning goal mapper have been made into separate pages. The reason for this change is the confusion some of the participants had around the separation of the tools, making it easier to evaluate the tools individually. Additionally, as the learning goal mapper was perceived as the most useful tool in iteration 1, it is interesting to investigate the impact of the learning goal mapper individually. This causes some change to the project because this makes the functionalities not revolve around the lesson planner. In other words it is possible for the users to use the notebook and learning goal mapper without the intention of making a lesson plan. Due to this, the evaluation will also investigate the motivational and practical properties these tools bring to the user experience of the system.

6.1   Wireframe prototype

Taking the changes discussed in section 5.4, an wireframe prototype was created. The high level requirements remained the same, but the following changes have been made to the design:

The lesson planning tool, the learning goal mapper, and the notebook feature have been made into separate pages. The saved pages and note cards, now appear in the same bar which is reachable at every page in the system. There has been an emphasis on having text on buttons which explicitly tells the user what the button does. Further there are question mark buttons next to functionalities which tells the user what that functionality does.

6.1.1   Ft-1: Lesson planning tool
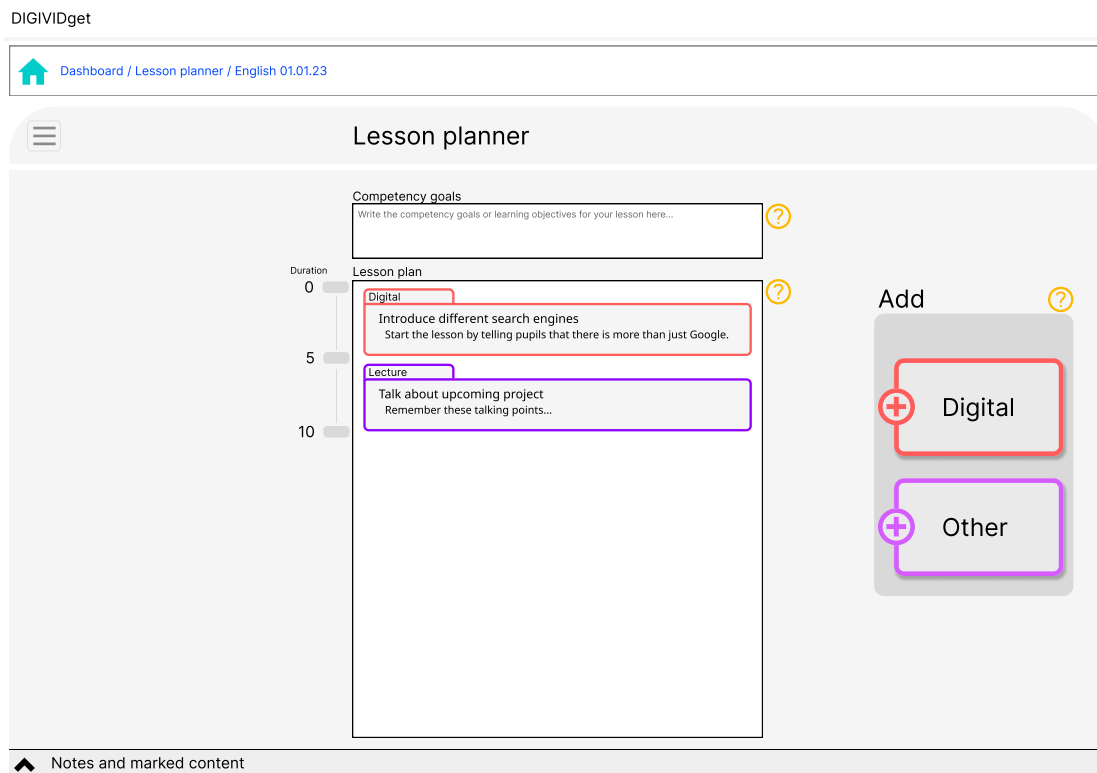
Figure 6.1.1: Wireframe prototype: Lesson planning tool

In the lesson planning tool there are now just two choices of labels for lesson elements, "digital" and "other". The main difference between these is that digital allows the user to "add from notes", while other only allows inputting free text and images. The "add from notes" functionality now opens in the digital lesson element now opens the notes and marked content bar.

6.1.2   Ft-2: Notebook

Figure 6.1.2 shows the new "notes and marked content" bar which lets the user easily access notes and saved pages. There has now been created a notebook main page, shown in figure 6.1.3, where the user can access and edit all notes. Figure 6.1.4 shows the popup window which appears when the user presses the "open notes for this course" button in a DIGIVIDget course.

The note cards have been changed so that there is only one note card per course. The note taking tool has been modified with a text editing bar. The user can get to the notebook main page by clicking "go to notebook" in figure 6.1.4.
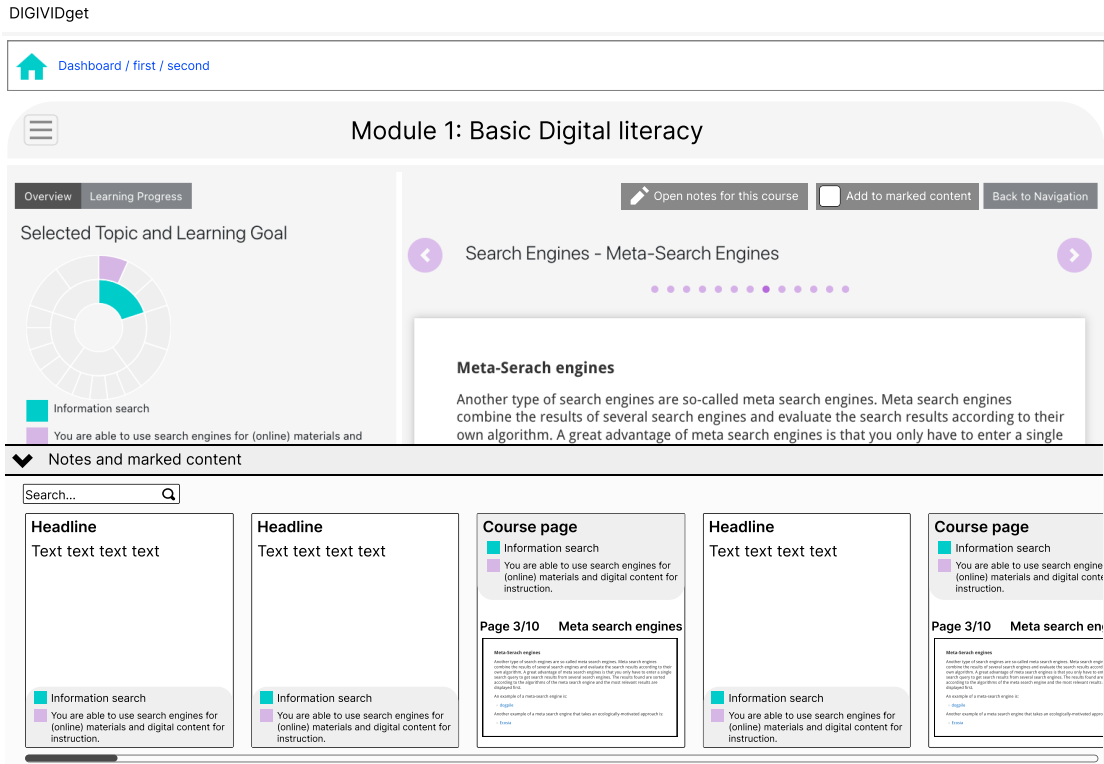
Figure 6.1.2: Wireframe prototype: Notes and marked content bar
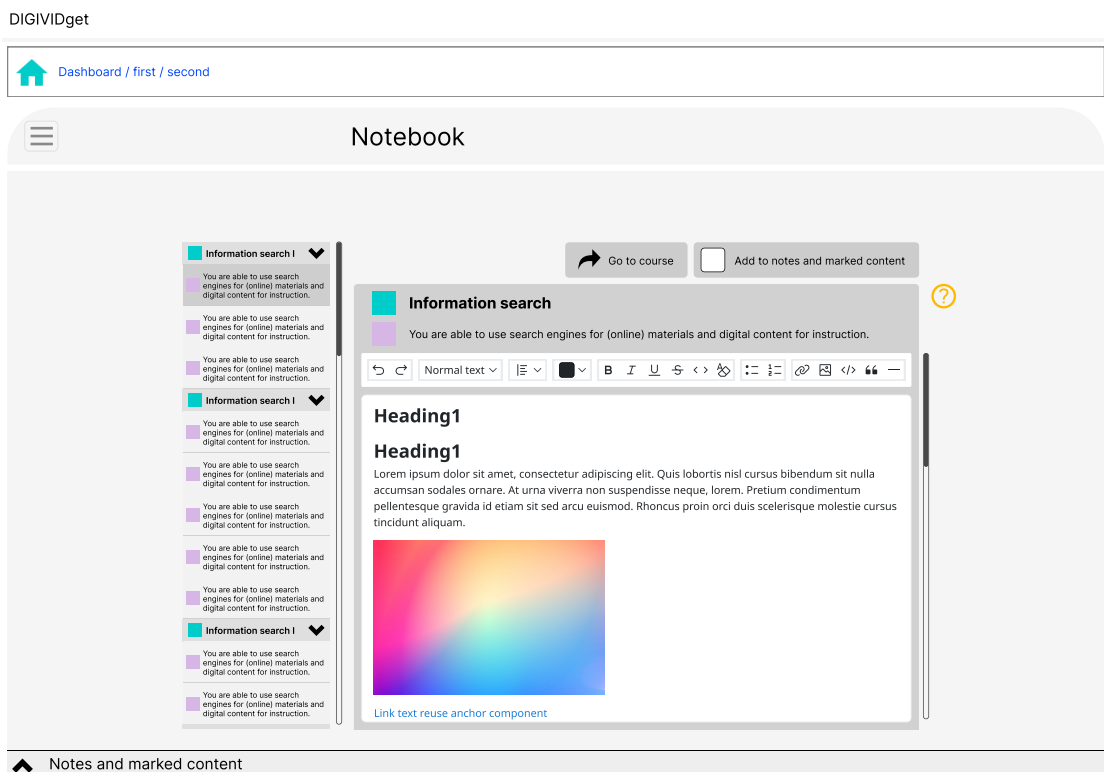
Figure 6.1.3: Wireframe prototype: Notebook main page
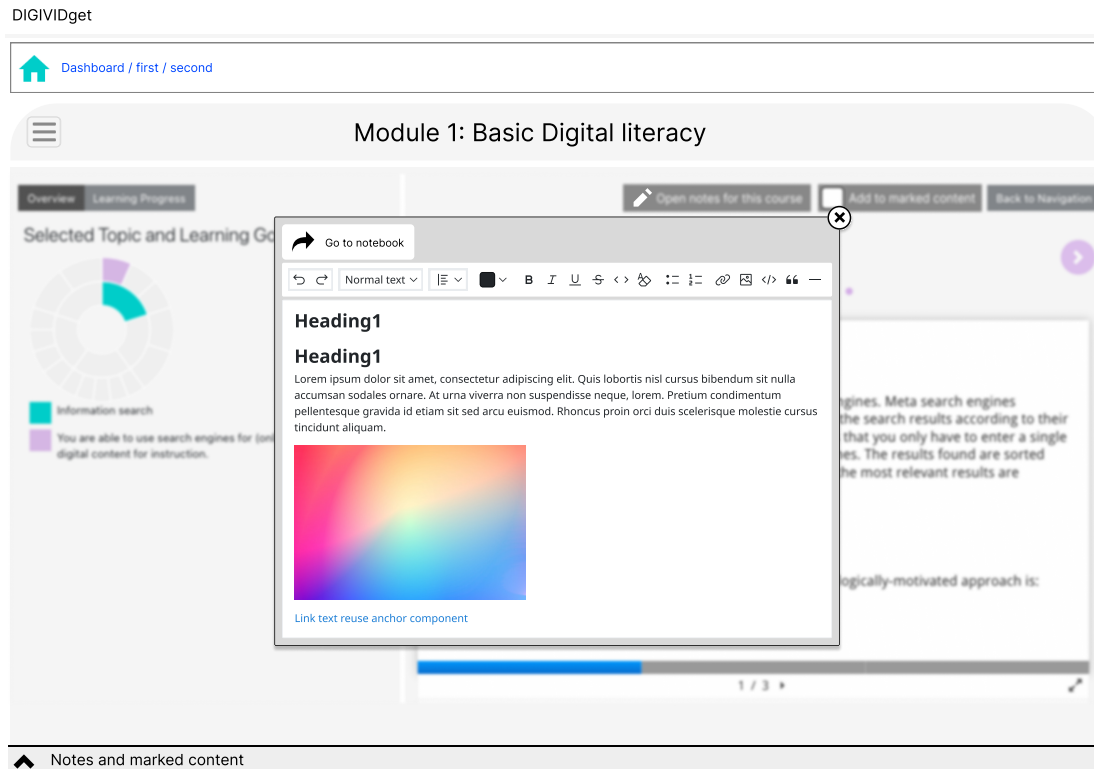
Figure 6.1.4: Wireframe prototype: Notebook popup window in a DIGIVIDget course.

6.1.3 Ft-3: Page saver

The page saver, shown in figure 6.1.2, has remained similar to how it was in the paper prototype. The only main difference is that the feature has been merged with the notebook tool, resulting in the "notes and marked content" bar. The course page cards is now marked clearly with which topic and course it is part of.

6.1.4 Ft-4: Learning goal mapper

In the learning goal mapper, the user can now choose between types of selection criteria. These types are *classroom situations*, *Specific topics*, and *UDIR competency aims*. Classroom situations will show the user topics that can be of help in technical problems or challenges that appear in the classroom, or different activites that can be performed in class. Specific topics are general topics in ICT. UDIR competency aims is the same as in the initial paper prototype. There has been added text so that the user can understand what the perceived learning progress bar means. While hovering over a relevant course, there appears a button which takes the user to that course.
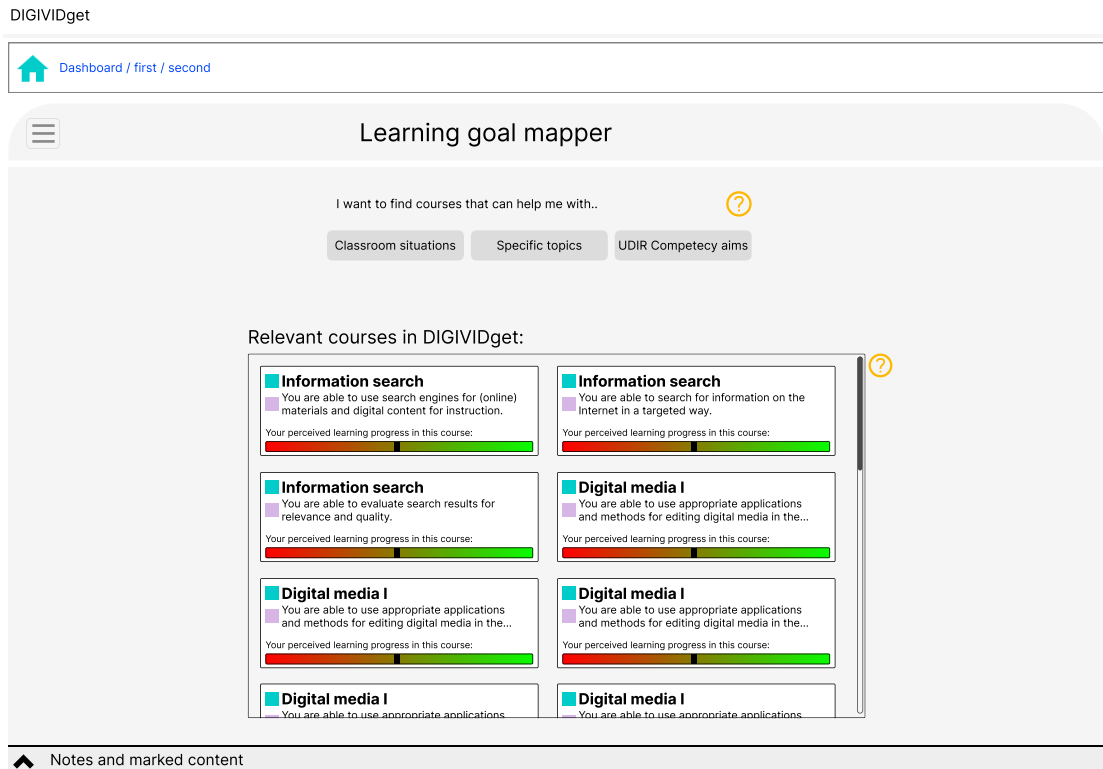
Figure 6.1.5: Wireframe prototype: Learning goal mapper

6.2   Evaluation

The second round of evaluation features similar participants as the first round and focuses on addressing the research questions of the project, contributing to the knowledge base as described. Additionally, the evaluation features an interview with a digital pedagogue. As described by the digital pedagogue who participated in the study, a digital pedagogue is a teacher who also *"is responsible for all software related to teaching and getting that software to work. The digital pedagogue also finds new software that can improve teaching, and hold courses about the software and helps colleagues in using the software."*

The higher fidelity prototype provides users with a clearer understanding of the tool's functionalities to determine their usefulness in terms of usage and learning. The findings from this evaluation will be utilized to draw final conclusions for this project.

The evaluation comprises a usability test, an interview, and a questionnaire. The usability test aims to uncover usability issues, while the interview delves into broader ideas and concepts. The questionnaire serves as supplementary data to the interview questions.

The primary goal of the second evaluation is to ensure rigor in terms of effectiveness by assessing the functionality of the artifact in real-world scenarios. Following the *risk & effectiveness* evaluation strategy (Venable et al., 2016), a

summative evaluation approach is employed. Table 6.2.1 outlines the properties
to be evaluated and their respective priority. The target group for this evaluation
remains the same as in the first evaluation (section 5.2.1).

Requirement	Feature	Desired feedback	Priority
HR1	**Ft-1**	Is the functionality relevant for utilizing DIGIVIDget content and individual learning?	High
HR2	**Ft-2**	Is the functionality relevant for utilizing DIGIVIDget content and individual learning?	High
HR8	**Ft-4**	Is the functionality relevant for utilizing DIGIVIDget content and for individual learning?	High
HR8	**Ft-4**	Are the types of selectable scenarios fitting for teachers to find relevant learning goals?	Medium
HR9	**Ft-1**	Is the functionality relevant for individual learning?	High
HR3	**Ft-1**	Is the functionality intuitive to use?	Medium
HR7	all	Is the system visually simple enough for users of all technical competencies to use?	High
HR5	**Ft-1**	Is the amount of labels (digital & other) enough for the users to utilize the lesson planner?	Medium
HR5	**Ft-1**	Is the timeline metaphor understandable by the users?	Medium

Table 6.2.1: Prioritization of features and requirements for the second evaluation.

6.2.1   Teacher interview and group interview questions

This evaluation consists of a semi-structured group interview of of three pre-service
teachers, one interview with an in-service teacher, and one interview of a digital
pedagogue. The protocol summarized is as follows:

1. Introduction to evaluation.

2. Demonstration and short trial of the DIGIVIDget platform.

3. Short usability test of prototype features.

4. Explanation of prototype features.

5. Interview questions.

6. Questionnaire.

7. Conclusion.

6.2.1.1   Demonstration and short trial of the DIGIVIDget platform

In order to give the participant a more thorough understanding of how DIGIVID-
get works, the user is given around 20 minutes to freely engage with the system.
The trial is added to the protocol in order to get more reliable results in terms of

the participant's impressions of the original DIGIVIDget platform. Prior to this trial, the participant will be shown the same functionalities in DIGIVIDget as in the first evaluation with the addition of some other functionalities:

1. Brief overview of the modules and topics

2. The hierarchical setup

3. How a learning goal course looks like.

4. How the user can set their own perceived learning outcome.

5. The reflection prompts.

6. Both visualizations, sunburst and rainbow views.

The additional functionalities were added to the demonstration in order to not cause confusion in the participant if they engage with these functionalities during the trial. The demonstration and trial are also placed before any questions, to ensure a good flow in the interviews.

6.2.1.2 Usability test

For the usability test, a list of user tasks were created. The participants will be presented these user tasks, and will be asked to navigate the prototype to complete the tasks. The tasks are written in table 6.2.2. The usability test will give data any design flaws, and also about the participants' natural reactions to the proposed features.

ID	Task
UT1	You are viewing a course about search engines in DIGIVIDget. You think that the course page you find can be useful for later. You decide to save this page for later use.
UT2	You wish to write some notes about the course you're going through.
UT3	You decide incorporate what you've learned in the course into a lesson plan and therefore open the lesson planner.
UT4	You add one section for teaching teaching digital skills and add some text to this.
UT5	You add one section for regular teaching and add some text to this.
UT6	You decide to add the notes you took earlier into your lesson plan.
UT7	You decide you want the digital section you first created to last for 10 minutes. You change this so that it lasts for 10 minutes.
UT5	You want to find more courses about search engines. You go to the learning goal mapper to find more about this under the specific topic search engines.
UT7	You need some more information from the course about search engines you went through earlier. You remember that you saved this page for later use earlier.
UT8	You are not satisfied with your notes and wish to edit the notes you took earlier.

Table 6.2.2: Evaluation 2: Tasks for usability test.

After the usability test, the features and their functionalities are explained to the participant, as well as any misunderstandings the participant may have had during the usability test.

6.2.1.3   Interview questions

ID	Question
Q2.1.1	What is your age?
Q2.1.2	What is your job title? If teacher - which subjects?
Q2.1.3	How long have you been in the teaching profession?
Q2.1.4	Do you view your digital competency as sufficient for teaching the digital aims as described by the Department of Education and Learning to your pupils?
Q2.1.5	Have you participated in some sort of professional development in digital competencies?
Q2.1.6	Are you interested in increasing your digital competency?
Q2.1.7	In broad terms - How do you currently include teaching of digital skills in your lessons?

Table 6.2.3: Evaluation 2: Interview questions part 1 - Introductory questions

ID	Question
Q2.1.1	Do you think that the learning contents of DIGIVIDget seem relevant for you as a teacher?
Q2.1.2	Would you want to learn the contents of DIGIVIDget of your own free will?
Q2.1.3	How would you describe your motivation to learn through a microlearning platform such as DIGIVIDget in your professional life?
Q2.1.4	Do you think the reflection prompts in DIGIVIDget were useful? Would you use these these prompts when using DIGIVIDget?
Q2.1.5	Do you think reflection is a useful way to reiterate the learning contents?

Table 6.2.4: Evaluation 2: Interview questions part 1 - Introductory questions

ID	Feature	Question
Q2.2.1	**Ft-1**	Is the lesson planning tool something that could increase your motivation for learning the contents of DIGIVIDget?
Q2.2.2	**Ft-1**	Is the lesson planning tool something you would use for implementing the learning material of DIGIVIDget into your teaching practice? Why/why not?
Q2.2.3	**Ft-1**	Do you think a lesson planning tool like this is a reasonable method for giving the learning material of DIGIVIDget use value in education?
Q2.2.4	**Ft-1**	If you were to be "forced" to create a lesson plan which includes curriculum from DIGIVIDget, do you believe this would help you learn that curriculum to a larger extent?
Q2.2.5	**Ft-1**	Do you believe that using the learning materials of DIGIVIDget in some sort of way in teaching practice, will help you learn the curriculum to a larger extent?
Q2.2.6	**Ft-1**	Is there any functionality in the lesson planning tool that you think could improve the tool? If the tool did not miss these functionality, do you believe that this would increase the tool's usefulness for either your own learning or using the DIGIVIDget curriculum in your classes?

Table 6.2.5: Evaluation 2: Interview questions part 2 - Lesson planning tool

ID	Feature	Question
Q2.3.1	**Ft-2**	Do you think taking notes is an efficient method for learning?
Q2.3.2	**Ft-2**	Do you believe note taking, as it is implemented in the prototype, could help you learn the contents of DIGIVIDget?
Q2.3.3	**Ft-2**	Do you believe note taking, as it is implemented in the prototype, could help in utilizing the contents of DIGIVIDget in your classes?
Q2.3.4	**Ft-2**	Do you think it is reasonable to make it so that there is one note card per DIGIVIDget course at it is in the prototype?
Q2.3.5	**Ft-2**	Comparing the note taking feature with the reflection note feature, which one of these do you prefer?

Table 6.2.6: Evaluation 2: Interview questions part 3 - Notebook

ID	Feature	Question
Q2.4.1	**Ft-3**	Do you believe having quick and convenient access to key information is useful for your own learning?
Q2.4.2	**Ft-3**	What type of pages do you envision you would save in the page saver?
Q2.4.3	**Ft-3**	In what type of situations do you envision the page saver could support you in implementing DIGIVIDget curriculum in your teaching?
Q2.4.4	**Ft-3**	Do you think it is confusing that the saved pages and note cards both appear in the "notes and marked pages" bar?

Table 6.2.7: Evaluation 2: Interview questions part 4 - Page saver

ID	Feature	Question
Q2.5.1	**Ft-4**	Do you think the categories of selection criteria are fitting for you as a teacher?
Q2.5.2	**Ft-4**	Would you use this tool in planning your teaching?
Q2.5.3	**Ft-4**	Would you use this tool in other situations than planning your teaching?
Q2.5.4	**Ft-4**	Do you believe that this tool could help you learn digital skills?
Q2.5.5	**Ft-4**	Do you think the learning goal mapper can give you increased motivation to use DIGIVIDget or a similar microlearning platform?
Q2.5.6	**Ft-4**	Do you think it is useful that the user's perceived learning progress in a course is displayed in the results?

Table 6.2.8: Evaluation 2: Interview questions part 5 - Learning goal mapper

ID	Feature	Question
Q2.6.1	**All**	Can you rate the four different functionalities after their usage potential for you as a teacher?
Q2.6.2	**All**	Can you rate the four different functionalities after the support you feel it could give you for your own learning?
Q2.6.3	**All**	Can you rate the four different functionalities after the support you feel it could give you for using the curriculum in your teaching?
Q2.6.4	**None**	Are there any other functionalities that you can envision would be fitting for the system? Either as additional functionalities or to replace one or more of the existing functionalities.
Q2.6.5	**None**	Is there anything that you feel you haven't mentioned that you want to mention?

Table 6.2.9: Evaluation 2: Interview questions part 6 - Summarizing questions

6.2.1.4   Questionnaire

As the interview questions in section 6.2.1.3 provide qualitative data, a questionnaire is added to provide additional quantitative data. The questionnaire is a list

of statements which the participants answer on Likert-scale, one to five, where one means the participant disagrees and five means the participant agrees. The list of statements are shown in table 6.2.10. The statements are concerned with the participant's views on digital skills in teaching and their existing digital skills, and on the participant's opinions about the different proposed features (**Ft-1**, **Ft-2**, **Ft-3**, **Ft-4**). If the interview is held as a group interview, each member of the group interview answers the questionnaire individually.

ID	Feature	Statement
S1.1		I believe my digital skills are sufficient for using digital resources in my lessons.
S1.2	**All**	I believe my digital skills are sufficient for teaching my students about digital skills.
S1.3	**All**	I am interested in learning more to improve my digital skills.
S1.4	**All**	I want to include more learning about digital skills in my lessons.
S1.5	**All**	I already include enough teaching of digital skills in my lessons.
S1.6	**All**	It is my responsibility as a teacher to teach students about digital skills.
S1.7	**All**	If I am to learn something new in a professional context, it is motivating for me if what I learn can be used in teaching.
S1.8	**All**	If I am to learn something new in a professional context, it is demotivating for me if what I learn cannot be used in teaching.
S1.9	**All**	I choose not to learn something new in a professional context if it cannot be used in teaching.
S2.1	**All**	I think the lesson planning tool can help me learn for my own sake.
S2.2	**All**	I think the lesson planning tool can help me take use the learning materials of DIGIVIDget in my teaching.
S2.3	**All**	I would have used the lesson planning tool in my everyday work life.
S2.4	**All**	I think the layout of the lesson planning tool was understandable.
S2.5	**All**	I think the lesson planning tool had the necessary functionality to plan an entire lesson.
S3.1	**All**	I think that saving pages can help me use the learning contents of DIGIVIDget in my teaching.
S3.2	**All**	I think that saving pages can help me learn digital skills for my own sake.
S3.3	**All**	I think that the way pages were saved, worked well.
S4.1	**All**	I think the notebook tool can help me learn digital skills for my own sake.
S4.2	**All**	I think the notebook tool can help me use the contents of DIGIVIDget in my teaching.
S4.3	**All**	I think that the way notes functioned, worked well.
S4.4	**All**	I think the difference between saved pages and note cards were confusing.
S5.1	**All**	I think the learning goal mapper was understandable.
S5.2	**All**	I think that the groups of search criteria in the learning goal mapper (classroom situations, specific topics, UDIR competency aims) were sufficient to cover my needs.
S5.3	**All**	I think the learning goal mapper can help me learn digital skills for my own sake
S5.4	**All**	I think the learning goal mapper can help me use the learning contents of DIGIVIDget in my teaching.

Table 6.2.10: Evaluation 2: Questionnaire statements

6.2.2   Interview with a digital pedagogue

Due to participant 2 from evaluation 1 having a background as a digital pedagogue, this participant is be recruited for another interview. This evaluation only consists of a demonstration of the wireframe prototype and a semi structured interview. The interview focuses less on the interviewee's personal experience of the prototype and rather focus on the prototype functionalities in relation to the interviewees competency and knowledge on teacher professional development of digital skills.

The interviewee is first shown the wireframe prototype and an explanation of the changes that have been made is given. Then the interviewee will be given a brief overview of the theoretical framework that has been used for the prototype. After this the interviewee will be asked the questions in table 6.2.11.

ID	Question
Q3.1	The page saver: This function is meant to help the teacher learn through repeating content from the courses. Do you think this is a useful function for this purpose?
Q3.2	The notebook: This function is meant to help the teacher learn through organizing content from the courses. It is also meant to act as a possible platform for reflection. Do you think this is a useful function for these purposes?
Q3.3	Learning objective finder: This function is meant to help the teacher learn through "solving real world problems". What do you think of this? Do you believe this function can increase motivation for learning?
Q3.4	Lesson planning tool: This function is meant to help the teacher in integrating what they have learnt into their real world. This is meant to increase learning through Bloom's taxonomy, and through the information processing model. What do you think about this?
Q3.5	All four functionalities that have been presented are meant to increase motivation through the self determination theory. Can you reflect around whether you feel these functionalities cover the SDT needs?
Q3.6	Which needs do you believe needs to be covered in order for teachers to increase their digital skills?
Q3.7	What do you believe motivates or can motivate teachers to increase their digital skills?

Table 6.2.11: Evaluation 2: Questions for interview with digital pedagogue

6.3   Results

The second round of evaluation resulted in one group interview consisting of three participants, with IDs 1, 4, and 5, and an interview consisting of a single participant with ID of 6. The participants are listed in table 6.3.1.

ID	Position	Subjects	Years of experience
1	Pre-service elementary school teacher	Norwegian, English	<1 year
4	Pre-service elementary school teacher	Arts and crafts	<1 year
5	Pre-service elementary school teacher	Norwegian, english	<1 year
6	In-service upper middle school teacher	English, social studies	4 years

Table 6.3.1: Participants of second evaluation.

When it came to UDIR's digital competency aims, all four participants perceived their knowledge of them to be sufficient, but that neither knew them in detail. In terms of having sufficient digital competency to teach their pupils digital skills, participant 1 stated that they can teach some things, but that they are unable to teach the "newest" technological topic, which the pupils in many situations know better than them. Participant 4 agreed that they cannot sufficiently teach the newest technological topics. Participant 6 stated that they have the sufficient digital competency.

When asked what their perception of what digital skills are, participant 1 stated that they mostly think about usage of computers and digital tools. Participant 4 stated that they though of digital skills that the pupils have use for later in life, such as being aware of online behaviors and online tracking. Participant 5 stated that it is mostly about how to use computers, elaborating with the example that in lower elementary school, they have to teach the pupils where the different letters are on the keyboard. Participant 6 stated that a lot of the teaching in digital competency goes to managing the problems arising from the transition from lower middle school to upper middle school. While Norwegian pupils use Chromebooks at lower middle school, they use PCs at upper middle school. A lot of problems arise with this, according to participant 6, such as understanding how an OS works, local saving vs cloud saving, and how to use the Microsoft Office package. Still some teaching is focused towards technical software such as screen and audio recording. The students also use their phones a lot, so they need to include that type of competency in their teaching.

This was reflected in how the participants included digital skills in their lessons. All participants stated that they were mostly concerned with teaching how to use digital tools. For participants 1, 4, and 5 this meant making digital books, writing on keyboards, and using iPads.

In terms of interest in improving digital skills, all participants stated a large interest in this. Participant 4 stated that *"It will be very important in the teaching profession going forward. As a teacher you don't really have a choice due to all the technical innovations. I also think it's exciting to learn new digital skills and it's useful for the pupils to have a digitally competent teacher"*. Participant 1 agreed with this. Participant 6 stated that there will always be topics to improve upon, and there will be new tools to learn. This participant also stated that using DIGIVIDget made them aware that they still had a lot of unknown topics to learn.

6.3.1   Opinions on DIGIVIDget

After the trial of DIGIVIDget, participant 4 stated that they thought some of the contents were interesting, and some of the content too basic, referring specifically to youtube being listed as a source for videos, which was well known to the participant group. Participant 1 liked the content but was demotivated by the amount of content which was in an unknown language. Participants 5 and 6 liked that the system showed many resources that could be used and found the content to be relevant.

When it came to whether the participants would use DIGIVIDget of their own free will, participant 1 stated that they would rather focus on learning to use the digital resources and tools that the school supplies. Participant 5 stated that they would use the system if the school's digital resources are insufficient, but that most problems they have they would most likely use Google search to solve. Participant 4 would use DIGIVIDget, due to that they could find topics they didn't realise they needed to know, and learn them through the system. Participant 6 would also use the system of their own will, describing their motivation to use the system to be at a medium level.

On DIGIVIDget's reflection prompts, participant 4 liked them, stating *"they make you more aware of what you've just read"*. Participant 5 said it was a useful feature, because they can forget to do this reflection on their own. Participant 1 stated they liked the prompts better than in-course quizzes, since the reflection prompts did not interrupt the learning process since they are at the end of the courses. Participant 6 did not like the reflection prompts, stating that they perform this type of reflection automatically in their head, elaborating that this type of reflection is very natural as a teacher, always needing to think about how to utilize content for teaching.

6.3.2   Opinions on proposed features

6.3.2.1   Lesson planning tool

Participants 1, 4, 5, and 6 liked the lesson planning tool, although they believed it took an excess amount of clicking to navigate the tool. Participant 5 stated that the tool would provide increased motivation for learning the contents of DIGIVIDget as *"it gives greater purpose to learning"*. Participant 6 stated that the tool would not result in increased motivation to learn the curriculum of DIGIVIDget.

None of the participants were interested in using the lesson planner in their professional lives, with participants 5 and 6 stating that it is easier to use the methods already known, and that utilizing the lesson planning tool would require spending time to learn how to use the system. Participant 6 also used visual tools such as drawings in their planning, which the lesson planning tool does not support. Participant 4 would rather use web search and plan their lessons based

on those results.

When it came to **Q2.2.5**, whether the participants believed that using the learning content would help them learn the learning content, participant 1 stated *"it is first when you use something that you learn it.* Participants 4 and 5 agreed with this. Participant 6 disagreed, stating that they have no problem learning due to the learning content being interesting in its own, and that *"if I get sent to a course by my bosses, then I would expect to have some clear practical use for the knowledge I gain, but if I learn from a system like this [DIGIVID], then I can learn just because I find it interesting"*.

The participants of the group interview believed that the lesson planning tool would make DIGIVIDget more useful, stating that *"you can put it together to a product, which is better than just reading"*.

6.3.2.2   Notebook

When asked whether they believe notes are a good way to learn, participants 1, 4, and 5 stated that with the way the curriculum is set up in DIGIVIDget, it would be more useful to do something practical such as using the programs suggested in the courses. Notes however would be useful when *"there's not enough time to try all the programs"* and for writing which programs are relevant to use in teaching etc.. Further they stated that the notebook feature could be used for writing synopsis of the courses, increasing learning. Participant 6 stated that while they believe notes to be an efficient method for learning, they would also prefer having the possibility to use visual means instead of just text. This participant also believed that the note cards should be simpler, with simple text input instead of a whole editor.

On question **Q2.3.3**, the participants believed the notebook function to be helpful for utilizing DIGIVIDget in their teaching. Participant 4 especially brought up the feature to paste note cards directly into the lesson plan as a useful feature for this purpose.

On question **Q2.3.5**, participant 6 preferred the notes due to notes as a concept being better known, further stating *"When I plan my lessons, I write reflections for myself while planning. So in the notebook i would write my own reflections"*. Participants 1, 4, and 5 saw pros and cons with both features, stating that they could write reflections in the notebook as they went through the course, but that they also preferred having a prompt explicitly asking for reflection at the end of the course, due to believing they would often forget to reflect. Participant 1 suggested to keep the reflection cards in the "notes and marked pages" bar. Participant 4 also believed that they would reflect implicitly while writing notes, but participant 1 believed that they would not.

6.3.2.3 Page saver

Participants 1, 5, and 6 believed the page saving tool to be helpful for their own learning. Participant 1 stated *"if there's something you find interesting and don't want to forget, then it's good that you can save it"*. Participant 4 believed that the function is useful, but that there still shouldn't be too hard to find back to the page you are looking for.

When it came to which types of pages the participants would save, participant 6 stated *"pages with topics that are hard to get into, so that you could go back multiple times"*. Participant 4 stated they would save pages containing things they could use as a teacher, and participant 1 would save pages that they wouldn't have time to complete.

Participants 1 and 4 believed the tool would make it easier for them to use the curriculum of DIGIVIDget in their lessons.

6.3.2.4 Learning goal mapper

The participants found the types of input criteria categories to be useful. Participants 1, 4, and 5 found the UDIR digital competency aims to be especially useful. To be able to search by classroom activities was suggested, which participants 4 and 5 stated seemed very useful. Participant 6 would prefer that the UDIR competency aims in the tool also covered the competency aims for individual subjects, in stead of just covering the digital ones.

When asked if they would use the tool in lesson planning, participant 1 said *"yes, if I was going to use DIGIVID, then I would use this tool"*. Participant 5 stated *"If I was teaching digital skills to my pupils, then I would definitely use this tool to find out what the students should learn"*.

On the question of whether the tool could help them learn the contents of DIGIVIDget, the answers varied. Participant 6 answered *"yes, clearly"*. Participant 1 believed that the tool would not help. Participant 5 stated *"It depends on whether I know enough to teach my pupils. I would use web search first, but if I don't find what I'm looking for, I would use this tool"*. All participants believed this tool would increase their motivation. Participant 1 stated *"it makes it easier to know what to teach the pupils. Then you can find more motivating courses"*. Participant 5 stated *"it's easily available, then it's easy to go in and see what you should learn"*. Participant 4 stated that *"you can get to know what you don't know, and that increases motivation to learn more"*.

All participants believed it was useful to have the user's perceived learning progress displayed in the relevant courses. Participants of the group interviews stated that this made it easy to see whether you have learnt a course.
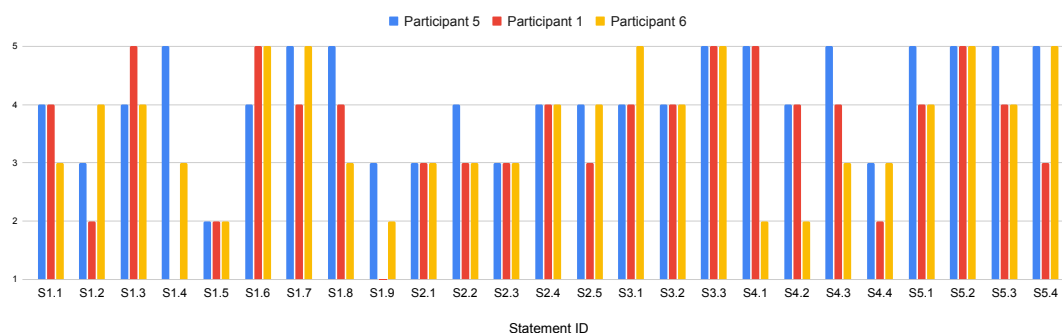
6.3.3   Questionnnaire data

Figure 6.3.1: Data from questionnaire (table 6.2.10).

6.3.4   Usability

The usability test was only conducted in the group interview and in the interview with the regular teacher. In the group interview, the participants completed the test together.

The participants of the group interview struggled for some time to find the "add to marked content" button and the "open notes" button in the DIGIVIDget course page. These participants also struggled with the "notes and marked content" bar. Firstly they believed that accessing the bottom bar directly would allow them to copy notes to their lesson plan. Secondly they did not understand which cards in the bottom bar were the the saved pages, so that they were unable to access the page they had saved for later use.

In the in-service teacher interview, it was not apparent to the participant how the learning goal mapper functioned. This participant also struggled with finding the saved page in the "notes and marked content" bar.

6.3.5   Interview with digital pedagogue

This interview was held with participant 2, who previously had a position as a digital pedagogue for three years. Participant 2 first explained what the position of digital pedagogue involves: *"A digital pedagogue is responsible for all software related to teaching and getting that software to work. The digital pedagogue also finds new software that can improve teaching, and hold courses about the software and help colleagues in using the software."*

The participant was shown the prototype features. When asked **Q3.1** and **Q3.2**, the participant believed these two functionalities were a good way to learn, stating *"they are a form of user adaptation, which is good for learning"* and that that the availability of saved pages and note cards made it easy for the user to access and process information. The participant also believed the note cards could

function as a platform for reflection, stating *"taking notes support the way forward, and reflection about what you have learned is naturally involved in going forward"*.

On **Q3.3**, the participant believed the learning goal finder to be very useful for learning, stating that the tool *"makes it easy to identify problems and solutions without help"* which would *"make the teachers more independent"* and that regularly teachers would contact the digital pedagogue if they encounter problems that they don't know how to solve. This tool would also promote motivation in the users according to the participant, who stated that *"yes, [it would promote motivation], due to the digital field being so large and confusing, which could cause teachers to simply give up. This tool makes it easier to navigate the digital field which would cause motivation"*. The participant also explained that the features of the system were simple to use, which would prevent user frustration and keep them motivated.

On **Q3.4**, the participant thought the feature could be useful for learning, because it made it simpler to implement digital teaching in one's lesson, stating that *"if you're going to implement something in your lessons that you strictly do not need to implement, then it needs to be simple. If the implementation of digital skills is difficult, then the teacher will simply not do it"*. The participant also stated that the feature would cause motivation if it has a usefulness value for teaching, meaning it would have a positive effect on teaching.

On **Q3.5**, the participant stated the tools would cause learning according to Bloom's taxonomy, stating that *"using the features and making a lesson plan means going along the taxonomy"*.

The main need that needs to be covered in order for teachers to learn digital skills, was identified by the participant to be simplicity, who stated that *"Finding a solution to a digital problem yourself needs to be as simple as calling the digital pedagogue, because teachers will usually follow the path of least resistance"*. When asked about what types of digital knowledge teachers need, the participant replied that there are two categories of knowledge. One being general and everyday digital knowledge, such as how to keep digital systems in the classroom running or general ICT topics such as web search. The other one being knowledge on new software that improves teaching. On question **Q3.7**, what caused motivation in teachers to learn digital skills, the participant replied that feelings of mastery and being able to use what you have learned in a useful way with your pupils are the most important factors that lead to motivation.

6.4   Discussion

This section will discuss the results of the second evaluation. The discussion will focus on the relevance of the prototype features and implications for their design.

6.4.1   Lesson planning tool

The results indicated that the lesson planning tool is not something teachers want to use. Many needs must be covered when making such a tool. Firstly, teachers use different techniques for planning their lessons. If the tool provided means for covering these needs, it could quickly make the tool saturated with functionalities, making it more complicated to use the tool. As simplicity was important for keeping teachers engaged, this would decrease motivation for using the tool. For those teachers who use visualizations to plan their lessons, using a digital tool might be especially difficult. As some teachers do not plan their lessons in writing, the lesson planning tool has no use for these teachers.

The lesson planning tool still showed potential for supporting learning of digital skills. In light of Bloom's Taxonomy, microlearning on its own can take the user to the levels of knowledge and comprehension. The lesson planning tool could assist the user in achieving a higher level of the taxonomy, resulting in increased learning. As pointed out by the participants, it is when something is used that it is actually learned. The tool could also promote motivation as it gave more meaning to the microlearning platform it was connected to.

Also, there seems to be a need for planning lessons in detail when the subject matter is something the teacher is unsure of. Digital skills seem to fit under the category of these subject matter, as pointed out by the digital pedagogue. However, planning the whole lesson can feel unnecessary for experienced teachers, which can lead to a lower feeling of autonomy, decreasing motivation according to the SDT theory. This shows that there is a need for support for lesson planning on digital skills, but this support should be related to planning the digital sections of the lesson, not the whole lesson.

6.4.2   Notebook

The notebook feature exhibited promising potential for supporting learning by facilitating tasks such as writing synopses or capturing ideas for programs that can be utilized in teaching. However, it should be noted that the current implementation of the notebook limits users to text and image-based notes, which may not suffice as a comprehensive means of information organization for all teachers.

While notetaking can serve as a platform for spontaneous reflection for some teachers, it is important to acknowledge that not all teachers engage in immediate reflective practices while taking notes. Consequently, relying solely on notes as a substitute for structured reflection prompts may not effectively support reflective practices among all teachers.

6.4.3   Page saver

The page saver feature offers significant potential for enhancing the learning process by facilitating quick and convenient access to the microlearning course content. This feature greatly simplifies course navigation, streamlining the overall learning experience and ensuring efficient progress through the material.

By leveraging the page saver feature, learners can easily save and retrieve specific pages or sections of interest, eliminating the need for exhaustive searching. This quick access feature optimizes learners' engagement and helps them maintain a consistent learning flow, ultimately enhancing the overall learning outcomes within the microlearning courses.

6.4.4   Learning goal mapper

The learning goal finder proved to be a valuable asset in assisting users in identifying courses that directly address the challenges encountered in the teaching profession. By facilitating the alignment of learning content with the daily activities of teachers, this feature has the potential to enhance motivation according to SDT theory (section 2.2) by fostering a sense of autonomy and relevance in the learning process.

By utilizing the learning goal finder, users can pinpoint courses that specifically address the problems and issues relevant to their teaching practice. This personalized approach increases the perceived autonomy of learners, as they have the freedom to select courses that align closely with their professional needs and interests. By bridging the gap between theoretical learning and practical application, this alignment can significantly boost learners' motivation by creating a direct link between the course content and their daily work as teachers.

Drawing on Self-Determination Theory (section 2.2), it can be anticipated that the integration of the learning goal finder will enhance learners' motivation. By allowing learners to select courses aligned with their specific goals and needs, the learning goal finder directly supports autonomy and competence, leading to increased motivation to engage with the learning materials.

DISCUSSION

This final discussion aims at finding implications for digital lesson planning tools, implications for teacher professional development, and implications for microlearning services. By comparing empirical data from the results to the theoretical background presented in this thesis, insights are found on these topics.

7.1 Implications for digital lesson planning tools

In terms of design, lessons derived from this research project emphasize the importance of simplicity when creating tools for teachers. As explained by the digital pedagogue (section 6.3.5), due to the varying digital literacy levels among teachers, especially older individuals, a user-friendly design is crucial to minimize confusion and frustration. As non-intuitive design can cause teachers to give up or use digital pedagogues, providing clear instructions and intuitive navigation is essential for adoption and usage of such a tool.

When designing digital lesson planning tools, the usage of a vertical timeline metaphor seems to be understandable by teachers, as was discovered in section 5.3.1. Labeling of the elements on the timeline should be able to be written by the user, as results showed that teachers can have many different needs for types of labels in their plans. As was identified in the results of iteration 1 (section 5.3.1), experienced teachers have less of a need to plan their lessons in detail, inexperienced teachers should be the main target group when designing tools for planning full-length lessons. Focusing explicitly on this group can open for implementing other means of support for newly educated teachers.

Lessons derived from this project draws parallels to other related works. The lesson planning tool showed potential for increasing learning of digital skills. These are similar results to Rahmi, 2020 who found that using lesson plans containing digital teaching increased the digital literacy of the teachers. It is also in line with Price and Roth, 2011, who found that lesson plans containing technology rich activities resulted in more ICT teaching in schools.

Whereas lesson planning tools show potential for increasing learning by supporting the teachers in the utilization of information, which is in line with Bloom's taxonomy, this presupposes that the planning tool is actually used. As it was found that teachers are not interested in using such a tool, similar to the results of (Queiros et al., 2018), some other forms of motivation for learning digital skills should be found. However, as (Onyango et al., 2017) concluded, technology and teaching should not be separated. This implies that a lesson planning tool, if providing proper motivation and proper means for planning lessons, can be an important factor for promoting digital literacy in teachers.

As this presupposes that the given lesson planning tool is actually used, it is necessary to design the tool in a way that caters to teacher's needs and motivation. The digital pedagogue indicated that experienced teachers perceive having the means to create a detailed plan as useful when teaching challenging topics. Since many older, experienced teachers find digital skills difficult, it would be beneficial to support the implementation of digital teaching in their lessons through a dedicated tool specifically designed for improving digital skills. For example, a planning tool that allows teachers to focus on incorporating digital elements into specific parts of their lessons, with short duration, could effectively assist in this process. A tool such as this could ensure that experienced teachers feel motivated to utilize digital curriculum without committing to planning the whole lesson, which was perceived as unwanted by the experienced teachers participating in the study.

Additionally, incorporating elements of collaboration can be a useful way to increase motivation for usage. As was stated by participant 3 during the first evaluation, having the option to share the created lesson plans with other teachers would increase the motivation to create lesson plans in a dedicated tool. Furthermore, implementing collaboration could increase motivation by allowing teachers to test and improve lesson plans made by other teachers, resulting in an increase in the teachers' education quality. A collaboration feature could improve the motivation of the users by appealing to their feeling of relatedness (Ryan & Deci, 2000).

7.2 Implications for teacher professional development

As the participants in the study expressed a large interest in learning more digital skills, this can indicate that teachers in general are interested in improving their digital skills. However, as the participants in the study also replied that their digital teaching mostly consisted of digital tools, it seems that learning digital tools is what motivates the teachers the most. This is likely due to this knowledge being the most applicable in teaching. As reported by the digital pedagogue

(section 6.3.5), being able to use knowledge in a useful way with one's pupils is one of the most important factors that lead to teacher motivation for learning. Therefore, it is likely that learning digital tools and knowledge that can be used directly in classes is the most motivating and therefore most desirable for teachers, due to the efficiency it brings to their teaching practice.

However, the interview with the digital pedagogue also showed that learning more generic digital skills is important for teachers. Participants of the group interview also identified these skills as important. Therefore the importance of learning digital skills that have no direct potential for usage in teaching practice should be made apparent to teachers undergoing professional development in digital skills.

There are however teachers who want to learn digital skills for the sake of learning, such as participant 4 in iteration 2 of this project. Results also showed that teachers are aware that digital skills are getting increasingly important, and that professional development in this field is important. Some teachers still want to learn for this reason or due to finding the learning content interesting, as the results indicated. For this group, microlearning can be a viable method for learning.

Moreover, it is crucial for school administrations to allocate dedicated work hours specifically for the learning of digital skills by teachers. This is imperative as the results indicated there to be a scarcity of time dedicated to teacher professional development. By providing designated time for this, schools can actively support and promote the continuous growth of teachers' digital competencies. This proactive approach acknowledges the importance of investing in teachers' professional development and ensures that they have the necessary time and resources to acquire and refine their digital skills.

It is also important to address the expectation among teachers that more technically competent colleagues should handle teaching of digital skills. The interview with the digital pedagogue (section 6.3.5) indicated that teachers often seek the path of least resistance within their daily work, which causes many to pass the teaching of digital skill to other teachers. To solve this, action needs to be taken on an administrative level to emphasize the importance that every teacher needs proficient digital skills.

7.3   Implications for teacher microlearning services

While microlearning attempts to mitigate the time restrictions faced by teachers by enabling professional development in short increments, a notable issue arises where many teachers exhibit a reluctance to utilize microlearning during their free time. As was found in the results (section 6.3.1), teachers tend to prioritize other activities during their professional practice. In order for teachers to utilize microlearning services in their practice, the motivational factors in microlearning services need to be high.

One such factor is, as discussed in section 7.1, simplicity in design. Non-intuitive design of a microlearning platform will result in teachers becoming frustrated and can eventually lead to them quitting.

Another factor is tailoring the contents of the microlearning service to for usage in teaching practice. As discussed in section 7.2, teachers are interested in learning if what they learn can be used with pupils in their teaching. Therefore implementing changes to the microlearning content, such as having teaching activities or tips for how the content can be used in practice as part of the courses can be a way to increase teacher's motivation for utilizing the microlearning service. Another method to solve this can be to emphasize within a course how the the digital skills being taught is important for teaching practice. By highlighting the direct relevance and benefits of digital skills in instructional practices, the learning of digital skills is aligned with the needs of autonomy in self-determination theory (section 2.2).

While DIGIVIDget intends to provide teaching friendly materials, the participants of the specialization project (Mikkelsen, 2022) and participants in the group interview of this study found the materials on DIGIVIDget to be too simple for their current digital skill level. This is another factor leading to less motivation. Connecting this to self-determination theory (section 2.2), it could be that the over-simplicity of the learning content decreases the user's feeling of autonomy, as consuming learning content that is already known can feel like a pointless exercise. It is therefore important in for microlearning services aimed at teachers, that the potential for usage is apparent for the learner.

For this problem, it is possible that a tool such as the learning goal mapper from this project can improve or mitigate this problem. If the user can use a tool to find information more relevant to their needs and problems, the feeling of autonomy and competence will possible increase, resulting in higher motivation for learning. A further improvement to such a tool could be to implement a functionality for the user to select their skill level, resulting in the user more easily finding information that fit their needs.

Lastly, as the digital pedagogue identified the page saver and notebook to be features of user adaptation, and that this was useful for motivation and learning, other means of allowing the user to adapt content can be implemented to increase learning. Features that allow the user to interact, modify, and organize information can simplify the learning process, by allowing the user to interact more with the learning content. This can be connected to the information processing model (section 2.1), by facilitating information rehearsal for the user.

EIGHT

CONCLUSION

8.1 Answer to research questions

In answering the research question, the subquestions will be answered first.

- **RQ1.1:** To which extent can a lesson planning tool that facilitates connection between microlearning curriculum and lesson planning support teachers in learning and teaching digital skills?

Teachers showed a low will or motivation to use this tool. This was due the tool not facilitating the necessary methods for planning as teacher may require for their planning of lessons. However, the tool showed potential for learning if the tool is used, as was discussed in section 6.4.1. Results showed that the tool can support the teacher in getting to a higher level of Bloom's taxonomy, which increases learning.

- **RQ1.2:** To which extent can a note taking tool assist teachers in learning and teaching the curriculum of a microlearning platform?

A note taking tool seems to offer support for learning digital skills by facilitating user adaptation of the learning content in the microlearning service. The user can write synopsis, lists of useful digital tools, or ideas for teaching. This seems to increase motivation through the self-determination theory (section 2.2), as the user's needs of competence and autonomy increases. The heightened motivation, in turn, positively impacts the learners' outcomes and their overall learning experience.

- **RQ1.3:** To which extent can a page saving tool assist teachers in learning and teaching the curriculum of a microlearning platform?

The page saving tool seem to be helpful for the learning of digital skills also by facilitating user adaptation of learning content. The quick and convenient access

to self selected pages in the microlearning curriculum increases motivation and simplifies the learning process, resulting in less easier learning and thereby and a higher learning outcome.

- **RQ1.4:** To which extent can a tool for mapping microlearning content to relevant teaching topics improve motivation to learn from a microlearning platform?

A tool which maps topics that relevant for teaching to the curriculum of a microlearning service seemed to have a very positive impact on the motivation to engage with the microlearning service. A tool such as this simplifies the process of finding courses with content that the user needs a better understanding of. The tool can reduce user frustration making it easier for the user to find courses that are relevant for their professional practice.

- **RQ1:** To what extent does the integration of microlearning curriculum with pedagogical tools enhance teachers' learning and teaching of digital skills?

Throughout the project, all the investigated tools demonstrated the potential to positively impact the learning outcomes of teachers utilizing a microlearning service. However, it was observed that not all tools were able to provide sufficient motivation to sustain user interest. Tools designed specifically for lesson planning purposes did not offer intrinsic motivation, while tools that effectively connected the learning content to relevant teaching situations showed greater potential to keep users engaged and motivated. These findings highlight the importance of creating tools that establish meaningful connections between the microlearning content and the real-life experiences and challenges faced by teachers. By aligning the learning material with practical teaching scenarios, such tools can foster higher levels of engagement and motivation among users, ultimately enhancing the learning experience and outcomes for teachers utilizing the microlearning service.

8.2   Summary

In this design science research project, the supporting of teacher learning of digital skills was investigated. In particular, there was developed four tools as additional features to the microlearning platform DIGIVIDget, namely a lesson planning tool, a page saving tool, a notebook tool, and a learning goal mapper. All tools were designed with the intention to support the implementation of digital curriculum from DIGIVIDget into lesson plans. The project investigated how each of the tools contributed to increase learning and motivation in pre- and in-service teachers to learn digital skills.

The project was based on data from an earlier specialization project Mikkelsen, 2022, and on theoretical background such as self-determination theory, Bloom's

taxonomy, and the information processing model. Literature review showed that lesson planning tools have been created before, but none had been made for the planning of digital skills in the user's lesson.

The project consisted of two design iterations. In the first iteration, a paper prototype was created based on the specialization project and theoretical background. The evaluation consisted of three separate interviews of pre- and in-service teachers. Data from the evaluation was used in the second iteration, where a wireframe prototype was created. The evaluation consisted of one focus group interview of three pre-service teachers, one interview with an in-service teacher, and one interview with a digital pedagogue.

The conclusions drawn from the evaluation data were used to address the research questions and identify implications for teacher professional development in the realm of digital skills as well as any implications for the design of digital tools aimed at teacher professional development. This project contributes to the existing body of knowledge by providing insights into the effectiveness and potential impact of these tools, thereby offering valuable guidance for fostering digital skill development among teachers.

8.3   Limitations

This project is susceptible to potential bias in its conclusions due to several factors. Firstly, the project was carried out by a single researcher, which may introduce researcher bias and limit the diversity of perspectives. Secondly, the same researcher was responsible for both designing and evaluating the prototype, raising the possibility of subjective judgment and lack of independent assessment. Additionally, the project primarily relied on qualitative data, which may be subjective and open to interpretation. All quotes have been translated from Norwegian to English, which is another step where bias can interfere with the translation, causing the presentation of the results to be inaccurate. Lastly, the participants were recruited from the researcher's personal network, potentially leading to a biased sample that may not fully represent the broader population.

The project duration of 21 weeks poses a limitation as it may have restricted the depth and breadth of exploration. With a limited timeframe, it becomes challenging to fully investigate all aspects and potential variations within the research topic. The condensed timeline may have affected the level of detail and comprehensive understanding that could have been achieved with a longer project duration.

Furthermore, the limited number of participants in the project is another constraint. Having few participants reduces the diversity of perspectives and experiences, which can make it difficult to establish robust patterns or generalize the findings. The smaller sample size increases the possibility that any observed patterns in opinions may be influenced by chance rather than being representative of

a broader population.

It is important to acknowledge that the participants in the project who are pre-service teachers, may have limited first-hand experience in the everyday professional lives of experienced teachers. This limitation affects the reliability and generalizability of the data collected, particularly when attempting to understand the prototype within the context of professional teachers. The perspectives and feedback provided by pre-service teachers may differ from those of experienced educators, potentially impacting the applicability and validity of the findings in real-world teaching environments.

Lastly there was no functional prototype implemented in the project. Having a functional prototype could improve reliability of the results, as the evaluation could have included extensive use of the tools in the participants natural work environment.

8.4   Future work

In future studies, it would be valuable to explore the impact of a functioning prototype incorporating the four features presented in this project on the learning and motivation to acquire digital skills. As discussed, teachers demonstrated a stronger motivation to learn digital skills that had immediate relevance to their classroom practices. However, it is essential for teachers to also acquire more general digital skills, even if their direct instructional use may not be apparent. Therefore, investigating effective methods to promote motivation for learning these broader digital skills would be of great interest.

Additionally, it would be worthwhile to investigate the relationship between motivation and the design of learning experiences that emphasize the practical application of digital skills. While the lesson planning tool failed to create the sufficient motivation in order to be utilized by teachers, other means of supporting the user in applying microlearning knowledge in practice would be interesting to be explored.

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APPENDICES

◀▶ Sikt

Vurdering av behandling av personopplysninger

Referansenummer
193182

Vurderingstype
Automatisk ❓

Dato
11.02.2023

Prosjekttittel
Masteroppgave i informatikk

Behandlingsansvarlig institusjon
Norges teknisk-naturvitenskapelige universitet / Fakultet for informasjonsteknologi og elektroteknikk (IE) / Institutt for datateknologi og informatikk

Prosjektansvarlig
Monica Divitini

Student
Kasper Mikkelsen

Prosjektperiode
09.01.2023 - 01.06.2023

Kategorier personopplysninger
Alminnelige

Lovlig grunnlag
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Behandlingen av personopplysningene er lovlig så fremt den gjennomføres som oppgitt i meldeskjemaet. Det lovlige grunnlaget gjelder til 01.06.2023.

Meldeskjema ↗

Grunnlag for automatisk vurdering

Meldeskjemaet har fått en automatisk vurdering. Det vil si at vurderingen er foretatt maskinelt, basert på informasjonen som er fylt inn i meldeskjemaet. Kun behandling av personopplysninger med lav personvernulempe og risiko får automatisk vurdering. Sentrale kriterier er:

- De registrerte er over 15 år
- Behandlingen omfatter ikke særlige kategorier personopplysninger;
  - Rasemessig eller etnisk opprinnelse
  - Politisk, religiøs eller filosofisk overbevisning
  - Fagforeningsmedlemskap
  - Genetiske data
  - Biometriske data for å entydig identifisere et individ
  - Helseopplysninger
  - Seksuelle forhold eller seksuell orientering
- Behandlingen omfatter ikke opplysninger om straffedommer og lovovertredelser
- Personopplysningene skal ikke behandles utenfor EU/EØS-området, og ingen som befinner seg utenfor EU/EØS skal ha tilgang til personopplysningene
- De registrerte mottar informasjon på forhånd om behandlingen av personopplysningene.

Informasjon til de registrerte (utvalgene) om behandlingen må inneholde

- Den behandlingsansvarliges identitet og kontaktopplysninger
- Kontaktopplysninger til personvernombudet (hvis relevant)
- Formålet med behandlingen av personopplysningene
- Det vitenskapelige formålet (formålet med studien)
- Det lovlige grunnlaget for behandlingen av personopplysningene
- Hvilke personopplysninger som vil bli behandlet, og hvordan de samles inn, eller hvor de hentes fra
- Hvem som vil få tilgang til personopplysningene (kategorier mottakere)
- Hvor lenge personopplysningene vil bli behandlet
- Retten til å trekke samtykket tilbake og øvrige rettigheter

Vi anbefaler å bruke vår mal til informasjonsskriv.

Informasjonssikkerhet

Du må behandle personopplysningene i tråd med retningslinjene for informasjonssikkerhet og lagringsguider ved behandlingsansvarlig institusjon. Institusjonen er ansvarlig for at vilkårene for personvernforordningen artikkel 5.1. d) riktighet, 5. 1. f) integritet og konfidensialitet, og 32 sikkerhet er oppfylt.

B - CONSENT FORM - FIRST EVALUATION

Vil du delta i forskningsprosjektet

Lesson planning tool for knowledge application

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke om et timeplanleggingsverktøy kan hjelpe lærere å flette inn undervisning om digitale ferdigheter i timene sine. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Dette prosjektet dreier seg om en mikrolæringsplattform som er ment for å lære lærere digitale ferdigheter. I prosjektet skal det utvikles et timeplanleggingsverktøy som skal hjelpe lærere å bruke kunnskapen de har lært fra mikrolæringsplattformen i timene sine. Mer spesifikt skal det undersøkes om å bruke et slikt verktøy er effektivt for å flette inn ukjent/vanskelig kunnskap i læringsopplegg, om å flette inn ukjent kunnskap i læringsopplegg kan gi økt personlig forståelse av kunnskapen, og hvordan et timeplanleggingsverktøy påvirker læreres motivasjon til å bruke en mikrolæringsplatform. I denne begynnende delen av prosjektet skal det samles data om brukermålgruppen (læreres) karakteristikker og arbeidshverdag for å danne et bedre grunnlag for hvordan et slikt verktøy kan utvikles.

Prosjektet inngår som min masteroppgave som lektor i realfag ved NTNU.

Hvem er ansvarlig for forskningsprosjektet?

Institutt for datateknologi og informatikk ved NTNU er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

I prosjektet spør jeg lærere og lærerstudenter om å delta, fordi dette er brukermålgruppen for programmet jeg planlegger å utvikle.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, vil du delta i et intervju der spørsmålene vil dreie seg om deg som lærer eller lærerstudent. Det vil ta ca 20 minutter. Jeg vil ta lydopptak og notater av intervjuet. Dersom du ikke ønsker lydopptak, vil jeg notere svarene dine mens intervjuet pågår. Lydopptak og notater oppbevares elektronisk.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

Personer med tilgang til data:
- Kasper Mikkelsen, student ved NTNU. Epost: kasperm@stud.ntnu.no. Tlf: 40326982
- Monica Divitini, veileder, professor ved NTNU. Epost: divitini@ntnu.no. Tlf: 73594462

For å sikre personopplysninger vil data lagres på NTNUs skylagringstjeneste. Deltakere vil ikke kunne gjenkjennes i publikasjon.

Hva skjer med personopplysningene dine når forskningsprosjektet avsluttes?
Prosjektet vil etter planen avsluttes 01.06.23. Under prosjektet vil datasett med dine personopplysninger anonymiseres, ved at datasettet refereres til ved en anonym kode, og ikke navn. Etter prosjektslutt vil datamaterialet med dine personopplysninger slettes.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra IDI-instituttet ved NTNU har Sikt – Kunnskapssektorens tjenesteleverandør vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:
- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:
- Kasper Mikkelsen, student. Epost: kasperm@stud.ntnu.no. Tlf: 40326982
- Monica Divitini, veileder. Epost: divitini@ntnu.no. Tlf: 73594462
Vårt personvernombud: Thomas Helgesen. Epost: thomas.helgesen@ntnu.no. Tlf: 93079038

Hvis du har spørsmål knyttet til vurderingen som er gjort av personverntjenestene fra Sikt, kan du ta kontakt via:
- Epost: personverntjenester@sikt.no eller telefon: 73 98 40 40.

Med vennlig hilsen

Monica Divitini   Kasper Mikkelsen
Veileder   Student

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet Lesson planning tool for knowledge application, og har fått anledning til å stille spørsmål. Jeg samtykker til:

☐ å delta i intervju.

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)

C - CONSENT FORM - SECOND EVALUATION

qu

Vil du delta i forskningsprosjektet

Lesson planning tool for knowledge application

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke om et timeplanleggingsverktøy kan hjelpe lærere å flette inn undervisning om digitale ferdigheter i timene sine. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

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Prosjektet inngår som min masteroppgave som lektor i realfag ved NTNU.

Hvem er ansvarlig for forskningsprosjektet?

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Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, vil du delta i et intervju, en brukertest av en applikasjon og svare på et spørreskjema. Alle deler av undersøkelsen er valgfritt å delta på. Intervjuet vil ta ca. en time.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

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Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

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- Monica Divitini, veileder. Epost: divitini@ntnu.no. Tlf: 73594462
Vårt personvernombud: Thomas Helgesen. Epost: thomas.helgesen@ntnu.no. Tlf: 93079038

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- Epost: personverntjenester@sikt.no eller telefon: 73 98 40 40.

Med vennlig hilsen

Monica Divitini   Kasper Mikkelsen
Veileder   Student

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet Lesson planning tool for knowledge application, og har fått anledning til å stille spørsmål. Jeg samtykker til:

☐ å delta i intervju.

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)

D - CONSENT FORM - DIGITAL PEDAGOGUE

qu

Vil du delta i forskningsprosjektet

Lesson planning tool for knowledge application

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke om et timeplanleggingsverktøy kan hjelpe lærere å flette inn undervisning om digitale ferdigheter i timene sine. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Dette prosjektet dreier seg om en mikrolæringsplattform som er ment for å lære lærere digitale ferdigheter. I prosjektet skal det utvikles et timeplanleggingsverktøy som skal hjelpe lærere å bruke kunnskapen de har lært fra mikrolæringsplattformen i timene sine. Mer spesifikt skal det undersøkes om å bruke et slikt verktøy er effektivt for å flette inn ukjent/vanskelig kunnskap i læringsopplegg, om å flette inn ukjent kunnskap i læringsopplegg kan gi økt personlig forståelse av kunnskapen, og hvordan et timeplanleggingsverktøy påvirker læreres motivasjon til å bruke en mikrolæringsplatform. I denne delen av prosjektet skal det utføres brukertesting av timeplanleggingsverktøyet beskrevet over. Det vil si at du som deltaker skal få utføre en rekke oppdrag på en prototype av timeplanleggingsverktøyet. Oppdragene blir gitt mens brukertesten pågår. Hensikten med brukertesten er å undersøke hvordan du som bruker interagerer med programvaren, for så å bruke dette til å evaluere programvaren samt finne muligheter for forbedringer.
Prosjektet inngår som min masteroppgave som lektor i realfag ved NTNU.

Hvem er ansvarlig for forskningsprosjektet?

Institutt for datateknologi og informatikk ved NTNU er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

I prosjektet spør jeg lærere og lærerstudenter om å delta, fordi dette er brukermålgruppen for programmet jeg planlegger å utvikle.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, vil du delta i et intervju. Intervjuet vil ta ca. en time.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

Personer med tilgang til data:
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