Interactive Student-Guide

Developing a Concept for Interactive Learning

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“Motivation is a product of good teaching, not its prerequisite” (Biggs, 1999, p.61).
The project detailed within this report (taking into account the time it took to edit and finalize the report itself) lasted for almost five months. Considering this wide time frame, it should come as no surprise that many different people have been involved in the development process in one way or another. This section is dedicated to those people who have helped me significantly during the development process, and in doing so have contributed to the successful completion of the project.

First off, I would like to thank Åsa Wikberg-Nilsson, my supervisor, for her dedication to my work, as well as all the help she assisted with during the project. That you were always willing to answer my questions and guide me in the right direction (while still leaving lots of room for independent work) is something that I am very grateful for. I also appreciate that I was able to brainstorm and discuss all the various ideas we both had for the student-guide with you.

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So to all of you mentioned above; thank you!

Luleå, 5th of June, 2015
Douglas Karlsson
ABSTRACT

This report details the development process of an interactive student-guide to be used by students at Luleå University of Technology, developed as a project in Industrial Design Engineering (D7014A). The intention was for the student-guide to motivate, engage and aid students with their learning, which in turn would support their dedication and effort towards becoming independent agents. By applying the ideal that is promoted in Industrial Design Engineering – to put human needs in focus – the aim was for the student-guide to truly be designed according to students’ needs.

The methods used during the development process were chosen in order to identify these needs; interviews, focus groups, and discussions were all used for their ability to generate qualitative data. Similarly, the creative methods used were brainwriting and sketching; methods that are easy to get into, but still allow a large amount of freedom.

The project as a whole followed an iterative Stage-Gate process, with a focus group discussion at the first, second and third stage. These provided feedback for the current state of the student-guide, and how it should move forward.

The final design consisted of an app for smartphones and tablets, with a variety of functions that aimed to streamline the studying experience for students. The main purpose of the app was to gather and summarize important information in one convenient location, as well as to provide an effective way for students to interact with each other. Whether the student-guide would actually create any significant change or not is difficult to say at this point, before it has been tested in practice. However, it was developed based on students’ needs defined through participants of several focus groups, and as such it can probably be relatively safe to say that it would assist at least some students. In order to make the student-guide as appealing as possible to more students however, further work may benefit from re-evaluating the final concept of the student-guide. This should be done both in terms of how defining how well it meets students’ needs, but also to ensure that it is backed by relevant theories.

Key words: Student-guide, learning, service design, Luleå University of Technology, Pedagogisk Idé.
Denna rapport behandlar utvecklingsprocessen av en interaktiv studentguide tänkt att användas av studenter på Luleå tekniska universitet, utvecklad genom ett projekt inom utbildningen Civilingenjör Teknisk design (D7014A). Syftet med studentguiden var att motivera, engagera och assistera studenternas inlärning, vilket i sin tur skulle stödja deras hängivenhet och strävan mot att bli självständiga aktörer. Genom att tillämpa det ideal som främjas inom Teknisk design – att sätta människan och hennes behov i focus – var målet att studentguiden skulle utvecklas enligt studenters verkliga behov.

De metoder som användes under utvecklingsprocessen valdes därför för att kunna identifiera dessa behov; intervjuer, fokusgrupper, och diskussioner utnyttjades alla för deras förmåga att generera kvalitativ data. De kreativa metoder som användes, brainwriting och skissning, valdes därför att de är metoder som är lätt att ta till sig, men tillåter ändå stor frihet i användandet. Projektet följde en iterativ Stage-Gate-process, där en fokusgrupper hölls vid det första, andra och tredje stadiet. Dessa gav feedback för studentguidens dåvarande tillstånd, samt hur den borde utvecklas därefter.


**Nyckelord:** Studentguide, lärande, servicedesign, Luleå tekniska universitet, Pedagogisk Idé.
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1. INTRODUCTION

This report details the development of an interactive student-guide, intended for students at Luleå University of Technology. The overall objective of the student-guide is to motivate, engage and support students’ learning. The development is performed as a project in Industrial Design Engineering (D7014A), at Luleå University of Technology. It covers the spring semester of 2015 - around 20 weeks – corresponding to 30 hp.

1.1 PROJECT STAKEHOLDERS

The primary stakeholders of this project are Luleå University of Technology and the project leaders of Pedagogisk Idé LTU (Pedagogical Idea). These two are the main force behind the project's initiation, and play an important role in the development process. The project team consists of one student (the author of this report) as well as participants in Pedagogical Idea; an all-university embracing project at Luleå University of Technology.

Additionally, the users – in other words, the university students at LTU – also play an important part in the project, since they represent the target group for the student-guide. The final product is intended to be able to be used independently by the students (that is, without relation to either teachers or courses), and it is thus important that it is designed according to their needs. The student-guide aims to motivate and aid in the users' studies and is intended to be used as a complement and a further link to existing resources at the university. The main difference is that the interactive student-guide is developed according to the maxim “for students, by students”.

Since the nature of the student-guide is undefined at the start of the project, it is difficult to determine exactly how many additional stakeholders that will be affected. However, the product will ultimately require to be produced, either physically or digitally, which will require additional manpower. This may be in the form of the client Luleå University of Technology, a related organization or a third-party.
1.2 PROJECT OBJECTIVES AND AIMS

The overall objective of the current project is to develop an interactive student-guide to be used by students at Luleå University of Technology. The intention is for the student-guide to motivate, engage and aid the students with their learning, which in turn may lead to improved educational performance. This project is not based on a direct request from a client, but rather is developed as part of Pedagogical Idea, a project at Luleå University of Technology. The initial motto of Pedagogical Idea was “with passion and effort” (Gedda & Wikberg Nilsson, 2012, p. 10, author’s translation), further defined as the goal to engage students in their education and support their development towards becoming independent agents. This also means that the university acts as a client, while the project supervisor partly acts as the client’s proxy.

The nature of the interactive student-guide is yet to be defined and there are no set requirements for it either. This makes it difficult to determine the exact design, function and similar aspects of the final product, as well as what kind of criteria it needs to fulfill. As a result, a major part of the project will be dedicated to research what kind of final design that is best suited for the student-guide, as well as what kind of student-needs it should satisfy. Nevertheless, the aim is to develop a detailed concept that will be ready for production, whether it will be a physical or digital product.
1.3 RESEARCH QUESTIONS

In order to develop a successful interactive student-guide for the students at Luleå University of Technology, the development process needs to be grounded in proper research. This means that the research questions that is intended to be answered in this project are based on two aspects. The first aspect concerns the theory behind the design (both aesthetic- and function-wise); how is the student-guide supposed to be experienced and function in order to support a pedagogical approach? The second aspects concern the students themselves; what kind of requests and demands do they have regarding this type of student-guide? The motivation for this development approach is to make sure that the final product is both based on suitable pedagogical theories, while at the same time being attractive to the users. This in turn defined the research questions presented below.

- How can social and/or digital interaction stimulate learning?
- How is the student-guide supposed to be designed (both regarding visual communication and function) in order to be as pedagogic as possible?
- What kind of resource or study-aid do students need and desire, as a complement to regular lectures and course literature?
- What would motivate the students to use an interactive student-guide?
- Are students interested in increased opportunities to interact with other students and if so, how should this interaction take place?
1.4 PROJECT SCOPE

Since the nature of the final result of this project is very open, it is difficult to define any specific delimitations. Instead these will take form as the project continues and the interactive student-guide develops. However there are still some guidelines that can be set up at this moment.

During the current project, the interactive student-guide is first and foremost developed for those who study Industrial Design Engineering at Luleå University of Technology, though the aim is for it to eventually be developed for any kind of student. Thus, the development process will initially put more emphasis on the requirements and needs of the former. Similarly, while some information may be acquired from teachers, if this information is in opposition to any requirements from the students, the latter will take precedence.

Due to a lack of time and know-how, any kind of planning for a possible production process for the student-guide will not be covered. This applies whether the final product ends up as a physical or digital object, or something else entirely. Instead, the intention is for the development process to create a detailed description of a concept of the student-guide. This concept can then be passed on to production planning, if the client deem this to be desirable.
1.5 THESIS OUTLINE

In the sections presented below is an overview, along with brief summaries, of each of the chapter of this report. The information provided here will give a quick impression of the work and result of the project itself.

The second chapter expands the background of the project that was touched upon in the current chapter. It gives a brief explanation as to the importance of a student-guide, and why the project was initiated.

The third chapter presents the theoretical framework performed during the early stages of the project. The chapter is divided into three categories - in turn divided into separate sub-topics - that were deemed the most important for the project’s progress.

The fourth chapter contains descriptions of the methods used for the development process, both of the methods themselves as well as how they were implemented.

Exactly as the title implies, the fifth chapter presents the results of each stage of the project.

The sixth chapter provides a discussion of the results from each stage, in relation to both the project objectives, as well as the theoretical framework.

The final chapter concludes the project as a whole by returning to the research questions defined in chapter 1.3, and briefly discuss if and how they have been answered.
In this chapter, the background and reason for the initiation of the current project is expanded upon. This includes a general description of what some claim to be one of the more common issues of the modern school system, the current educational situation at Luleå University of Technology, as well as how these add up to spark the creation of the current project.

To claim that education - and all the aspects and areas that it entails – is a controversial subject is no understatement. In order to quell the falling grades of many young students today (Skolverket, 2013), the spotlight is passed from one scapegoat to the next. Some claim that schools don’t take into account the vast difference between students learning styles (Dunn, 2001; Grasha, 1972; Sternberg, 1994), while others oppose this idea entirely (Stahl, 1999). On a similar note, Prensky (2001) argues that a major contribution to the decrease in students’ grades is the fact that present-day curriculum is not designed for the modern student. He notes that students today have drastically changed from their counterparts just a few decades ago, and digital technology is the main force behind this ‘singularity’. This has led to a decrease in motivation for the modern students, mainly due to the contrast between their interest and the present schools’ archaic educational approach (Prensky, 2001). Similarly, the recent PISA (Programme for International Student Assessment) survey of 2012 showed that "underperforming students, especially boys, are slipping further and further behind, the attitude towards school is getting worse and an increasing amount of students consider school to be a waste of time” (Skolverket, 2013, p. 153, author’s translation). Considering that motivation is a key factor to facilitate long-term learning, this issue may be an important point to consider for further research if one intends to inhibit the trend of falling grades (Murayama, Pekrun, Lichtenfeld & vom Hofe, 2012). On the other hand, it might be foolhardy to put the blame entirely on students, as everyone is different. At the same time it is impossible to deny that society looks radically different now than it did just a few decades ago. In light of this, there is certainly an interest in finding new, innovative methods that support students’ learning.
While the PISA-survey mentioned above mainly considers students around the age of 15, there is no reason to exclude neither those practicing a lower nor a higher degree of education. It would make sense that all levels of education should strive to encourage the motivation of students. Considering that the ambition of the LTU project Pedagogical Idea is to support students’ dedication and effort towards learning and becoming independent actors (Gedda & Wikberg Nilsson, 2012), Luleå University of Technology should be no exception.

2.1 PERSONAL REFLECTION

Regarding the situation at Luleå University of Technology, the current design of the curriculum is often considered a controversial topic. Specifically, the setup of a typical school year (and the efficiency of said setup) is something that I feel is frequently debated, both among teachers as well as students. With the current arrangement an entire school year is usually divided into two semesters (fall and spring), which in turn are divided into two study quarters (meaning a full year contains four study quarters). For the typical student, a study quarter consists of two courses; each worth 7.5 credits. With eight courses each year, this adds up to the default value of 60 credits per year. While this arrangement may seem simple and effective, there are a few troublesome points that both teachers and students address from time to time (which is expanded upon later in this report, mainly in chapter 5.1.1 Focus Group 1 – Background). For example, most of the courses at the university are treated individually, and rarely define their relations and dependencies to other courses, or even beyond the university itself. Add to this that most courses are designed to make students feel like they are “starting from scratch” at the beginning, and usually only have a major presentation, project report, or exam at the very end as assessment of whether students should pass or not. This setup commonly makes students consider each study quarter individually from the others; as separate obstacles that are to be overcome one by one until they finally reach the final goal (a completed education). The main problem with this is that many students fail to realize that knowledge can be considered to be built from an entire education as a whole, not just bits and pieces from individual courses. While most students certainly do gain knowledge from the courses they take, it is the experiences both inside and outside the university that ties everything together.
It would not be too unfeasible to claim that it is when these experiences come together that students truly evolve into the independent actors that Luleå University of Technology aspires for them to become.

Another point that needs to be addressed is the fact that Luleå University of Technology already provides a collection of different resources in order to assist students with their study techniques (Ltu.se, 2011b). Most of these resources consists of either instructional videos or texts. These are far from perfect however, as many students note a few issues with these resources. For starters, the university does very little in actually promoting them; usually they may be mentioned briefly during the “hazing period” that most new students go through, but they are rarely (if ever) mentioned again. Add to that the fact that the resources available from the university’s website are difficult to find, and it makes sense that few students actually end up using these.

Secondly, another issue with the resources is that they are “designed” by teachers, which becomes especially apparent in the way they are expressed. They can often be perceived as superior; as a master talking to his apprentice. For example, on the page meant to inform new students of how studies at the university differs from prior education, one finds the following phrasings:

“The studies demands more of you; that you take responsibility. No one will check if you have “done your homework”.

The studies demands more of you, in regards to how much time you need compared to earlier degrees of education. It is often required more than 40 hours per week.

The study pace is higher than at earlier levels of education. It is in your greatest interest to keep up immediately” (Ltu.se, 2011a), author’s translation).

While these tips are certainly not wrong; education at a university level is indeed very different from prior levels, it is the phrasing of these tips (and the mentality that phrasing gives off) that are problematic. These tips seem to put all the responsibility on the student, as if to say that “if you are unable to study efficiently it is probably your own fault”. On the other hand, it is also true that many students (especially new ones) can be a bit lazy at times, and in turn enjoy to put all the blame on teachers and the university instead.
At the same time, if one imagines the perspective of a new, inexperienced student who finds himself taken aback by the increased responsibility that university studies demands, one could certainly discuss the how well the paragraphs quoted above fulfills their purpose. If at all.

Finally, it might also be worth to mention that the study-aid resources provided by Luleå University of Technology – just like the courses themselves – can be seen as a bit individual from each other. There is not really anything that connects them with each other; they are just "there". While this issue may seem insignificant at first, this could actually be an important reason as to why the resources fly under the radar of most students. The study techniques mentioned above, the hazing period, and even the social environment at the university are all but separated from each other. Perhaps more importantly though, they are separated from the educations themselves and excluding the hazing period, many students may go through their entire education without taking advantage of these resources.

Thus, the student-guide developed in the current project is intended as a way of remedying the issues mentioned above. It should try to highlight the connections and relations between different courses (as well as situations outside the university). Similarly, it should also make it easier for students to gather and connect important information (such as the aforementioned study-aid resources) and make them relevant throughout the entire education. Finally, the student-guide needs to be designed from a student’s perspective, and thus avoiding the “teacher mentality” as mentioned above. In other words, by applying the ideal that is promoted in Industrial Design Engineering – to put human needs in focus – the aim is for the student-guide developed in this project to be designed according to students’ needs. An interactive student-guide that is not just another “to-do”-list from the teachers, but rather an efficient tool that engage and aids the students’ in their education. A student-guide for students, by students.
3. THEORETICAL FRAMEWORK

This chapter presents the result of the extensive literature study performed during the current project. The study covers a variety of topics; from a description of industrial design engineering and its applications, to information regarding aesthetic theories, as well as the theories of pedagogy that the student-guide will be based on.

3.1 INDUSTRIAL DESIGN ENGINEERING

To describe the area of industrial design engineering is quite difficult, in part due to the vagueness of the subject. This vagueness stems from the fact that industrial design is an area that covers a lot of different things. March (1994) argues that industrial design originally aimed to simply support engineering and marketing by improving the aesthetic appeal of a product. However, she also notes that several companies in later years have pushed for industrial design as a method of making products more user-friendly. In this sense it has become a more integrated part in the development process of products, instead of just a way to add that little extra flair at the final stage. In a similar vein, Siegel (1995) calls the industrial designer a “user’s advocate” because of their ability to consider the users’ needs. Norman (2013) similarly mentions how poor product design can be the glaring cause of many problems in our daily lives, while good design seem almost invisible due to its intuitiveness. Siegel (1995) also notes that due to the success of products that are developed to satisfy the users’ needs, many companies have begun to re-evaluate their development strategies to put more emphasis on the user. Finally, both Norman (2013) and Siegel (1995) argues that this may have played a role in how industrial design engineering has begun to become an important part in the early development process, instead of something added at the last minute.
3.1.1 USER EXPERIENCE DESIGN

The field of user experience design (often shortened as UX) is a broad and vaguely defined concept (Hassenzahl & Tractinsky, 2006; Kujala, Roto, Väänänen-Vainio-Mattila, Karapanos & Sinnelä, 2011), but is generally summarized as how a person experiences a product or system (Arvola, 2014). This is not only limited to the function itself, but also more “abstract” aspects such as beauty, fun, pleasure, and personal growth, which sets it apart from other more task-oriented fields of interaction design (Hassenzahl & Tractinsky, 2006; Kujala et al., 2011). As it turns out, the wide definition of UX was intentional, since the term was invented by Don Norman in an attempt to cover all aspects of a person’s experience with a system; including industrial design graphics, the interface, the physical interaction and even the manual (Merholz, 2007).

“A modern representation of UX is that it is something that spans across channels, even beyond interactive computer-based systems and applications. What determines a user’s whole experience of a product or a service is how the user comes into contact with it through acquaintances on social media, sees it in advertisements, gets to know more during a customer meeting, creates an account on the internet, starts using it, acquires material sent home by mail, and so on” (Arvola, 2014, p.22, author’s translation).

According to Kujala et al. (2011), one of the main differences between UX and usability is the fact that the former puts more emphasis on the enjoyment of a product or system; in other words, how much a user enjoys interacting with it. Considering this trait, it would appear natural to take aspects of UX into consideration during the development of the student-guide. The aim is for students to actively and voluntarily use it, and in order for this to happen, the development needs to consider the user experience in its entirety. This means that beyond investigating how well the student-guide fulfills its purpose, it is equally important to consider the more emotional experiences of the interaction, as argued by Hassenzahl and Tractinsky (2006) and Kujala et al. (2011) above.
3.1.2 USABILITY

Even considering how far product development processes has developed in recent years, Brumberger and Northcut (2013) argues that there still seem to exist an archaic rivalry between two certain fields; science and design. Considerably so in areas such as engineering, filled with hard facts and rationale as argued by Roeser (2010); there is no place for the creative and ditzy artist. Norman (2013) similarly notes that engineers are often trained to solve problems, while designers are trained to define them. But while these two areas may be quite different from each other, this does not mean that they can’t mix. One might even argue that what characterizes an efficient industrial design engineer is the ability to cover the gap between the two fields. March (1994) points out that the human-centered values of user-centered design can be used in product development “to encompass the cognitive aspects of using and interacting with a product, or how logical and natural a product is to use, as well as the emotional aspects, or how people feel about using it” (p.144). In that sense, by implementing the "soft" values of design and art into a product development process, it may be possible to create a product that not only serves its intended function, but also caters to the need of the user. Scolari (2009) uses the following definition for these aspects of usability:

"- Effectiveness: the accuracy and completeness with which specified users can achieve specified goals in particular environments.

- Efficiency: expanded resources in relation to the accuracy and completeness of goals achieved.

- Satisfaction: the comfort and acceptance of the work system by its users and other people affected by its use."

(p. 2)

In a similar vein, Ericson, Bergström, Larsson and Törnnd (2009) notes that “‘understanding customer needs’ and ‘being customer focused’ is increasingly important for companies to achieve product innovation” (p.89). However, they go on to mention that this does not simply mean trying to categorize – or “know” – their customers, but rather to analyze and observe the user in the real environment where the product will be used. Gathering this kind of information can be quite difficult however, since it differs so greatly from the traditional metric-based, problem-solving approach used by engineers (Ericson et al., 2009). Nevertheless, as products and technology grow more complex the need for intuitive
and user-friendly design grows with them, as evidenced by the increased frequency of usability-testing in product development processes (Boersema, Hoonhout & Zwaga, 1999; Barbieri, Angilica, Bruno & Muzzupappa, 2013). It is no coincidence that a majority of successful product companies of the late 20th/early 21st century has re-defined the way they consider design in the product development process; in the words of Siegel (1995):

“That trend contrasts sharply with the more typical situation in which managers view design as being only about the look and feel of a product, see industrial designers’ role as supporting engineering or marketing, and use designers in the refinement rather than the definition of a product. The shift within companies from cosmetic design to use-centered design is a big paradigm shift in its own right. It sets the stage for transformative, design-led organizational shifts” (p.151).

In the case of the current project, no matter what kind of end-product the interactive student-guide will turn out to be, the aspect of usability will play a significant role. Once the users’ needs has been defined it is up to the student-guide to satisfy them, and the theory of usability will be an important tool to do so. Just as March (1994) noted, it is important to not only cover the cognitive aspects of a product’s design, but also the ones regarding emotion. In other words, it is just as important to consider the experiences behind why a product is used, as to how. If done properly, these two aspects may come together to create a student-guide that both engages and motivates the user to use it. Additionally, as Norman (2013) argues:

“[Designers] first spend time determining what basic, fundamental (root) issue needs to be addressed. They don’t try to search for a solution until they have determined the real problem, and even then, instead of solving that problem, they stop to consider a wide range of potential solutions.” (p. 219)
This human-centered design mentality will also affect the outcome of the development process of the student-guide. Not only will it be necessary to define what the students’ needs are, but also why those needs exist in the first place. The intention is to go beyond a simple quick-fix product; the student-guide is not to be a simple “cheat” that helps students pass their exams, but rather something that encourages them to willingly engage in and take responsibility for their own learning process. This will hopefully allow more students to achieve the intended learning outcomes.
3.2 VISUAL COMMUNICATION

The student-guide developed in this project needs to contribute to the user’s motivation and commitment to learning. After all, what good is a product that is left unused? An important factor in achieving this outcome is to have a design that is attractive to the user, and encourages usage. However, what constitutes a pleasant aesthetic is often considered as subjective, which means that one design can rarely (if ever) satisfy everyone. Nevertheless, there are still a few key points that can help in developing a good design. On the other hand, no matter how pleasant the product may be to look at, it does not matter if the aesthetic hinders the usability of it. A good design is not only eye-pleasing but also intuitive, in order to simplify the user experience. This chapter details some of the theories regarding how to develop a design that embodies these ideals.

3.2.1 SEMIOTICS

The theories of semiotics were developed in the early 20th century (Crow, 2010), when a Swiss professor in linguistics – Ferdinand de Saussure – and an American philosopher - Charles Sanders Pierce – performed studies revolving signs; the meaning assigned to them, and how they are interpreted (row, 2010; Mono, 1997). In his model, Pierce divided signs into three separate categories; icons, index and symbols (Crow, 2010). According to Bergström (2001) and Crow (2010), an icon is defined as a sign that resembles the very object it represents (see chapter 3.2.1.3 Icons for a more detailed definition), an index as a representative link between a sign and the object (such as how a tail is an index of a dog), and a symbol as an “agreed” relationship between a sign and an object (such as the letters of the alphabet; they do not really mean anything by themselves, but we are taught to assign the meaning that ‘the letter A is the letter A’). These factors play an important role when it comes to product design, as it determines how the product itself will be perceived (Westholm, 2002). As an example, Scolari (2009) notes that something as simple as reading the morning newspaper is greatly affected by the theories of semiotics. He mentions that attention – and by extension the perceived importance – is focused on the articles on the upper part of the page, articles with pictures, as well articles on the first page. These aspects may appear subtle, but they play a great role in how the paper (or in a more general sense; a product) is “used”.

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Three aspects of semiotics that are of particular value for the current project, are archetypes, gestalts, and icons which are explained below.

### 3.2.1.1 Archetypes

An archetype is an innate product of “unconscious biases and dispositions that has been “hardwired" in the brain over the course of human evolution” (Lidwell, Holden, Butler & Elam, 2010, p.28). While these covers such varying topics as storytelling (with its hero and villain archetypes) and myths (including aspects of death and rebirth), they are also used frequently when designing products (Lidwell et al., 2010; Tsai, 2006). Usually these archetypes are called upon when it is desired for a product to instill a certain response - or feeling - into the beholder, such as the outlaw archetype of Harley Davidson bikes, or the hero archetype of Nike products (see Figure 1 below). In a similar vein, Roeser (2010) argues that the design of products and infra-structures also influence our behavior. Thus, by taking advantage of the meaning behind archetypes when designing a product, it may be possible to change how the user approaches it (Tsai, 2006). This may in turn be used to increase the usability of the product.

![Figure 1: A pair of Nike sneakers, representing the hero archetype. The sport brand itself is in fact named after the ancient Greek goddess of victory (Haus, 2008). Photo: Pixabay.com; covered by Creative Commons.](image-url)
Archetypes may prove beneficial when it comes to the development of the student-guide. No matter what kind of media the end-product will utilize, there will still be a need to take into account the aesthetic and functional design. In order for the student-guide to evoke certain responses or experiences within the user, it may be useful to take advantage of certain archetypes and have the design of the end-product reflect what they represent. For example, utilizing archetypes that indicates excitement while simultaneously avoiding those representing typical school work and mandatory assignments, may help with making the student-guide appear more attractive to use.

3.2.1.2 Gestalt Psychology

The theories of Gestalt psychology originated in 1910 by three Germans psychologists; Max Wertheimer, Kurt Koffka and Wolfgang Köhler (Behrens, 1998). The theories themselves depicts how a person perceives objects, shapes and similar elements, and more importantly how they relate to each other. Lidwell et al (2010) mentions what is known as the Gestalt principles of perception, which summarizes these aspects. The authors go on to define some of these principles accordingly;

**Closure:** Defines the tendency to view a set of several, individual elements as a unified whole (if possible) (Lidwell et al, 2010). This includes subconsciously closing gaps and filling in missing information, in order to complete a recognizable pattern, such as the triangle in Figure 2 to the left. This principle also asserts that elements that are enclosed together belong together (Bergström, 2001).

![Figure 2: A figure depicting the law of closure. The indents in the circles are perceived as a unified triangle, even though the shape is not really there.](image)

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**Good Continuation:** When viewing several elements, those that are aligned with each other are perceived as a single group, or related to each other (Lidwell et al, 2010). Figure 3 to the left is interpreted as a single wobbly line, instead of four separate lines aligned with each other.

**Figure 3:** A depiction of the law of good continuation.

**Law of Prägnanz:** This principle asserts that when a person is presented with ambiguous elements, these are usually interpreted in the simplest way possible (Lidwell et al, 2010). For example, as seen in Figure 4 to the left, the pattern is interpreted as five linked circles (a), rather than nine separate pieces (b).

**Figure 4:** An example depicting the law of Prägnanz. Figure 4 a) shows five circles linked together, whereas figure 4 b) show nine separate pieces adjacent to each other.
**Proximity:** States that two or more elements that are close together are perceived as more related compared to those further away (Bergström, 2001; Lidwell et al, 2010). This principle is commonly used in layout design, as it is a powerful tool for indicating objects and elements that relate to each other. In Figure 5 to the left, the dots in a) are perceived as a single group, while the dots in b) instead are perceived as being divided into three different groups.

![Figure 5: The Gestalt law of proximity.](image)

**Similarity:** Elements that have a similar appearance are perceived to be related to each other, or share common attributes (Bergström, 2001; Lidwell et al, 2010). Compare with the shape of buttons on a remote control; those that perform similar tasks (such as the volume buttons) usually have the same shape. As the example in Figure 6 shows, even though the diamond shapes are mixed in together with the circles, they are perceived as a single group, and vice versa for the circles.

![Figure 6: A figure depicting the law of similarity. The diamonds are perceived as being part of the same group, or sharing attributes with each other. The same goes for the dots.](image)
By taking advantage of these principles in the design of products, it is possible to change their aspects or attributes. For example, gestalt theories were used for camouflaging American battleships during World War I, as an attempt to confuse German submarine torpedo gunners (Behrens, 1998; Lidwell et al., 2010). The same can be said for modern military equipment, which uses colors that “blend in” with the environment. Similarly, Gestalt psychology can also be used to increase usability in products. Such was the case with Thomson's System Link remote control, which took advantage of the good continuation and proximity principles by clustering the VCR-buttons separately from the television buttons (March, 1994). Relating to this, it would not be infeasible to claim that the Gestalt theories may also offer some value for the development of the student-guide. As opposed to archetypes described above which could be used to affect the experience of the end-product, Gestalt psychology would instead mainly influence the usability. The five principles that are presented above all concern the subconscious impression of a design, which in turn could affect how the user interacts with the product itself. By properly taking advantage of these aspects, it might be possible to subtly “guide” the user of how to properly use the student-guide, reducing the risk of errors, and leading to a more pleasant experience overall.

### 3.2.1.3 Icons

When Charles Sanders Peirce were working on his model of semiotics, he defined one of the categories a sign could belong to as icons (Crow, 2010). Bergström (2001) and Crow (2010) defines an icon as a sign that resembles what it represents, such as the flammable icon commonly found on everyday objects (Figure 7). In this case, the icon is depicted as the flames themselves, and it is most likely possible for any person who has encountered any type of flame before to recognize the meaning of the icon itself.

![Figure 7: A typical icon found in everyday life. Photo: Pixabay.com; covered by Creative Commons.](image)
Contrast with the symbol category mentioned above, where prior knowledge is required in order to interpret the sign correctly (Crow, 2010).

The author goes on to mention that icons are not limited to images alone, but rather even words can represent the sound they refer to. Onomatopoeic words can be defined as iconic, in that they resemble the sound they represent (such as ‘woof’, ‘bang’, or ‘pow’) (Crow, 2010).

When the graphic design of the student-guide is to be developed, icons hold considerable potential in increasing the usability of the final design. Since icons depicts the signs they represent, they might be used as a way to visualize the functions of the student-guide to the user without using any text. This in turn may lead to a better user experience, as the final design might become more intuitive and feel more natural to use.

### 3.2.2 AFFORDANCE

The term affordance was coined by Gibson (1986) and can in broad strokes be defined as the co-dependent relationship between an animal and the environment that surrounds it (Cabiddu, Carlo and Piccoli, 2014; Franchak, van der Zalm and Adolph, 2010; Hsiao, Hsu and Lee, 2012; Warren, 1984). More specifically, the concept details what opportunities and possibilities of action an animal perceives that the environment offers.

“For example, if an object which has a rigid, level, flat and extended surface and it is about knee-high to human, then it affords sitting-on. If a human can detect visual information of the five properties, the object can offer the affordance of sit-ability to the human” (Hsiao et al., 2012, p.126).

This definition also means that affordance is an ambiguous subject, which changes from moment to moment, as a consequence of both the environment and the observer being in constant flux (Franchak et al., 2010; Hsiao et al., 2012). As an example, two different observers can perceive the same environment in two entirely different ways, as “a farmer might perceive that a hill offers him the opportunity to feed grazing livestock, whereas a tourism entrepreneur might perceive the same hill as a surface upon which to climb, cycle, or ski” (Cabiddu et al., 2014, p. 177). Similarly relating to the quote by Hsiao (2012) above, depending on the material and thickness of the object in question as well
as the physical properties of the human, the object may only offer sit-
ability to someone below a certain weight. As such, one might consider
affordances to be a very subjective concept, which varies from person to
person and depending on the surroundings.

In product design, Norman (2013) relates the concept of affordance as to
how a user perceives a product should be used, just based on the design.
In other words, affordance may allow the user to understand how a
product is used, just by looking at it. You and Chen (2007) argue that the
appearance features of a design can direct a specific user’s action, which
would mean that the design of a product influences how users interact
with it. In a similar vein, Hsiao et al. (2012) argues that “[a]n effective
evaluation method of affordance helps designers identify earlier the
appearance features of a product necessary to be optimized, which also
assists users to operate the product easily even when using a complex
product for the first time” (p. 127). Based on this, it may possible to
assume that efficient consideration of affordance during product
development can increase the usability of a product.
3.3 THEORIES OF PEDAGOGY

In order for the student-guide that is developed in the current project to successfully support student learning, it needs to be based on actual pedagogical theories. However, as there are a vast amount of different theories regarding learning, this study narrows down the focus to two specific theories; community of practice and constructive alignment. The reasoning behind this choice is that these theories put an emphasis on social interaction, the educational environment and learning that goes beyond just lectures (Biggs, 1999; Wenger, 1998), which are three aspects that the student-guide aims to embody. As a side-effect of this, there are a few aspects that overlap between the two theories. Additionally, a third section details the idea of threshold concepts. The ideas of threshold concepts can be applied to most pedagogical theories and as such hold potential value for this project.

3.3.1 COMMUNITY OF PRACTICE

Wenger (1998) argues that humans are social beings by nature and as a consequence learning can be seen as a social phenomenon.

"We interact with each other and with the world and we tune our relations with each other and with the world accordingly. In other words, we learn” (p.45).

This can, to an extent, be said to be the definition of the theory communities of practice; to be part of an organization, an enterprise or social community and evolve through continuous interaction with other participants (Wenger, 1998). Biggs (1999) makes a similar comparison: “Learning is thus a way of interacting with the world. As we learn, our conceptions of phenomena change, and we see the world differently” (p. 4). Kumpulainen and Wray (2002) argues that conventional pedagogical practices are being challenged by a more collaborative manner of learning, putting emphasis on “collective meaning-making and socially shared expertise” (p. 145). This in turn leads to teaching and learning being constructed through social interactions.

Haneda (2006) notes that the theory of communities of practice was brought forward as a sort of opposition to the traditional cognitive psychologists’ views that learning was first and foremost an individual achievement. Knowledge is thus not something that is stored in an individual’s mind, but rather a form of understanding that evolves over
time as people interact with their surroundings and the relationships therein. As a result “learning is an intrinsic and inseparable aspect of any social practice, not the goal to be achieved, and it occurs when people engage in joint activity in a [community of practice], with or without teaching” (Haneda, 2006, p. 808). The last part is of particular interest, as it notes that learning doesn't necessarily have to occur in a scholarly context, but rather in any form of social community. As an example, Lave and Wenger (1991) mentions Vai and Gola tailors, Yucatec midwives, meat cutters, naval quartermasters, and nondrinking alcoholics as a variety of examples of (somewhat unorthodox) communities of practice. To further point out the non-scholarly aspect of these communities; “with the exception of the butchers, all involve (a) apprenticeship learning in nonschool [sic] settings, (b) little explicit teaching, and (c) newcomers’ assuming increasingly responsible roles over time” (Haneda, 2006, p. 809).

The educational aspect of a community of practice can be implemented in several manners in a curriculum. Chang, Chen and Li (2008) developed an online community for students to share and comment their portfolios, called Coursework Journal. The community was modeled after a journal-publishing community and intended to solve the disadvantages of present portfolio-sharing systems.

*However, most published coursework products include only the final versions of the course work. Many learning experiences, which exist in the form of personal notes, discourse, or an individual’s mind, cannot easily be shared with peers in the context of traditional assignment activity. Students may not know what is worthwhile sharing, or how to describe things in such a way as to let peers understand. Some students are also unwilling to share knowledge with peers. Therefore, this sort of knowledge exchange is often ineffective” (Chang et al., 2008, p. 236).*

Chang et al. (2008) argues that internet-based peer assessment can promote critical thinking as well as interaction. As a result, online communities has great potential to encourage students to construct and share knowledge, as students can exchange information, communicate with peers, access learning materials and participate in learning activity online. The authors goes on to note that online communities can be a useful extracurricular learning tool, if they manage to promote students to *actively* share and construct knowledge.
After all, there is a risk that only some students will participate actively, while others take a more passive role. However, as Lave and Wenger (1991) noted, newcomers to a community of practice will often take a peripheral role initially, and move towards core participation overtime. This means that the more familiar the students get with the online community, the higher the number of active participants will be. This was indeed confirmed with the Coursework Journal, where the number of submitted assignments and peer assessments increased as time went on (Chang et al., 2008). But perhaps more importantly, the authors noted that students learning performance – as well as the quality of the submissions – showed an increase as a result of the online community.

However, there are some issues regarding the theory of community of practice, and learning through social interaction as a whole. For example, Yakhlef (2010) argues that to insinuate that knowledge is not stored in the individual’s mind is to ignore the large amount of content knowledge passed over millennia of years and which doesn’t require participation. By content knowledge the author means “what is known, or the corpus of knowledge that does not belong to any particular individual or context (such as scientific knowledge, historical knowledge, technological knowledge, management knowledge, etc.)” (p. 39). To put it simply, communities of practice as a form of pedagogy ignores the potential and importance of the individual. Additionally, Harvey, Cohendet, Simon and Dubois (2013) found that communities of practice doesn’t fit all types of organizations, as implementing one into a professional bureaucracy proved to be quite challenging. The main cause of this was the highly informal degree of the interactions within the community of practice, which was new to the employees. Similarly, the vagueness of the activities used in the community as well as the absence of guidelines caused tension among the participants, an issue that is noted by Handley, Sturdy, Fincham and Clark (2006) as well. “Instead of being stimulated by vague and loose structures, the professional bureaucracy employees showed an intolerance of ambiguity and were incapable of taking control in unstructured situations” (Harvey et al., 2013, p. 34). Nevertheless, while the authors still realize the potential of communities of practice, they argue that it is important to be aware of the context in which they are used.

The theories of community of practice hold a lot of interest for this project, mainly due to the social aspect of the student-guide. As has been stated, the intention is for the guide to be used by the students, unrelated to any specific courses or educations. Yet as both Biggs (1999) and Wenger (1998) argue, learning is a social experience.
From this perspective it would make sense for the student-guide to take this into account. Especially the interactive part of the student-guide, which can both refer to interacting with the product itself or interaction with fellow students. The study performed by Chang et al. (2008) is also of particular interest, as it noted the positive aspect of social interaction in a digital environment and how it can influence learning. This shows that there may be potential for the interactive student-guide as a digital platform.

3.3.2 CONSTRUCTIVE ALIGNMENT

Biggs (1999) (the main proponent behind the theory of constructive alignment), Gibbs and Habeshaw (1989) make a distinction between two kinds of learning; a surface approach and a deep approach. The former "refers to activities of an inappropriately low cognitive level, which yields fragmented outcomes that do not convey the meaning of the encounter" (Biggs, 1999, p. 4). In other words, the kind of “learning” that takes place when a student simply listens to a lecturer, takes notes and possibly memorizes them. However the student doesn’t reflect on what is actually said, resulting in knowledge that is difficult to apply to later scenarios. The latter approach "refers to activities that are appropriate to handling the task so that an appropriate outcome is achieved" (Biggs, 1999, p. 4). This can be further described as a way of interpreting, analyzing and theorizing around the information that is being taught. As a general rule, the latter way of learning leads to a better comprehension of subjects, which also means that the knowledge can more readily be applied in the future. In this sense, to learn is not simply to gather information and memorize it, only to blurt it out during the final exam (and consequently to forget it all afterwards), but an educative conceptual change (Briggs, 1999). Gibbs and Habeshaw (1989) also notes that one common reason behind students adapting a surface approach is the presence of unrealistic syllabuses. "They are too wide, they are too detailed and they are over-ambitious in terms of the level of understanding which students are required to achieve in the time available" (p. 20). As a result, many students try to either cover all the subjects - although to a very brief degree - or try to cover just a few subjects fully. Either way, the result is a collection of students who only know a slight part of what is "expected" from them (Gibbs and Habeshaw, 1989).
On the other side of the spectrum, Briggs (1999) also defines three levels of teaching that teachers may assume. These levels considers the teacher's point of view; in other words, how do they approach their teaching?

- **Level 1:** According to Biggs (1999), the first level focuses entirely on the student. The entire role of the teacher (in their own eyes) is to act as an expert and provide the proper information to the students. Once the information has been presented, the teacher is done. Note the choice of words; the information is *presented*, not *taught*. It is up to the student to take in the information and analyze it, read the recommended pages, and be up to date with the assignments. If it happens that a student has problems with understanding the information provided during lectures, it is because he/she lacks skill. It is entirely unrelated (and of no concern) to the teacher. In this sense, this level of teaching is performed not with the aim to teach, but rather to sort out the good students (i.e. those that are natural deep learners), from the bad ones (the surface learners). Briggs (1999) notes that this is level of thinking is mostly common in new teachers.

- **Level 2:** The second level of teaching instead puts the focus on the teacher (Briggs, 1999). While the main idea is still to transfer information from an expert (the teacher) to a learner (the student), the teacher is now aware that he/she needs to transmit concepts and understandings, not just hard facts. In this sense, the main responsibility to successfully transfer the knowledge now lies with the teacher, as opposed to the student in the former level. As a consequence, what is learned is dependent on what the teacher is doing and not what kind of students are taking the class. There are still some issues with this kind of thinking though, as the focus is entirely on what the teacher is doing without taking into account if the students are actually learning anything.
- **Level 3:** The third and final level once again puts the focus on the students, but this time with a different intention. The emphasis is to make sure that “student activities leading to appropriate learning are being supported” (Biggs, 1999, p. 7), in other words to investigate what the student does and how that leads to learning. This means that there are three viewpoints that the teacher needs to be aware of (Biggs, 2011):

  1. What the students are to learn, as well as the desired outcome of their learning needs to be defined. In other words, the teacher needs to clarify what the student should be able to do after having been taught a topic.

  2. Additionally, the teacher needs to have clearly defined what it means for a student to have understood the content that is to be taught. This requires that the level of understanding the students are to achieve is clearly specified.

  3. Finally the teacher needs to be aware of what kind of teaching and learning activities that is required to achieve these levels of understanding. In other words, the teaching materials (lectures, literature, assignments and so on) needs to be attuned in such a manner that it aids students in achieving these goals.

These two theoretical concepts - regarding the learning approach from students, as well as the teaching approach from the teachers – make up the main definition of what constructive alignment is. The first part – constructive – comes from the constructivist theory; students construct knowledge through their own activity and observations of events, based on earlier experiences (Biggs, 2011; Chang et al. 2008). The second part – alignment – comes from a principle in curriculum theory that emphasizes the importance of aligning assessment tasks with what is to be learned. In other words it is important to clearly define what the students are to learn, after which the teacher needs to teach and assess in a manner that is aligned to meet this goal (Biggs, 2011).
In a similar manner, Gibbs and Habeshaw (1989) argues that the assessment system is an important driving factor with many students. However, they also note the importance of the way in which assessment is handled, which is crucial in affecting the students’ motivation. If done properly though, the student has a better chance of taking a deep learning approach, which may lead to an increased gain in knowledge.

While the concept of constructive alignment may appear almost obvious and omnipotent, it is not without controversy. Jervis and Jervis (2005) considers constructivism to be unscientific in some of its forms, and "diverts attention from the need for well-qualified teachers" (p. 9) when implemented in school science. In this sense, "constructivist views of learning appear incompatible with what some might call the prescriptive nature of outcomes-based education" (Poole, 2013, p. 345). Furthermore, Johansson, Skoogh and Williams (2012) found that a common discussion regarding constructive alignment was whether it actually improves the quality of education, or if it instead limits the creativity of professional and motivated teachers. On the other hand, the authors also notes that most teachers find that they can implement creative learning activities and assessment tasks based on constructive alignment ideas, in order to still meet the desired outcomes. In addition, constructive alignment allows for clearly defined objectives, activities and tasks, which improves the communication between courses and to students (Johansson et al., 2012).

A majority of constructive alignment concerns the design of the curriculum, assignments, and assessments and how these needs to be aligned in order to ensure the desired learning outcomes from the students (Biggs, 1999). From this point of view, these theories may not appear to have too much to offer the current project, as the interactive student-guide is not intended to be bound to specific courses or their content. However, the desired outcome – no matter which course or education it concerns – is still for all students to acquire a deep learning approach. The intention is thus for the interactive student-guide to aid the students in this endeavor. An important question would then naturally be how the student-guide can promote that such alignments may occur, in order to motivate students to achieve a deep learning approach. Additionally, the different levels of teaching may hold some values as well, as the student-guide can hopefully act as a complement to those courses were the teachers have a somewhat lacking approach to their teaching.
Finally, a subject which also needs to be considered for this project is the idea of threshold concepts. For certain subjects there exists specific concepts or pieces of information that is vital to understand in order to fully grasp more complicated parts of the same subject, sometimes referred to as “portals” (Meyer & Land, 2003). The concept of entropy in physics as well as imaginary numbers in mathematics, for example, are two central themes in the higher levels of the subjects, yet they can be quite troublesome for new students in the fields (Meyer & Land, 2003, 2005). According to Meyer and Land (2003), a threshold concept usually carries five distinct characteristics. They are transformative, meaning that as an individual takes in knowledge and reflects upon it, it changes who they are, how they see the world and how they feel (Stacey & Stickley, 2012). Secondly, they are probably irreversible; once the learner has grasped the subject they are unlikely to forget it and it can only be unlearned through considerable effort (Meyer & Land, 2003; Stacey & Stickley, 2012). They are integrative, which means that “they expose the hidden relatedness of phenomenon which may have originally appeared disconnected or irrelevant to the learner” (Stacey & Stickley, 2012, p. 535). In other words, threshold concepts have a tendency to reveal relationships between several different concepts or subjects, which appeared to be unrelated beforehand. They can also potentially be bounded, in the sense that concepts have their own limits, and these limits may act as thresholds on their own, toward new conceptual areas (Meyer & Land, 2003). Finally, threshold concepts are also considered potentially troublesome, or are known to contain troublesome knowledge, as a majority of students may show difficulties grasping the subject (Meyer & Land, 2005; Stacey & Stickley, 2012). This may be because the subject itself is problematic, or because it requires the student “letting go of customary ways of seeing things, of prior familiar views” (Land, Rattray & Vivian, 2014, p. 200).

The theory of threshold concepts is not without criticism though. Rowbottom (2007) specifically notes the ambiguity of the theory, claiming that several authors seem to have entirely different definitions of what a threshold concept actually is. He goes on to mention the weak explanation of the term by Meyer and Land (2003), mainly the usage of words such as ‘is likely to be’, ‘probably’, ‘possibly often’ and ‘potentially’. “It is therefore remarkable that Meyer and Land not only fail to specify what is essential to a threshold concept, but also neglect to explain what they understand a concept to be” (Rowbottom, 2007, p. 264). Rowbottom (2007) also notes that another consequence of the
ambiguity of threshold concepts is that what may appear as troublesome and transformative knowledge for one person, doesn't necessarily have to be so for another. Sandri (2013) similarly argues that “[i]t needs to be said that in line with learner-centred pedagogy, the nature and experience of a threshold concept will vary from learner to learner and how it is understood or engaged with will obviously differ based on the life experiences of every learner” (p. 817). In this sense, what makes a certain knowledge a threshold concept (i.e. transforming, irreversible, integrative, bounded, and troublesome) may appear to be quite subjective. On the other hand, this doesn't mean that threshold concepts are useless on their own, as they can still provide help with shifting the focus of teaching to increase learning of potentially problematic areas (Jordan, Tracy & Johnstone, 2011; Meyer & Land, 2005; Sandri, 2013).

The reason threshold concepts are taken into account in this project is similar to the reasoning regarding constructive alignment. While the theories of threshold concepts may not really affect the design of the interactive student-guide itself, it will still be important to have their characteristics in mind during the process. After all, defining threshold concepts within subjects (and more importantly how to overcome them) could be an important part in stimulating a deep learning approach, which is what the student-guide is intended for. Thus, by taking into account the characteristics of threshold concepts while developing the interactive student-guide, the end result may have an increased chance to engage and motivate learning.
3.4 CONTEXT OF THEORETICAL FRAMEWORK

The three subjects which the theoretical framework has been based around are quite varied in their nature, and how they are relevant to the current project may not be immediately obvious. This chapter provides a brief summary and discussion regarding how each of these three topics affected the development process of the study-guide.

The subject of industrial design engineering played an important role in ensuring that the development process took the users' perspective into account. In other words, making sure that the final design would be both easy and satisfactory to use. Similarly, the information regarding this topic also promoted a scientific and reliable development process, increasing the likelihood of an efficient and desirable end result. The theory summarized in this topic were mostly used during the background research (by aiding in defining the user needs), concept development (through the creation of a survey), and detail development (by helping evaluate the generated concepts based on the defined needs, as well as the design of a customer journey).

The subject of visual communication was chosen in order to ensure that the graphic design of the student-guide would be based on valid research. Hopefully this would promote usability, by increasing the intuitiveness of the end result. This subject was mostly used during the concept development and the detail development (by influencing the visual design of the concepts, as well as the final design).

The final subject, theories of pedagogy, is slightly more difficult to define in its usage, as the implementation of that knowledge was not as straightforward as with the other two topics. Initially, the theories were used to get a better understanding of the overall situation at the start of the development process. Similarly, the information was also used when evaluating the discussions generated during the focus groups, as a means to draw parallels between the participants' thoughts and actual research. As such, the theories of pedagogy was mostly used during the background research, concept development and detail development stages.
4. METHOD AND IMPLEMENTATION

As has been stated earlier in this report, it was of major importance that the student-guide was to be designed according to the needs of the users. As a result of this, the methods that were used in the current project were chosen in order to best achieve this goal. They were chosen for their ability to acquire qualitative data, and because they might allow for additional analysis of areas of interest, as opposed to methods with a more quantitative nature. Coffey and Atkinson (1996) mentions that part of the value of qualitative data-gathering methods is their explorative nature. Based on this assumption, qualitative data would be useful for the current project due to the fact that the project team was more interested in the students’ motivation and thoughts, as opposed to mere opinions. The downside to this was that there was a risk of the data being one-sided, or only representing the opinion of a minority of the users. In order to counter-balance this, the intention was to have a large diversity of users as possible participate (in relation to their background, field of education, and age).

Additionally, the development process for the current project was based on a slight variation of the Stage-Gate process. This reasoning was based on the fact that the development process of the project was of a very explorative and innovative nature. A Stage-Gate process such as the one used in this project would allow for a larger degree of freedom in relation to the development activities used, while at the same time defining some limitations of what each stage needed to provide.

4.1 STAGE 0 - PLANNING

The first task that needed to be addressed when the current project was initiated was to prepare a proper schedule. As the scope for the development was quite extensive - spanning 20 weeks - a properly defined plan would be beneficial in making sure that the right amount of work was performed at each stage. The initial preparation phase thus resulted in a project plan (appendix I). The planning itself was based on the Stage-Gate process, which in turn was visualized through a variation of a Gantt-chart. The theoretical theories regarding these two concepts, as well as descriptions of how they were implemented into the current project are presented below.
4.1.1 STAGE-GATE PROCESS

A Stage-Gate process is a conceptual and operational map for successfully moving a project or process from the initial idea to a possible launch, or further yet (Cooper, 2008; Van Oorschot, Sengupta, Akkermans and Van Wassenhove, 2010). The main objective of a Stage-Gate process is to aid in properly allocating “scarce” resources in a project, such as people, budget and time, as well as to bring order to the sometimes chaotic process of developing new products (Grönlund, Sjödin and Frishammar, 2010; Van Oorschot et al., 2010). A typical Stage-Gate process consists of several stages, each followed by their own gate (Cooper, 2008; Grönlund et al., 2010). Each stage contains a set of required or recommended activities to be performed, in order to move the project towards a desired goal; the early stages usually consists of discovering opportunities and generating ideas, while latter stages focus on developing and testing concepts, as well as commercialization (Grönlund et al., 2010). The end of each stage usually has a defined criteria for the desired end result, which symbolizes the gate. These criteria are usually divided into two categories, “must-meet” criteria (used to sort out the ideas and concepts that doesn’t fit the project at all) and “should-meet” criteria (which prioritizes the remaining ideas) (Cooper, 2008; Grönlund et al., 2010). When the project reaches a gate, it is evaluated based on the set criteria and a go/kill decision is made (Cooper, 2008; Grönlund et al., 2010). In other words, this phase determines if the project is beneficial enough to proceed with. Alternately, if the project doesn’t meet the specified criteria, a second iteration through the stage may be performed (Cooper, 2008; Van Oorschot et al., 2010). Grönlund et al. (2010) mentions that one of the benefits of Stage-Gate processes is that it can energize and speed up an organization’s process of developing new products. Additionally, Van Oorschot et al. (2010) notes that the early stages in a Stage-Gate process are usually less costly, but have a higher level of uncertainty regarding their value. This means that efficient use of a Stage-Gate process can keep resource costs at a minimum by dividing the budget appropriately towards projects that hold the greatest value, while less money will be spent on projects that are discarded.

On the other hand, Stage-Gate processes are sometimes considered to be too rigid and bureaucratic, which doesn’t lend well to innovative and dynamic projects, as well as restricts learning opportunities (Cooper, 2014; Grönlund et al., 2010). Grönlund et al. (2010) also mentions that
Stage-Gate processes get critique for being time-consuming, which results in activities that waste too much time. Van Oorschot et al. (2010) similarly argues that the high level of uncertainty of the early stages may lead to organizations underestimating the required workload (especially during the early phases), or overestimating the team size. This may lead to inefficient results, which in turn may lead to unnecessarily canceling a project which could have been successful. Van Oorschot et al. (2010) therefore suggests that allowing more resources to be spent during the early phases of a Stage-Gate process may still lead to a successful and - in the end – more efficient project.

"The situation is analogous to that of a malnourished person, for whom a doctor's first action is to prescribe a healthy meal to increase the patient's strength. With this newly gained strength, the patient is much better equipped to face subsequent medical treatment" (Van Oorschot et al., 2010, p. 837).

This project is based on a variation of a Stage-Gate process, due to the fact that innovative processes can be quite chaotic. This in turn means that every phase has potential to lead off in several different directions. The rigid characteristic of a Stage-Gate process may thus be beneficial, as each gate act as a limitation of what kind of work needs to be performed (by defining what kind of results that are desired), while the stages allow for a degree of freedom as to how these results are to be achieved. The stages themselves will be modeled after what Norman (2013) refers to as the double-diamond model of design, where the stages alternate between divergent (emphasis on generating quantity) and convergent (emphasis on generating quality) phases.

In the end, as someone who had rarely performed a project of this magnitude by myself before, it certainly seemed like quite the daunting task at first. Especially the process of planning the whole project is something that I have often found myself having the leisure of avoiding during prior projects. Having to define which kind of work process that the current project should follow was thus something new to me. Nonetheless, I found that the setup provided by the Stage-Gate process was well suited for the project. As Cooper (2014) and Grönlund et al. (2010) argues, a Stage-Gate process may sometimes come off as too rigid and bureaucratic, which was something I wanted to avoid. Due to this, I mainly used the process as a way of determining the purpose of each stage, as well as a vague description of what the desired result would be. This way, the setup mainly acted as a way to make sure that everything was running smoothly, without too much time being spent
with a single task. As Van Oorschot et al. (2010) claims, I also found that the first two stages required more time and was of a more iterative nature. However, I suspected that this would be the case, and thus made sure to allow myself some extra time for these stages, which I think in the end saved me a lot of trouble.

4.1.2 GANTT CHART

A Gantt chart is considered to be one of the most used tools for controlling and planning projects (Geraldi and Lechter, 2012; Maylor, 2001; Wilson, 2003). They are useful visual representations that help with visualizing important dates such as deadlines, understanding sequence of activities (i.e. how certain tasks may depend on each other), as well as clarifying the length of specific project stages (Geraldi and Lechter, 2012; Maylor, 2001). Wilson (2003) notes that a main benefit of Gantt charts is their ability to display important information, while “providing a readily useful interface allowing users to define problems and better understand and accept solutions” (p. 436). However, Geraldi and Lechter (2012) argues that Gantt charts may not be suited to all kinds of projects, as projects with a high degree of ambiguity or where there is a major risk of unforeseen situations may be unfit. Instead they argue Gantt charts are better used for projects which are time-driven, can be clearly defined in different parts, and promotes a linear sequence. On the other hand, Maylor (2001) notes that the usage of Gantt charts may “encourage the project manager to over-control the project rather than devolve the responsibility for the time-plan to team members” (p. 95). In other words, as opposed to Geraldi’s and Lechter’s (2012) argument above, a Gantt chart may cause an already overly rigid project to become even more so.

However, despite what Geraldi and Lechter (2012) mentioned above, they still note that Gantt charts can be helpful in open-ended or “creative” projects, if adapted properly. They specifically note that these kind of projects run a risk of going through a messy process that goes on forever. A Gantt chart thus helps to define certain limits; visualized deadlines that focus attention and make sure that work is finalized, while the actual work itself is left unplanned (Geraldi and Lechter, 2012). This allows for a certain degree of freedom and iteration, which creative processes usually benefit from.
For this project, the Gantt chart was implemented similarly to these guidelines, as an extension of the Stage-Gate plan. The Gantt chart provides a simple yet effective overview of the different stages of the project, while also showcasing important dates and deadlines. The chart itself can be viewed in appendix II.
4.2 STAGE 1 - BACKGROUND RESEARCH

After the necessary stages and timeline had been defined, the first proper stage could be initiated; to perform an extensive literature study and background research. The overall objective of this phase was to acquire as much information related to the development process as possible. This meant both information regarding theories that would be applied to the project (such as how the student-guide should be designed), as well as various methods to define the users' needs.

4.2.1 METHODS FOR COLLECTING DATA

During the development process of the student-guide, two specific methods played an important role in collecting valuable data; interviews and focus groups. In the following sections is a summary of the methods themselves, descriptions of how they were used, as well as discussions of the implementation.

Interviews

According to Bohgard et al. (2010) and Holloway and Wheeler (2010) an interview is one of the most common methods for gathering subjective information and qualitative data. It is a versatile method in the sense that both quantitative and qualitative data can be acquired, depending on how the interview is set up; a structured interview is preferred if the former is desired, while an unstructured interview is more suited for the latter (Bohgard et al., 2010). In a structured interview the questions are already defined and are usually relatively straightforward. Similarly, the interviewee may be able to respond freely or pick a response from a graded scale (such as how well they agree with a certain opinion, where 1 means “not at all”, and 5 “completely”). In an unstructured interview the questions are much more open and may offer some freedom of interpretation, or might even take shape as the interview goes on (Bohgard et al., 2010; Holloway and Wheeler, 2010). Andersson (1994) argues that structured interviews may at times be unfavorable, as one of the main points of an interview is to allow for a certain degree of freedom regarding both questions and responses. However, both Bohgard et al. (2010) and Andersson (1994) mentions that unstructured interviews can be a bit more difficult to summarize and compare. Since the responses may be open and vague, it may be tough to tell if all the areas of interest have been covered.
Bohgard et al. (2010) and Holloway and Wheeler (2010) argues that the main benefit of interviews as a method for gathering data is the versatility and subjectivity of its nature. The interviewer is able to get information of what people think regarding a certain subject, and if something is unclear they are able to ask the interviewee for additional information. Interviews also allows for more control during the selection of the interviewees, in order to make sure that they are relevant for the area of research. On the other hand, Bohgard et al. (2010) also notes that interviews as a method is quite costly from an administrative standpoint. They require a lot of planning, and both the interviewer and interviewee needs to be available at the same time. The fact that the interviewer is present may also affect the responses from the interviewees, either with or without intention (Bohgard et al., 2010). Similarly, Andersson (1994) argues that the posed interview questions needs to be properly defined, as they may otherwise lead the interviewee in a certain direction. There is also no escaping the fact that interviews only provides the opinion of a select few, and in order to arrive at a more justified conclusion, it may be desired to use an additional method (such as surveys or observations) to countercheck the results from the interviews (Andersson, 1994).

The main benefit of interviews for the current project is the ability to generate qualitative data, as the subjective nature of interviews should allow for a greater possibility of uncovering the underlying thoughts - and thus get to the heart of the issue – as opposed to entirely quantitative methods. After all, in order to develop a successful student-guide it is important to know the motivations and desires behind how and why students learn.

Thus, interviews played a significant role in the current project during the preparation of the focus groups. Because even though the focus groups were more of a discussion among the participants themselves, they still had to revolve around the relevant subject. Hence, the theory regarding interviews was beneficial in developing questions that would spark the right kind of debate. On the other hand, there was also an intention to perform individual interviews during the project. However, due to time constraints as well as the people of interest being unavailable, this idea was scrapped. As such, no interview in the regular sense was performed during the current project. Instead, the theory gathered from this subject was used when defining the setup of the focus groups.
Focus Groups

On that note, a focus group can be defined as a group discussion or group interview, led by a moderator (Bohgard et al., 2010; Vaughn, Schumm and Sinagub, 1996). Barbour (2007) is of a similar meaning, but makes a distinction between group interviews and focus group discussions. According to her, the former uses a setup where the participants are asked a set of questions in order, while the latter instead aims to create a vivid discussion among participants. This in turn means that the data gathered from a focus group is of a highly qualitative nature (Côté-Arsenault and Morrison-Beedy, 2005). Nevertheless, Barbour (2007) indicates that there is confusion regarding what exactly defines a focus group, even among researchers themselves. Kitzinger and Barbour (1999) use a rather broad approach, and contemplates that “any group discussion may be called a ‘focus group’ as long as the researcher is actively encouraging of, and attentive to, the group interaction” (p.4-5).

Bohgard et al. (2010) notes that the main benefit of a focus group, as opposed to a regular interview, is that the dynamic between participants allow for further discussion and association of ideas, which may go beyond simply stating opinions. This in turn allows the focus group to provide a multifaceted look at a certain subject (Bohgard et al., 2010; Barbour, 2007). Morgan (1997) states that another valuable aspect of focus groups is the efficiency of the method. Compared to individual interviews, focus groups are able to collect a considerably higher amount of data, during the same amount of time. Additionally, he goes on to mention that the presence of the moderator also ensures that the data is centered on the topic of interest. It may then be logical to assume that a properly performed focus group has the potential to generate a vast amount of valuable information in a relatively short time.

Barbour (2007) emphasizes that the informal set up of a focus group can be both beneficial as well as detrimental. In one way, they allow for individuals who would otherwise be intimidated by face-to-face interviews to participate in a more relaxed environment. Similarly, they are also considered an efficient method to ‘access groups viewed as ‘hard to reach’, such as members of ethnic minority groups (Chiu and Knight, 1999), urban youth (Rosenfeld et al., 1996), and migrants (Ruppenthal, 2005)” (Barbour, 2007, p.21). On the other hand, the author also notes that in focus groups encouraging the participants to share individual narratives, the end result may become a messy concoction of stories that is hard to obtain any viable information from.
Côté-Arsenault & Morrison-Beedy (2005) similarly notes that performing serial focus groups is not recommended, as “group processes, such as roles, and positions of power, begin to emerge” (p. 174).

The main motivation behind the use of focus groups in this project is twofold. Firstly, the highly qualitative nature of the data acquired may have a higher chance of revealing the motivation and thoughts that lie behind what the students actually requires to learn (Côté-Arsenault and Morrison-Beedy, 2005). Secondly, if certain topics seem to hold additional interest or potential, the setup of focus groups allow for further investigation within these areas. Furthermore, Vaughn et al. (1996) argues that a focus group which promotes voicing of different opinions allows for a more complete understanding of the issues that are investigated. Relating to the current project, a focus group with students of different age and areas of education will hopefully lead to the identification of needs, issues and preferences that applies to a variety of students. So while the actual data from the focus group may only be valid to the students who are participating, it may still lead to the identification of certain themes that can be applied to the average student. This in turn may allow for the interactive student-guide to cater to the needs of all students, instead of a select few. Additionally, Vaughn et al. (1996) notes that a proper focus group should attempt to have at least six participants, in order to ensure an active discussion. On the other hand, Barbour (2007) notes that even three or four participants may suffice depending on the type of discussion.

During the current project, three separate focus groups were performed, which are described a little more in-depth below. Out of these three, the first focus group only had five students, which could be considered problematic as argued by Vaughn et al. (1996) above. Still, the discussion proved to be quite rewarding anyways, thanks to the participants’ dedication, and provided more than enough data to allow the development process to continue unhindered. The second focus group had six participating students, so the number of participants was hardly an issue either. The third meeting only had two students participating however, which meant that it became more of an interview rather than a proper focus group. Nevertheless, the feedback gathered from the meeting was quite substantial anyway, so even though this “setback” was relatively unexpected it still managed to allow the project to progress smoothly.
4.2.1.1 Focus Group 1 - Background

The first focus group aimed to investigate how current students at Luleå University of Technology perceived the state of their education, as well as what needs they considered to be relevant. In order to properly define this data, a topic-guide was created for this focus group, which can be found in appendix III. The first focus group attempted to elicit a deep discussion among the participants, in order to acquire qualitative data that would go beyond the participants’ opinions, and instead uncover the motivation and experiences behind them. Thus, the questions provided by the topic-guide were left relatively open and required more than a “yes” or “no” in order to be answered.

The group were first introduced to the objective of the current project, as well as the purpose of the focus group, after which the focus group moderator began asking the questions. After this, the participants generated a lively discussion among themselves, with only brief inputs from the moderator every now and then, in order to pose new questions, as well as ensure that the discussion stayed on topic.

4.2.1.2 Focus Group 2 – Creative Workshop

In the second focus group, the participants were tasked with performing various creative methods, as well as generating ideas for solutions regarding some of the student needs defined during the first focus group. Aside from a short warm-up session, the process itself was divided into two separate parts. The first one focused on generating looser and more general ideas, while the latter one instead emphasized creating concepts, based on the ideas generated during the first phase. The first phase used something called Negative Brainstorming (Michanek and Breiler, 2007), which meant that the participants generated ideas based on three problem statements, presented as questions. The stinger was though that instead of trying to solve a problem by coming up with solutions to the questions, they were tasked with generating ideas to make the situation worse. The questions can be viewed in Table 1 below. After having amassed a wide variety of negative ideas, these were then “translated” to a positive version (i.e. an idea promoting bad PowerPoint-slides instead becomes an idea promoting good PowerPoint-slides). The intention behind this method was that a lot of people find it easier to come up with negative ideas and perspectives, rather than positive and constructive ones (Michanek and Breiler, 2007). The second part instead aimed at creating more detailed
concepts, using a specific variation of the Brainwriting method called 6-3-5 (see chapter 4.3.1 Brainwriting), where the six participants were supposed to write down three ideas every five minutes. They were tasked with generating ideas of how the student-guide could be developed; how it would function and what it could be used for.

Table 1: The three questions used for the Negative Brainstorming during the second focus group.

<table>
<thead>
<tr>
<th>Questions used for the second focus group</th>
</tr>
</thead>
<tbody>
<tr>
<td>How would it be possible to get students to become as inactive and unengaged as possible during lectures?</td>
</tr>
<tr>
<td>How would it be possible to make students never attempt to contact or aid each other?</td>
</tr>
<tr>
<td>How should the student-guide developed in the current project be designed in order to be unattractive to use and decrease the chance of learning as much as possible?</td>
</tr>
</tbody>
</table>
4.2.1.3 Focus Group 3 – Concept Feedback

The third focus group was initially intended to be more of a presentation, where the participants of the two former focus groups would be able to provide feedback regarding how they felt that the concepts generated based on the ideas from the second focus group met the needs defined during the first. However, as only two participants were able to participate, the setup of the focus group became more of an interview, or discussion.

The presentation itself was set up in a way that the participants first performed a customer journey detailing their thoughts and experiences throughout their time at the university. The participants were asked to grade the feelings they experienced during the journey based on three emotional states; happy, indifferent, and sad (represented by the three icons to the left in Figure 8 below). Additionally, the participants provided short commentaries for how and why they felt like they did at particular moments. For a more extensive description of customer journey as a method, as well as how it was performed by the participants of the third focus group, see chapter 4.5.1 Customer Journey.

Figure 8: The customer journey, as filled by Student F. For a close-up of both participants’ customer journeys, see appendix VII.
After having presented the concepts, the intention was to apply these to the participants’ journeys, and evaluate how the concepts could affect the whole experience. Hopefully, they would work as a means to increase the positive moments, and improve the negative ones. However, the feedback discussion regarding the concepts became longer than expected, which meant this approach had to be scrapped. Instead, the customer journey worked as a way for the participants to reflect on their time at the university, and thus acted more as a reminder of particular positive and negative areas that the student-guide could hope to affect. This process was followed by a presentation of the three concepts, which were presented consecutively. Afterwards, the participants were allowed to provide their feedback regarding the concepts, with no particular order. As was mentioned earlier, this discussion dragged on longer than expected and constituted the final step of the focus group.

**4.2.2 LITERATURE REVIEW**

The two earlier methods aimed to define the students’ perspective, to ensure that the student-guide would be relevant to them. The problem is however, that these methods are highly subjective, and in order for the student-guide to hold a certain scientific standard, the development process needed to take into account theories and past research regarding relevant subjects. Thus, a proper literature review was performed. As each subject was studied, the initial information was mostly gathered from regular text books and similar forms of literature, in order to get a quick overview of the subject. After this was done, the emphasis was instead focused on scientific articles and similarly peer-reviewed resources, in order to acquire a more nuanced and scientifically proven understanding. In addition to verifying the information gathered from the books, the peer-reviewed references also served as a means to summarize discussions regarding each subject. This helped to clarify various positive as well as negative aspects of each area, which aided with implementation of the information in the development process.

Some references where thus chosen either because they verified information brought forward in the regular literature, or because they highlighted either positive or negative aspects within the fields. A summary of the various resources used to perform the literature review, as well as the main keywords, can be found in Table 2 on the next page.
Table 2: An overview of the resources and the main keywords used while performing the literature review.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Name</th>
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<tbody>
<tr>
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<td>Resources acquired</td>
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<td>Luleå University Library</td>
<td>Books</td>
</tr>
<tr>
<td>Luleå University search engine: Primo</td>
<td>Journal articles, conference proceedings, books</td>
</tr>
<tr>
<td>Search engine: Google</td>
<td>Journal articles, webpages</td>
</tr>
<tr>
<td>Reference generator: Cite This For Me</td>
<td>Used to find and generate proper references for all resources used during the current project</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Keywords</th>
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</tr>
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<tbody>
<tr>
<td>Industrial design</td>
<td>Usability</td>
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<tr>
<td>Design Thinking</td>
<td>Visual communication</td>
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<td>Archetypes</td>
<td>Gestalt theory</td>
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<td>Pedagogy</td>
<td>Learning</td>
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<tr>
<td>Community of Practice</td>
<td>Constructive Alignment</td>
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<td>Threshold concepts</td>
<td>Stage-Gate process</td>
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<tr>
<td>Gantt chart</td>
<td>Interviews</td>
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<td>Focus groups</td>
<td>Qualitative data</td>
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<td>Idea generation</td>
<td>Creative methods</td>
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<tr>
<td>Brainwriting</td>
<td>Brainstorming</td>
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</tbody>
</table>
4.3 STAGE 2 - IDEA DEVELOPMENT

The overall objective of the second stage was to develop a vast amount of ideas for the design and function of the student-guide, based on the information gathered in the last stage. The methods used to accomplish this was mainly an individual brainwriting-session performed by the author, as well as a second focus group where the participants performed various creative methods of their own, led by the author.

4.3.1 BRAINWRITING

The creative method known as brainwriting is an offshoot of another idea generation technique; brainstorming (Boeijen, Daalhuizen, Zijlstra and Schoor, 2013; Bohgard et al., 2010). The main difference between brainstorming and brainwriting is that the ideas are created by writing them down individually in the latter, instead of just mentioning them out loud as is the case with regular brainstorming (Holt, 1996). This in turn makes the method much less spontaneous than its counterpart. A specific variant of brainwriting is also commonly referred to as the 3-6-5 method, which requires 6 participants to write down 3 ideas every 5 minutes (Boeijen et al., 2013; Bohgard et al., 2010; Wodehouse & Ion, 2011). When the five minutes have passed, the papers are redistributed among the participants, allowing new ideas to be inspired by the existing ones. According to Wodehouse and Ion (2011) a common complaint of regular brainstorming is that it can be personality-driven and lack focus. Brainwriting goes around this by allowing each participant to work individually, while still promoting group discussion in between rounds.

Brainwriting was chosen as a method for the current project because of two reasons, the first being that it is a method that can be used by one person (as was the case of the initial idea generation-session performed by the author). The second reason was due to the relative simplicity of the method, which would allow even those new to creative methods to participate without any prior knowledge. I anticipated that the participants in the focus groups would originate from different kinds of educational fields, and as result some of them may be unfamiliar with using creative methods. As such brainwriting held two specific benefits in this regard; the relatively direct nature of the method meant that no prior experience was required for the participants, while being able to work individually might have helped every participant to contribute to the idea development in some way. Just as Wodehouse and Ion (2011)
argues, regular brainstorming can sometimes result in certain participants taking the center stage, which might cause others to fall back and be afraid to come with their own suggestions. The individual setup provided by the brainwriting method meant that everyone were “forced” to contribute in at least some way.

The individual Brainwriting session was performed without any time limit, only focusing on generating as many different ideas as possible. The ideas were put down on paper which was then put away for future reference. The Brainwriting performed during the second focus group however, was based on the 3-6-5 method mentioned above, using a variation called Negative Brainstorming (see chapter 4.2.1.2 Focus Group 2 – Creative Workshop for a more detailed explanation).
4.4 STAGE 3 - CONCEPT DEVELOPMENT

At the end of the idea development stage, a considerable amount of ideas had been generated, both through the individual brainwriting session performed by the author, as well as the students participating in the focus groups. The ideas had varying degrees of complexity and feasibility, thus the first step of the concept development stage was to evaluate the proposed solutions individually. In order to have some sort of reference to base the evaluation on, the information acquired through the background research was reviewed again. This resulted in six separate functions that summarized the main needs defined by the literature study, as well as the focus group discussion with students (see Table 9 in chapter 5.3 Stage 3 – Concept Development).

The actual development of the concepts was based on four themed categories coined in the latter phase of the idea development stage (see chapter 5.2.2 Focus Group 2 – Creative Workshop). As the ideas were reviewed depending on the category they belonged in - all the while with the six functions in mind - three separate concepts grew into shape, each with its own focus. When these concepts had been properly defined, they were presented to students participating in a focus group, as well as the project supervisor, in order to acquire feedback for the continued work.

4.4.1 SURVEY

The functions mentioned above were made into a survey which was sent out to students at Luleå University of Technology. A survey is a subjective method of gathering data from a study population, by indirectly asking questions (Bohgard et al., 2010; Fowler, 2009). The main benefits of surveys, as opposed to interviews for example, is the possibility of acquiring vast amounts of data under a relatively short time. For the current project, the participating students were asked to rank the six functions from most to least important (appendix IV). The intention was then to use the result of the survey as a base for the idea evaluation, prioritizing ideas that highlighted the more desired functions.

In the end though, the amount of replies from the survey was not substantial enough to warrant any validity, with only thirteen replies. One of the main reasons behind this unfortunately lacking response may have been that the survey itself was broadcasted to a rather small
audience, and only once. Many will not respond to surveys unless inquired multiple times, and it does not require much thought to realize that the more people who receive the survey, the greater the chance of getting a higher number of replies. Thus the results from survey was completely disregarded, and had no further impact on the project. Still, the project itself was never dependent on the result from the survey, which was supposed to streamline the concept evaluation by highlighting the most desired functions for the student-guide. Instead, the functions available in Table 9 were treated as equally important, while the development process progressed as planned. Due to the fact that a majority of the ideas had a very similar nature, they were able to be combined together, while other ideas were considered a bit too infeasible and had to be removed completely. This in turn led to the amount of ideas being reduced to a more manageable level.

4.4.2. SKETCHES

The concepts created in this phase were almost exclusively developed and presented through sketching. This method provides a quick and easy way of generating, exploring and evaluating design ideas in the conceptual phase of a project (Prats, Lim, Jowers, Garner and Chase, 2009; Sun, Xiang, Chai, Wang and Huang, 2014). Prats et al. (2009) especially notes that one of the benefits of sketching is that it provides designers with a method to assess various design characteristics of a product, such as shapes and colors, in a low-cost, fast and flexible manner.

This was notably the case with the current project; due to the explorative nature of the development process, there was a need for a method that could swiftly test various solutions, while demanding few resources. As a result, some concepts were quick mock-ups with a low level of detail in order to swiftly get good visualization of ideas, while latter ones were of higher quality with more detail, in order to provide a better description of how the concepts would function. An overview of some of the latter sketches can be found in appendix V.
4.5 STAGE 4 - DETAIL DEVELOPMENT

Due to the nature of the final stage, the methods used varied quite a bit from each other. The aim was to first perform a third focus group with students, in order to evaluate the concepts developed in the former stage. In order to emphasize that the assessment was to reflect the present educational situation at the university, a customer journey-map was used. After the evaluation was complete and the positive and negative aspects of each concept had been defined, these were sorted through the use of mind map. Through an iterative process of continued brainstorming and sketching, a final concept design eventually grew forth.

4.5.1 CUSTOMER JOURNEY

A customer journey is a method used to identify the various experiences and stages a customer goes through when interacting with a product or service (Boeijen et al., 2013). According to Arvola (2014) and Boeijen et al. (2013), the journey itself usually consists of a series of stages, which themselves are made up of “touch points”. The touch points are defined as any interaction between the customer and the service. Arvola (2014) goes on to note that the term interaction is not necessarily limited to physical encounters alone, but rather can also include visiting company websites, reading published material, or even visiting places affiliated with the product or service in question. The touchpoints can be identified by the research team through interviews, or by letting the customers recount their experiences and identify the touch points themselves (Arvola, 2014; Boeijen et al., 2013). Once the stages within a customer journey has been properly defined, these are mapped along an axis, in order to visualize the journey a customer goes through during their interaction with a product or service. Additionally, Arvola (2014) notes that images and quotes can be added along the path in order to highlight areas of interests, such as possibly problematic areas (and how these can be resolved), positive experiences, and personal musings regarding the experience.
A customer journey was performed by the participants of the third focus group for two reasons (Figure 9). The first was for them to review and evaluate their experience at Luleå University of Technology, while the second was as a means to identify both positive and negative aspects of their education. The intention was for this to allow them to better realize the impact the concepts developed during the third stage may have, which in turn may increase the chance of identifying possible opportunities for innovation. As such, the customer journey used during the third focus group started out with asking the participants to evaluate the process of applying to Luleå University of Technology, as well as being accepted. From there, the participants went through the first impression of both the social and educational environment, a general review of the courses, interaction with the staff, social experiences and finally the participants’ outlook of the future. The intention of the customer journey was to highlight both the most positive experiences, as well as the negative ones, throughout the entire stay at the university.

Figure 9: A figure depicting the template of the customer journey used during the third focus group. The figures on left represents the emotion felt by the participants, and the horizontal axis acts as a timeline for their time at the university.
When it comes down to it, the main purpose of all the focus groups performed during this project was to provide a chance for potential users to voice their personal opinions regarding the student-guide. As such, a customer journey would act as an additional measure to ensure that important details that the project team may have missed would still be taken into account.
4.5.2 MIND MAP

In order to get a good overview of all the intended functions and perks of the student-guide, as well as the additional comments provided from the participants of the third focus group, a mind map was used. A mind map is a visual tool that allows users to detect and organize ideas, as well as understand the correlation between primary ideas and new information (Tanriseven, 2014). It consists of a main topic, usually presented in writing but occasionally with an image, which is put in the center of the mind map (Farrand, Hussain & Hennessy, 2002; Tanriseven, 2014). Various sub-topics are then assigned protruding from the main topic, using shapes, symbols and images in order to hierarchically sort all important aspects (see Figure 10 below). Thus, the most general information is presented at the center of the mind map, getting more detailed as one progress along each sub-topic (Farrand et al., 2002).

For the current project, a mind map was developed in order to sort all the information regarding the student-guide in one convenient location, as well as to establish the correlations between particular aspects.

Figure 10: The mind map developed during the fourth stage of the project. For a closer view of the mind map, see appendix VI.
The overview provided by the mind map made it easier to sort the feedback garnered from the third focus group. This was especially useful when it came to finalizing the concept chosen as the base for the final design of the student-guide. Through the use of the mind map it was possible to evaluate the aspects of the final design, in regards to how it met the needs defined during all of the focus groups. Additionally, it also made it easier to implement the strengths of the concepts that were discarded into the final design.

Once the overview was complete and the extent of the final design was defined, the concluding work consisted mostly of establishing the visual style and graphic profile of the student-guide through sketching. Similar to the sketching performed in the concept stage, the first sketches consisted of undetailed concept illustrations by hand, and as the design became more final they were instead created with computer-based programs.
5. RESULTS

The following sections presents the results provided by each stage. The presentations vary depending on the nature of the results themselves; those of a quantitative nature are mostly presented in tables to give a better overview, whereas the more qualitative ones use a combination of descriptive text and images.

5.1 STAGE 1 - BACKGROUND RESEARCH

The results from the first stage played a major role in the development of the student-guide, as it defined the basis and direction of the development process itself. While the literature review ensured that the work constantly took into account a scientific mindset, it was information gathered from potential users that significantly influenced the major aspect of both the final design itself, as well as the process to get there.

5.1.1 FOCUS GROUP 1 - BACKGROUND

In order to acquire potential users’ perspective regarding issues relating to the student-guide, a focus group was performed. Information regarding the participants of the focus group is presented in Table 3 below.

<table>
<thead>
<tr>
<th>Student</th>
<th>Sex</th>
<th>Education</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>4th year*</td>
</tr>
<tr>
<td>Student B</td>
<td>Male</td>
<td>Industrial and Management Engineering (MSc)</td>
<td>4th year</td>
</tr>
<tr>
<td>Student C</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>5th year</td>
</tr>
<tr>
<td>Student D</td>
<td>Female</td>
<td>Natural Resources Engineering (MSc)</td>
<td>2nd year</td>
</tr>
<tr>
<td>Student E</td>
<td>Male</td>
<td>Industrial and Management Engineering (MSc)</td>
<td>4th year</td>
</tr>
</tbody>
</table>

Table 3: A summary of the five participants of the first focus group.
As can be seen in the table, there is an unfortunate lack of variety among the participating students; only one of the students is in her second year, while the others are in their fourth, at earliest. Some clarification needs to be put forward regarding Student A however, as she was technically in her fourth year at the time of the focus group, but had postponed her studies in order to work at the university. As such, she falls somewhere in between either a third-year or fourth year student. Additionally, the students only represent three educational fields, all within a Master of Science in Engineering.

Despite the somewhat homogenous group, the focus group managed elicit a heated discussion, covering a wide variety of areas. For starters, the introductory question was left relatively open, asking what the participants believed they had actually learned during their time at the university. Quite ironically, the discussion immediately moved into what (or more specifically in which courses) the students perceived that they had not learned anything; mathematics. The participants all agreed that they felt like they are only taught information that will help them pass the exam, but not how this knowledge can be implemented in real-life scenarios. In other words, the courses in mathematics seemed to hold little relevance to them (beyond as a required means to achieve their degree), which gave them little motivation to engage in the course itself. On the other hand, the participants agreed that in the courses where they had actually gained some knowledge, they had felt a certain motivation to learn; some sort of incentive to engage them into the course:

*Student A:* “The courses where I have learned the most are ones where I was the most engaged in, or like... that I found the most interesting, because then I have acquired more [knowledge]. I want to work more, I want to read more about the subject, eh, and have like... I have learned more, to put it simply. I have reflected [about the knowledge], talked with others. And that is how I learn.”

*Student D:* “I agree with you... The courses where you learn the most are the courses where you get to reflect, for example seminars, group work and that stuff” (Focus group, 6th March 2015, author’s translation).
The second question followed the theme of the last one; the students were asked **which courses at the university that they had enjoyed the most, and what made it so.** Naturally then, the responses were similar to those of the last questions as well. The participants agreed that projects and similar assignments – both individual and in groups – were something that would increase their motivation and thus learning. When asked to define what made this the case, the participants seemed to agree that these kind of assignments usually had an increased relation to "real life", i.e. situations that they would actually encounter in their future career, as opposed to "manufactured" questions and assignments that you might only find in classes. The layout of projects also often allows for a degree of freedom as to how one should approach the assignment, which was also appreciated. Freedom itself was something that most participants desired when it came to coursework. They felt that they achieved a better learning approach if they could decide for themselves how to solve a specific problem; even if their method would prove to be wrong or inefficient they would still have learned something from it. Additionally, if working with a team, one might be able to choose specific areas that catered to your interests, which meant that you were more motivated to perform well. The participants thus argues that it might be better to define a specific goal for students to achieve and let them decide themselves how to achieve it, rather than creating specific questions and problems. However, they were quick to add that this meant that the goals need to be clearly defined, so the students know what is expected of them. The main reason behind this requirement was, according to the participants, that they found that the grade students are assigned at the end of a course didn’t really hold much meaning. It's just a number meant to tell the student if he/she performed well or not, but the student doesn't really know what aspects of their work that was good, and what needs improvement. Since the grades are often set several weeks after the class has ended, this doesn’t really leave any room for reflection either. Finally, one participant noted that he has found diverse project teams (regarding personality, experience, attitudes, etc) to allow for more reflection, and thus promote better learning.

The third question instead went in the opposite direction and asked the participants **what courses they have had that they found were terrible, and why this was the case.** The first response was related to the teachers, who were often regarded as lacking motivation to teach. Relating to the first level of teaching as defined by Biggs (1999), the participants had found that some teachers mainly viewed themselves as experts with the sole purpose of providing the students with
information. Once that information has been presented, it is up to the students to absorb and utilize it. Failure to do so would exclusively be the fault of the student, who simply are not “good enough” to be taught:

Student C: “I have also been told, once again in a mathematics course: ‘if you can’t even solve this problem, then perhaps you aren’t fit to study [at Luleå University of Technology]’” (Focus group, 6th March 2015, author’s translation).

But even beyond the teachers themselves, the participants seemed to agree that the setup of the courses were just as important in defining the quality of the teaching. They mentioned that some courses try to cover too many subjects, which meant that a lot of stuff is just barely touched upon, or has to be excluded completely, due to time constraints. Similarly, the literature that is either recommended or “required” by the teachers has a tendency to be badly implemented. The participants mentioned that teachers would tell the students to read a certain amount of pages (usually a fairly extensive amount), when in reality only a fraction of the text contains information that is actually relevant. As a student it is virtually impossible to know exactly what information is key, which in the end leads to the whole experience feeling like a waste of time. Two participants felt that this does not necessarily mean that only the immediately relevant text needs to be read, but instead that some sort of clarification or guideline would be appreciated, so that the students better understands exactly what the text is supposed to do for them. More specifically, all the participants felt that just blindly reading the required pages in itself is not an efficient way to acquire information. Having fewer pages to read, but with more condensed information would instead improve learning, as it allows for more time to revisit and reflect over the text.

The next question intended to clarify the participants experience regarding what makes them either take a surface learning approach or a deep learning approach, as mentioned by Briggs (1999). They quickly defined two relating aspects; personal interest and stress. If you are interested in a subject you are more inclined to take a deep learning approach, due to a greater sense of motivation. On the other hand, if you find a subject to hold no personal value, you give it little priority and the learning may suffer as a result. However, as noted by one participant, if he was feeling stressed and perceived he didn’t have enough time to properly learn everything in a course, he would make sure that he knew just enough to pass the exam, but nothing more (in other words, what defines surface learning). Once again, motivation seemed to be a key
aspect in this case, as the participants agreed that the more interest they had in a subject, the more likely they were to “go out of their way” to learn. They felt that they’d learn more because they themselves realized they needed the knowledge, not that the teacher said they should learn it. One participant noted that it would be beneficial to have constant accessibility to the information being taught, a feeling the others seemed to share. They often found that you need some time after a lecture (or similar) to reflect about the information, specifically in order to identify what you did not understand. Being able to review the information whenever you need would thus serve as a way to clarify uncertain pieces.

Next, the participants were asked what their method of choice is for solving problematic assignments and questions, to which they all seemed to agree. The initial reaction in such cases is to ask their friends and fellow peers, or to search the internet for an answer. Additionally they would read through course books or related literature in hope of finding some assistance. Asking the teacher seemed more like a last resort, rather than a helpful method, for several reasons. First of all, they felt like they needed to try everything they had before they were "allowed" to ask the teacher and secondly (which relates a response to the third question two paragraphs above) they felt like some teachers had a habit of looking down on students that asked for help. Quite interestingly, the participants seemed to prefer to ask PhD students rather than teachers, as the former seemed to hold a more pedagogic and understanding perspective. Additionally, a follow-up question was asked relating to the same issue; if the participants would be allowed any kind of shortcut to acquire the solution of a problematic task, what would they wish that shortcut to be (provided it was still intended to result in learning)? The first response was of a slightly lighthearted nature, with one participant jokingly stating that the Siri-app on iPhones can be used to solve simple mathematical problems (Apple.com, 2015). However, this response transitioned over to a discussion regarding the desire for a swift and convenient way to receive help with problems. For example, another participant noted that she would often find herself stuck at a specific point in a problem, realizing that there is something she doesn’t know. She went on to state that it would be convenient to get “clues” at those points, tips that would aid her in clearing the obstacle, without simply providing the answer. The other participants agreed and added that in similar situations they would appreciate the option to elaborate the troublesome parts; to quickly get an overview of what it is they don’t understand, or hints regarding any errors they may have made. Moving on from there, the participants mentioned
something known as gamification (defined by Domínguez et al. (2013) and Simões, Redondo and Vilas (2013) as adapting aspects of video games into a different, non-game context) and how these aspects may be implemented into the school setting. For example, they discussed the tendency for games to be divided into different “levels” with increasing difficulty, which would only allow the player to proceed once the former level has been completed. A similar system could be implemented into classes they argued, where the “player” (in this case the student), would only be able to proceed to the next “level” (which could be an assignment, question, project, or similar) if they have successfully cleared the previous one. The participants argued that knowledge would develop continually, as the student clears each level.

Student A: “So you’ve received this skill...or this ‘potion’ [the other participants laughs], which you can use in this scenario...”

Student B: “Exactly!”

Student A: “Like you have retrieved all this knowledge, you can look through your backpack, of all the things you have, and now you can kill this problem...”

Student C: “Yeah, and then it should like... if you notice that you’re standing still, then there’s this... [makes beeping noise], a thing starts jumping and you’re like: ‘right, I can try that particular method out’.”

Student A: “So I can ask you for help over there, and that thing says: ‘hey, remember when you retrieved that knowledge, you can use that on the ‘Big Boss’...” (Focus group, 6th March 2015, author’s translation).

The next question was meant to analyze what school-related resources the participants had found useful during their studies, and particularly so during their first year. However, as with some of the other questions, the first response to this one was to take the opposite approach; to describe how they felt these resources were lacking. For example, one of the most useful resources for a new student is to meet with older and more experienced ones. However, besides the initial introduction period, there are no other real situations where this kind of interaction is encouraged. One participant did note however that her educational section do set up monthly meetings, where students have a chance to meet with their peers of different educational levels, as well as PhD students. On the other hand, another participant noted the
importance of making sure that those kind of meetings also caters to the older students, so that they too have something to gain from the interaction. On a similar note, the participant argued that the university was lacking in relation to the social interaction between students. There is nothing to encourage students to stay in the school environment to study, and instead many decide to do so in their own homes. This leads to a loss of knowledge and learning that could have been gained from students studying together. It was suggested to have rooms or facilities occupied for certain educational sections, so that there would be specific areas where one can find students studying the same classes. Additional comments mentioned how a majority of the university students are unaware of the resources available to them, and that the school should do a better job of advertising these (as opposed to students having to go out of their way to find them). Furthermore, another participant added that a considerate amount of these resources are presented to the students, but only as a part of the introduction period for their first year, where the student is already bombarded by a vast amount of new information. Thus, most students tend to forget about these options. The participants then concluded with establishing that both the university and the students would probably gain from continually informing the students about the resources available to them.

Finally, the last assignment for the participants was to perform a brainstorming session, where they were asked to come up with ideas of how the student-guide developed in this project might work. Perhaps not surprisingly, many of the ideas shared the same core concepts. One popular idea was to develop some sort of forum (either digital or “in real life”), where both newer and older students can interact with each other, share information, and so on. One participant noted something similar to Facebook, where it is easy to create new groups and add your friends. Another concept was based on having some sort of interactive course book, or course page. The idea was to allow the student to decide to what degree they want to retrieve information by interacting with the “course book”. Thus the user would be able to decide to what extent they want to delve into each subject; those they found interesting can be thoroughly investigated, while the other ones may only have to be touched upon. Additionally, it would beneficial if the lectures in a class would be recorded and displayed on a specific course page. If many students find a specific area problematic additional videos and explanations could be provided as well.

There were also some ideas that didn't necessarily relate to the student-guide itself. One participant noted that teachers could have timeslots
during the weeks were they would be available in their office, if students need help. Finally, another mentioned having specific facilities were students of a specific education can meet up, study or just interact with each other.
5.2 STAGE 2 - IDEA DEVELOPMENT

Having explored and defined the background and context for the development of the student-guide, it was then time to initiate the actual generation of ideas. The information gathered during the last stage acted as springboard for this process; a source of inspiration of how to solve the problems that had been defined by the focus group and the literature study. This process occurred in two steps; an individual brainwriting session carried out by the student of the project team, as well as a second focus group arranged as a creative workshop.

5.2.1 INDIVIDUAL BRAINWRITING

The intention of the initial brainwriting session was to develop a range of loosely defined ideas and concepts, based on the immediate impression of the information and needs gathered from the background research. This idea generation process was performed individually by the author with a relatively simple setup, and resulted in a small number of undetailed ideas which can be viewed in Table 4 on the next page.
**Table 4:** The ideas generated through the individual brainwriting session.

<table>
<thead>
<tr>
<th>Generated Ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>A smartphone-app for courses at the university. Allow users to see and contact</td>
</tr>
<tr>
<td>other participants of the courses, and provide overviews of the assignments.</td>
</tr>
<tr>
<td>A website or blog where students can post their own experiences and tips for</td>
</tr>
<tr>
<td>studying.</td>
</tr>
<tr>
<td>Students can create their own website or blog where they can upload and share</td>
</tr>
<tr>
<td>their work, resources or stuff they like. The website might be able to</td>
</tr>
<tr>
<td>“recommend” stuff from other students that it thinks the user might like, based</td>
</tr>
<tr>
<td>on what kind of material the user is uploading and sharing.</td>
</tr>
<tr>
<td>Stylish “business cards” for each course, that clearly explains the course</td>
</tr>
<tr>
<td>objective and what the students will learn (with real examples), like a summary</td>
</tr>
<tr>
<td>of the syllabi but much more user-friendly.</td>
</tr>
<tr>
<td>A podcast run by students at the university.</td>
</tr>
<tr>
<td>A smartphone-app that sends out a “call for help” to other users. This allows</td>
</tr>
<tr>
<td>them to find the student that needs help and assist.</td>
</tr>
<tr>
<td>A personality test that lets students find out how they learn best. The test</td>
</tr>
<tr>
<td>could also provide tips of university resources that lends well to various</td>
</tr>
<tr>
<td>“learning types”.</td>
</tr>
<tr>
<td>A system where students get points based on the grade of their assignments.</td>
</tr>
<tr>
<td>Scoring a certain amount of points bestows the students with certain rewards,</td>
</tr>
<tr>
<td>as a motivation to study.</td>
</tr>
<tr>
<td>A smartphone-app that scans the area for other users and allows the students</td>
</tr>
<tr>
<td>to interact with each other. The application could also allow students who</td>
</tr>
<tr>
<td>interact frequently to register each other in their respective apps, and share</td>
</tr>
<tr>
<td>resources with each other.</td>
</tr>
<tr>
<td>A system that lets students send anonymous questions to teachers.</td>
</tr>
</tbody>
</table>
5.2.2 FOCUS GROUP 2 - CREATIVE WORKSHOP

The second focus group was more akin to a workshop and had the overall objective to let the participants perform an idea generation process of their own. Out of the six participating students, only two had attended the last focus group; Student A and Student E. The reason behind this change was because three of the original participating students canceled just a few days before, and due to time constraint the focus group could not be re-scheduled. Instead the focus group was carried out as originally planned, but with four new students. These new participants had all been briefed of the current project’s status beforehand however, and they were well aware of the overall objective. A short summary of all the participating students can be found in Table 5 below.

<table>
<thead>
<tr>
<th>Student</th>
<th>Sex</th>
<th>Education</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>4th year</td>
</tr>
<tr>
<td>Student E</td>
<td>Male</td>
<td>Industrial and Management Engineering (MSc)</td>
<td>4th year</td>
</tr>
<tr>
<td>Student F</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>5th year</td>
</tr>
<tr>
<td>Student G</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>5th year</td>
</tr>
<tr>
<td>Student H</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>5th year</td>
</tr>
<tr>
<td>Student I</td>
<td>Male</td>
<td>Architectural Engineering (MSc)</td>
<td>5th year</td>
</tr>
</tbody>
</table>

The first phase of the creative method used a method called Negative Brainstorming to generate loose, individual ideas related to students’ needs (see chapter 4.2.2.2 Focus Group 2 – Creative Workshop). The process was based around three questions – or themes – to brainstorm around, and the results from the session are presented in Table 6, Table 7 and Table 8 below.
Question 1: How would it be possible to get students to become as inactive and unengaged as possible during lectures?

As one might expect, a major part of the response to this question related to the classes themselves and what teachers do, as opposed to what students can do to become more inactive and unengaged. The ideas generated as well as their positive counterparts are displayed in Table 6 on the next page.
Table 6: The participants’ suggestion of how to get students to become as inactive and unengaged as possible during lectures, as well as the “positive translations”.

<table>
<thead>
<tr>
<th>Negative statement</th>
<th>Positive translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create an environment as noisy as possible.</td>
<td>Try to minimize noise and unwanted sounds as much as possible.</td>
</tr>
<tr>
<td>Use seats that are either too uncomfortable, or the opposite.</td>
<td>Use seats and seating arrangements that promote lecture engagement.</td>
</tr>
<tr>
<td>Have teachers that lack motivation and speak with a dull voice.</td>
<td>Have engaging teachers, who are both interested and knowledgeable within their topic and can transfer that interest to the students.</td>
</tr>
<tr>
<td>Use PowerPoints with too much or too little text. They should also be boring to look at.</td>
<td>Let the PowerPoints be an aid in the presentation of information, and neither a substitute for the lectures nor an afterthought.</td>
</tr>
<tr>
<td>Use bad lighting (too cold light, blinking lights).</td>
<td>Use as much natural light as possible, or lighting that simulates natural light.</td>
</tr>
<tr>
<td>Let the material that is presented in class be completely unrelated to real life, and the rest of the education.</td>
<td>Use real life examples that are relevant to both the education as a whole, and future work.</td>
</tr>
<tr>
<td>Use bland and unclean environments. Boring and repetitive colors.</td>
<td>Have a clean and stimulating environment, with fresh air and colors that stimulate productivity.</td>
</tr>
<tr>
<td>Fill both the classroom and the surrounding environment with as many distractions as possible.</td>
<td>Keep distractions to a minimum and lead attention to what is important.</td>
</tr>
<tr>
<td>Have long, repetitive and tedious lectures.</td>
<td>Try to keep lectures as short as possible, or at least with frequent breaks to let the students recharge.</td>
</tr>
</tbody>
</table>
Question 2: How would it be possible to make students never attempt to contact or aid each other?

This question was mainly used in order to put emphasis on what students can do themselves, and especially how to promote contact among students. The result can be viewed in Table 7 below.

Table 7: Ideas generated regarding how to make students never attempt to contact or aid each other, along with the positive versions.

<table>
<thead>
<tr>
<th>Negative statement</th>
<th>Positive translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have students punished for trying to aid each other.</td>
<td>Have some sort of reward for contacting and helping other students.</td>
</tr>
<tr>
<td>Have everyone speak different languages.</td>
<td>Everyone (both teachers and students alike) should speak the same language and on the same level.</td>
</tr>
<tr>
<td>Make it so that it takes considerable effort to contact other students.</td>
<td>Contacting other students should be simple and effective.</td>
</tr>
<tr>
<td>Forbid all kinds of anonymity when it comes to contact between students, or between teachers and students.</td>
<td>Allow students to be anonymous in situations where it might be considered “awkward” to be visible, such as asking a teacher questions.</td>
</tr>
<tr>
<td>Arrange seats so that it makes contact between students inefficient and unwanted.</td>
<td>Arrange seats in a manner that encourage contact and interaction between students.</td>
</tr>
<tr>
<td>Remove all events and instances where students get to know each other, such as the introduction period.</td>
<td>Encourage students to interact with each other, through events or other means.</td>
</tr>
<tr>
<td>Always allow the students to decide their own work team, so that they do not have to meet anyone they do not know.</td>
<td>Let the teachers divide the students into teams, in order to allow students more chances to meet new people.</td>
</tr>
<tr>
<td>Have large classes with many students.</td>
<td>Have fewer students in each class; creating a more close-knit atmosphere and supporting interaction.</td>
</tr>
</tbody>
</table>
Question 3: How should the student-guide developed in the current project be designed in order to be unattractive to use and decrease the chance of learning as much as possible?

Quite interestingly, as can be seen in Table 8 below this topic amassed the most discussion and provided several key ideas as to what the participants of the focus group considered important.

Table 8: Showcasing the suggestions for how the student-guide should be designed in order to be unattractive to use and decrease the chance of learning as much as possible, as well as the positive responses to this question.

<table>
<thead>
<tr>
<th>Negative statement</th>
<th>Positive translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use low quality pictures with low resolution.</td>
<td>Use relevant, high quality pictures with high resolution.</td>
</tr>
<tr>
<td>Use long and complicated texts, as well as bullet points.</td>
<td>Use short paragraphs of text that summarize the important information. Avoid using bullet points unless it is necessary.</td>
</tr>
<tr>
<td>Do not use any kind of index or table of contents, in order to make navigation as tiresome as possible.</td>
<td>Make navigating the student-guide as easy and intuitive as possible.</td>
</tr>
<tr>
<td>Do not use alternative media as a resource (such as e-books, audiobooks, etc.).</td>
<td>Consider taking advantage of alternative and unorthodox media.</td>
</tr>
<tr>
<td>Use complicated jargon, filled with strange abbreviations and obscure references.</td>
<td>Use clear and straightforward phrases to communicate information. Avoid using abbreviations or expressions that require prior knowledge.</td>
</tr>
<tr>
<td>Use completely unserious language.</td>
<td>Avoid using language that may appear childish or immature (i.e. “dude”, “what’s up”, etc.).</td>
</tr>
<tr>
<td>Use poor materials that give of a cheap and low-budget impression.</td>
<td>Use materials that give a high-quality impression and make the overall presentation appear superior.</td>
</tr>
<tr>
<td>Do not reveal the purpose of the student-guide, and do not tell potential users what it is for.</td>
<td>Clearly explain and establish the purpose of the student-guide.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Do not take advantage of summaries.</td>
<td>Please do take advantage of summaries.</td>
</tr>
<tr>
<td>Use a “blaming” tone toward the users. The student should be ordered what they are supposed to do.</td>
<td>Let the general tone of the student-guide be “supportive” toward the student. The student-guide should act as a guide, not an extra requirement.</td>
</tr>
<tr>
<td>The student-guide should be big, bulky and inconvenient.</td>
<td>The student-guide should be convenient, easy to handle and (if it is a physical object) be portable.</td>
</tr>
<tr>
<td>It should not cater to neither anyone’s needs nor interests.</td>
<td>It should cater to both the needs and interests of as many students as possible.</td>
</tr>
<tr>
<td>Have no relevance to personal hobbies or similar aspects.</td>
<td>The student-guide should try to implement or embody as many personal hobbies or similar as possible.</td>
</tr>
<tr>
<td>The student-guide should cost money.</td>
<td>The student-guide should be free, or at least reasonably priced.</td>
</tr>
<tr>
<td>Should be difficult to acquire.</td>
<td>Should be acquired without any considerable effort.</td>
</tr>
<tr>
<td>The presentation/introduction of the student-guide should be awkward and untimely.</td>
<td>The presentation should come of natural and at a time where it is both interesting as well as beneficial to the users.</td>
</tr>
<tr>
<td>Assignments, tasks and other class-related stuff related to the student-guide should be scattered all over in a cluttered mess.</td>
<td>The student-guide should help with sorting and displaying assignments, tasks and other class-related stuff, in order to make planning easier.</td>
</tr>
<tr>
<td>It should be completely impossible to discern what personal gain can come from using the student-guide.</td>
<td>It should be obvious how students can benefit from using the student-guide.</td>
</tr>
</tbody>
</table>
It might be important to note however, that regular, “proper” brainstorming is supposed to exclude all form of judgment of the ideas. However, as the ideas that were generated during the session were presented, they kind of involuntarily sparked a conversation among the participants. As such one might consider this session to be a slight variation of a proper brainstorming-session.

The second phase of the creative workshop used a specific variation of the Brainwriting method, called 6-3-5. They were tasked with generating more detailed and descriptive concepts of the student-guide. Though the participants were given no limits or guidelines for the idea generation, a majority of the concepts shared some key-points between them. This made it possible to sort the ideas into four groups, each one with a specific theme; game-related ideas, digital media in general, resources or materials, and a category detailing miscellaneous or more “outlandish” concepts.

**Game-related ideas:** One of the more frequently occurring themes for the ideas was one relating to what is known as “gamification”, usually defined as implementing aspects from video games into a non-video game setting, in order to increase engagement and promote certain behavior. In this case the participants defined two particular aspects of interest. The first one was to have something akin to a regular video game where the player could explore and interact with the environment. Doing so would initiate tasks and assignments where the player would be challenged with specific problems (such as constructing molecules in a chemistry-based setting). After completing a problem (or even failing to do so) the player would receive feedback from the program, telling them what they did well and what needs improvement. The second aspect the participants noted were similar to the first, but with a specific twist; the tasks and assignments would be level-based and by completing a problem the player would reach a new level where something beneficial (as a form of a reward) would occur. This would hopefully act as a positive incitement to continue playing (or as it would be in this case; studying).

**Digital media:** Another theme that was mentioned at least once by everyone was ideas related to other forms of digital media. Many of the responses shared a lot of general themes here as well. For example, the most prominent ideas relating to digital media mentioned using some sort of smartphone-app in various ways. This app would be linked with both other functions of the phone itself, and other machines (such as computers or printers). In this way, the app would help with scheduling by sorting and creating reminders for the due dates of assignments,
send brief summaries before lectures (explaining the general content of the coming lecture), synchronizing the phone’s calendar with the class schedule, and allow for easy printing from school printers. The ideas also stressed the importance of the app’s layout; it should be easy to navigate, be compelling to use (in the same manner that people constantly check their Instagram, Facebook, and Tumblr accounts), and have an attractive aesthetic design. Some ideas particularly noted the benefit of letting the user customize the app themselves, both in regards to the design and layout as well as the functions used. Another theme was concepts regarding utilizing a website to provide information or interaction. The purpose of these websites ranged from just displaying information regarding lectures, to presenting lectures as YouTube-videos (in order to allow students to review any lecture they may have missed or want to analyze a second time), as well to allow students to create their own profiles which could be used to review their performance in classes and allow for better planning of future assignments. The latter aspect was something that was also mentioned for the apps; an overview of the assignments, lectures and exams in each course, where the students would be able to see how they are performing, both in relation to the teachers’ expectations as well as the other students’ performance. The overview would continuously update during the course’s progression, and should be dynamic in the sense that it clearly visualizes when there will be “spikes” in the workload, as well as periods with less activities. One idea that took a different approach to having YouTube-videos present information covered in classes was to allow these to be interactive in some manner. The user would then be able to pause the video, pick a certain theory or piece of information that was especially troublesome, and acquire additional information of this specific subject. This way, the user would also be able to decide to what degree information should be presented. Finally, there were two miscellaneous concepts relating to digital media. The first one was to provide students with a sort of digital notebook, which would work like a fusion between regular course literature and a notebook, by providing information as the class progressed while simultaneously allowing the user to add their own notes. The final concept was to establish a digital chat-room where the teacher had mandatory attendance during specific hours, and where students could ask questions or similar (either as themselves or anonymously).
**Resources and materials:** The third category contained what can best be described as “analogue” resources such as books, notes and schedules. One concept was based on the idea of students receiving a small, introductory booklet even before their studies at the university had started. The book should have a clean and elegant presentation and exude an essence of high quality to give a good first impression. The booklet itself could emphasize what the student will learn at the university, while also alert common problems and issues that might arise regarding studies (and naturally how to solve them). Another concept suggested a book with information regarding the courses themselves. For example, it might contain examples of what prior students has learned from a particular course, and how that has benefited them in their later career. Another implementation were for the book to provide checklists and timetables that would help the students with planning their work and reach the defined objectives. The timetable would contain several milestones such as due dates, exam periods and breaks. Once a milestone has been passed the book would remind the user to reward him-/herself. Furthermore, the book may be designed to also work as a notebook, in order for the student to add their own thoughts in addition to the information provided by the book itself. Finally, one concept suggested that no matter the final design of the actual student-guide, it could be accompanied by a more uncommon resource, such as a poster, chart, map or even a deck of cards that the student could display in their own home. The content of this resource would depend on the student-guide itself, as the unconventional resource would act as a complement.

**Miscellaneous/Outlandish ideas:** The final category summarizes concepts that either does not fit into any of the earlier categories, or are slightly less conventional than the others. One idea notes establishing some sort of place (either physical or digital) where it is possible to get information of all courses, but that are much more compelling than the present course descriptions and syllabi available on the university’s webpage. For example by using less pretentious language, giving much clearer description of the course itself, and using more images. Additionally, it could also work as a portfolio of prior students’ work; showcasing assignments, exams, and so on. Another idea instead imagined the student-guide as a room at the university, where students can interact with the environment. For example, walking on a specific tile may activate a projector in the room, where the student can decide what to display. Additionally, one wall could be filled with information that the student can also interact with and change at a whim.
Alternately, students might be able to enter what they are studying before entering the room, and it would then change appearance accordingly. Every hour the room would change its interior and what information is displayed, and every now and then teachers would be available for help or discussion. The final concept describes each student having a robot, which would follow them throughout the day. The robot would take notes during class, be able to explain parts that the student finds problematic and provide encouragement when motivation is low.
5.3 STAGE 3 - CONCEPT DEVELOPMENT

Before the ideas could be developed to more properly defined concepts, the background research was reviewed again. This was to make sure that the concepts developed in this phase actually took into account the information that had been gathered during the earlier stages of the project. Extra emphasis was put on the issues defined during the first focus group session. By retracing the progress the project had made this far, six aspects were able to be defined. The intention was for the final design to fulfill as many as possible of these, in order to promote the desirable outcome. These aspects can be viewed in Table 9 below.

Table 9: The six desirable aspects of the student-guide, as well as some clarification of what they mean.

<table>
<thead>
<tr>
<th>Desirable aspect</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitate engagement and participation</td>
<td>Make it easier and more rewarding for students to actively participate during lectures.</td>
</tr>
<tr>
<td>Clarify application</td>
<td>Clarify what the purpose of classes are, and how the knowledge from these courses can be applied in the future.</td>
</tr>
<tr>
<td>Assist problem-solving</td>
<td>Assist students when they encounter problems or issues with schoolwork; to streamline the experience.</td>
</tr>
<tr>
<td>Offer resources and materials</td>
<td>Allow students to share their own resources and assignments with each other, as well as access course-related material that will improve their learning.</td>
</tr>
<tr>
<td>Edit the amount of information</td>
<td>Let the students themselves decide how much information they want from text-books, articles and other school-based resources; only the bare minimum or as much as possible.</td>
</tr>
<tr>
<td>Offer possibilities of interaction</td>
<td>Make it easier to interact with and share resources with other students.</td>
</tr>
</tbody>
</table>
These aspects were intended to be used as the basis for a survey, in order to determine what users deemed most important. However, the amount of responses to the survey were not substantial enough to be considered valid (meaning that the survey as a whole was scrapped), and no specific aspect was prioritized more than the others during the continued concept development process.

Quite similarly to how the ideas generated in the prior stage was divided into four groups, the three concepts that were developed in this stage were each based on their own, separate theme. These themes were based on the groups from the creative workshop; one game-related concept, one based on digital media, as well as one based on “physical” resources. The ideas belonging to the fourth group from the creative workshop was not made into its own concept (as it did not seem extensive enough), but instead they acted as an inspiration for ideas that could be implemented into the other three concepts.
5.3.1 CONCEPT 1 - DIGITAL CHARACTER PROFILE

The first concept was based around each student creating their own character profile when they start studying at the university. Along with a general description of themselves they would also design an avatar with customizable features, such as hairstyle, clothes, colors and body features (Figure 11).

Figure 11: A sketch showcasing the character creation page.
As their character is created, so is a “competence profile” along with it. The competence profile is a radar chart where each corner would correspond to a certain trait that is different depending on the education itself. In the example presented in Figure 12 below, the student creating a profile is studying Master of Science in Industrial Design Engineering, and thus the traits found on the competence profile are attributes emphasized in said program; “presentation skills”, “innovation”, “writing”, “cooperation” and “problem-solving”.

Figure 12: An overview of what the competence profile could look like, as well as the attributes connected to it.
Each of these traits would have their own levels, with every trait starting at level one when the profile is created. The courses that the student takes during his/her education all correspond to at least one of these traits; as do the assignments, exams and projects of each course. By turning in assignments the student earns a certain amount of points in one or more traits depending on the type of assignment. For example, **Figure 13** below show a student turning in a project report and receiving the grade 4, which amounts to 20 points in the “writing” trait.

**Figure 13:** Turning in a report in the digital character profile.
As the traits gain more points they eventually level up (Figure 14). In addition to work as a clear proof for the student that they are progressing, levelling up would also unlock a specific accolade. The nature of the accolade would be pre-determined and dependent on the trait itself.

![Figure 14: A trait levelling up in the digital character profile.](image)
As seen in Figure 15, reaching the second level in writing could for example reward the student with an accolade that gives them a free Microsoft Word license to be used on one of their computers for their entire education.

![Figure 15: An example of receiving an accolade.](image)

Since the traits vary depending on the education itself, this means that both the traits and the accolades of the competence profile could be tailor-made to fit the needs and ambitions of different students. Additionally, teachers would have the possibility of creating optional assignments that would still offer points for the competence profile if completed. This would better motivate students that have an interest in specific areas to immerse themselves into the topic, as it might be easier to feel rewarded for their work with the more tangible accolade.
5.3.2 CONCEPT 2 - RESOURCE PACK

The second concept could best be described as a pack of various physical resources that each student would get both before they have started their education, as well as while their studies are under way. One part of this package would be something akin to "business cards" for each course. These cards should contain simple yet effective descriptions of the course itself, as well as concrete examples of what students will learn (Figure 16a). Additionally, they would also contain images of the main teachers of the course, as well as contact information to them. For some courses, the cards could also contain quotes from students; summarizing their experience with that specific course (Figure 16b).

![Figure 16 a) and b): An example of how a course business card could look like, with the front (a) and back (b).]

The intention of these cards is to allow students to get a quick overview of the course they are about to take part of, while avoiding the academic language and mentality usually found in regular course syllabi. This would hopefully allow students to get a better feel of whether a certain course is for them, and what they are expected to learn and take away from the course. Thus, these cards would be handed out before the courses start, or immediately after they do.
The next part of the resource pack is a “welcome booklet” that would be sent home to each student when they have been accepted to the university, but before they actually start. This book would contain a large variety of information, intended to help the student get better accustomed to the university environment, but at the same time something they can continue to use during their entire studies. The booklet would contain interviews with earlier students, who would present their own work in order to let new students get a tangible example of what they will learn at the university. Additionally, there would also be a lot of emphasis on learning itself; the booklet would contain a test that allows students to determine their learning type (how they learn most efficiently), which university resources that support specific learning types, common mistakes when it comes to studying and how to avoid them. In other words, the booklet would act as a sort of hand guide in how to manage at the university. Finally as can be seen in Figure 17, the booklet would have borders at the ends of the pages to allow students to add their own notes and thoughts.

![Figure 17: An example of the layout of the welcome booklet.](image)

The final part of the resource pack was a calendar-poster that every student would receive right before the start of a new semester or period. The calendar would be tailor-made for each student, depending on the combination of courses they are taking during that specific period. All important dates, such as project due dates, presentations, and exams would be available on the calendar, in addition to a schedule of regular lectures. The calendar itself would make it easier for students to keep track of their work, while the poster-format would allow them to put it up somewhere at their home and always have it available.
5.3.3 CONCEPT 3 - SOCIAL SCHOOL-APP

Finally, the last concept was based around a digital smartphone-app that students would be able to download to their smartphones or tablets. Quite similarly to the first concept, the students would be able to create their own profile, with a picture and general information about themselves. This profile page would then represent the “home page” of the app, where the user would be able to utilize various functions (Figure 18). The user would also have the option to design the layout of their own home page; changing the colors, background image, and even arrange the placement of the buttons.

Figure 18: The profile page for the app, along with the functions available.
Through one of the functions available on the app, students would be able to access a course page of the courses they are registered to. These pages would both contain descriptions of the course itself (Figure 19 a)), as well as a page with its own sub-functions related to the course (Figure 19 b)). The main purpose of both the description, as well as the sub-functions would be to help students with both planning and performing their studies. For example, one utility would allow the user to see a list of all other students registered to the same course, as well as an option to enter these students’ profiles and interact with them. Another utility would provide students with various materials and resources related to the course. However, the intent is for these resources to be rather “lightweight” and easy to embrace. In other words, long text articles and similar should be avoided as much as possible, while short summaries, video-lectures and YouTube-links are preferred.

Figure 19 a) and b): The page containing a description of the course (a)), as well as the “main” course page (b)).
The final course utility concerns a timeline-feature that would provide an overview of the assignments in a course, with due dates and objectives easily available (Figure 20). In addition to displaying the due dates of assignments, the timeline would also feature a curve that describes the estimated workload within a course. The intention is that this would help students with planning their time, as they will know that during certain periods they are expected to put in some extra effort, only to be rewarded with some leisure time later on.

Figure 20: The timeline feature of the course page, as well as the summary of all course objectives.
The final major part of the concept relates to a function called the “student finder system” (Figure 21 below). With this feature, the app would search a specified radius around the user, and display the profiles of all other students within that radius that are using the same app (the “Passersby” section in Figure 21). The profiles displayed here will update with frequent intervals, constantly revealing new students as they use the app. By clicking on a profile the user would be able to access a range of options to interact with that specific student, such as starting a chat, check which courses that student is registered to, as well as view assignments and other work that the student has shared on his/her profile. If either one of the users initiate a chat with each other, they will move from the “Passersby” section to the “Acquaintances” section, where they will remain for a longer period of time. Should the two users continue to interact with each other while in the “Acquaintances” section, the app will automatically inquire both students whether they want to register each other as “Friends”. The profiles registered to this section are constantly displayed and available, whether the user is online or not, providing quick access to students that the user frequently keeps in touch with.

Figure 21: The Student Finder system, showcasing how other students are sorted into the three different categories.
Now, the entire premise of this function is to simplify the interaction-process between students, especially between those who may not know each other beforehand. For example, by entering another student’s profile, it would be possible to view what courses that student has finished, as well as those he or she is registered to at the moment. It would similarly be possible to view what assignments the other student has finished within a specific course, which could spur the user to initiate contact, in order to acquire assistance with problems they might be having. Additionally, students who are registered to the same courses as the user may have a specific icon attached to their profile in the student finder window (the book-icon in Figure 21 above). That way, it would be easier to find those that can provide help.
5.4 STAGE 4 - DETAIL DEVELOPMENT

The final stage also contained the final focus group performed throughout the project. Through this discussion, the three concepts that were generated in the prior stage were evaluated, and could eventually be merged into one. How this evaluation – as well as the continued development – turned out is presented in the sections below.

5.4.1 FOCUS GROUP 3 - CONCEPT FEEDBACK

Despite the initial intentions of having the same students that participated in the first and second focus group to partake in this one as well, only two students were able to make it. As can be seen in Table 10 below this was Student C (from the first focus group) and Student F (from the second). As such, what had initially been planned as a sort of presentation for a multitude of participants, followed by feedback, instead became more of a discussion. Not to say that this did not provide any useful information, as the discussion was quite insightful. However, it could still be considered somewhat unfortunate that a majority of the participants who contributed with their opinions during the earlier stages, were unable to provide a reflection of how the three concepts met these.

Table 10: The two participating students in focus group three. Note that Student C in this case is the same person as the one from the first focus group, while Student F was also in the second focus group.

<table>
<thead>
<tr>
<th>Student</th>
<th>Sex</th>
<th>Education</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student C</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>5th year</td>
</tr>
<tr>
<td>Student F</td>
<td>Female</td>
<td>Industrial Design and Engineering (MSc)</td>
<td>5th year</td>
</tr>
</tbody>
</table>

The following sections details the results from the two phases of the third focus group; the customer journey and the concept feedback.
5.4.1.1 Customer Journey

Both participants regarded the initial contact with the university to be generally positive. This mostly concerned the welcoming phase after the students had accepted to start their education at Luleå University of Technology, where the school sends out a collection of information. This information contains general information about studies and the university itself, but also regarding the social environment, which the participants regarded as positive as it created anticipation. The next touchpoint with the school came when the participant arrived and started the “hazing period”; around two weeks with events and activities designed to introduce the new students to the school and get to know each other. This was also seen as positive, as the participants enjoyed meeting new people. Simultaneously with the hazing period, the university also offered something called “Proppen”; optional math lectures designed to review knowledge from the mathematics in prior education, as a means to prepare students for the university courses. While this was appreciated by the participants, they still felt a bit caught off guard by the high tempo, as well as how much they had forgotten.

This was a common occurrence for both the participants during the entire customer journey; the initial mentality to something new was mostly positive, but they often found themselves doubting their own abilities and resolve as things started going, which led to a more negative opinion. For example, both participants considered the first year to be very challenging due to not having found their preferred way of studying, as well being unused to the high tempo. As time went by they felt that they grew more accustomed to the setting, and felt more comfortable with their studying techniques. One of the participants defined the time about halfway through - around the third year - to be where her motivation to study was at its lowest. She realized that she was halfway done, but had failed exams from earlier courses, as well as a lot to do in the current ones, which led her to feeling swamped. She felt like she still had a long way to go. The other participant felt somewhat similarly, but noted that things started to look a lot better with the fourth year, due to the increased emphasis on group projects and courses that emphasized the focus of the education program itself. Finally, both participants felt that their fifth and final year was largely positive, due to almost being finished with graduation just around the corner.
When it came to contact with university staff (both considering teachers as well as various faculty staff), both participants saw an increase in interaction over time. At first it didn't seem necessary to have any specific interaction with them, as they did not know what they would gain from it. As the years passed, they got to know teachers through courses and started to get a deeper bond with them. Additionally, one participant took two years of from studies, in order to work at the university (similarly to Student A from the first focus group, see 5.1.1 Focus Group 1 – Background Research), which led to better contact with both teachers and other staff at the university. Regarding other social aspects of their education, not necessarily referring to the school itself, both participants saw a lot of change over time. During the hazing period and the first few years, they wanted to get to know as many people as possible, and do a lot of stuff with everyone. As time went on they found that they mostly spent their time with a “core gang”, a smaller group of close friends. The further they got with their education, the more they found themselves tired of all "student activities". Instead, they considered school as something more professional, their studies became more like a job.

5.4.1.2 Concept 1 - Digital Character Profile

Both participants considered the first concept to be fresh and innovative, which they deemed a good thing. They particularly appreciated that it had potential to be highly accessible, especially if were implemented as an app to be used with smartphones or tablets. However, they considered the level-system to be a bit problematic; while it was certainly based on good intentions – and some would definitely benefit from it – they suspected that there was a risk it might promote competitiveness with the users. They argued that this might lead to stress, as those who are already behind with schoolwork would feel even worse. Notably, the accolades themselves might appear unfair depending on who decides the grade (and thus the amount of points rewarded to the user). In other words, the system may reward those who are already performing well, while those who actually need the motivation might not really get anything out of it. One way to deter from this, the participants argued, could be to reduce the accolades to minor rewards, such as coupons at university restaurants, a free coffee or something similar. However, this would risk diminishing the point of the concept itself, and make the whole system moot.
On a similar note, both participants considered the “create your own avatar”-system to be superfluous, as only a few students would probably take advantage of it. Most students may find it amusing at first, but would go on to consider it a waste of time. One of the participants specifically said that she would never use it, and that it was not just her kind of thing.

The participants did appreciate some other aspects of the concepts however, such as the radar graph layout of the competence profile. It seemed like an efficient way to show the progress a student has made, a proof that a growth has occurred.

*Student F:* "I thought it was nice when [the graph] was increasing like that... since it does not really give any indication of how much it should grow, or like, that it can decrease; it can only get bigger. So if you just keep working it will only get bigger, the only thing that can happen is that it... it can just stay still, kind off. Or, like, it has a very friendly look.” (Focus group, 23rd April 2015, author’s translation).

In other words, the graph itself would act as a means to show students that they have gotten better since they started out, and have actually learned something. The friendly aesthetic of the radar graph also emphasize that the student cannot fail, but only move in one direction: forward. The other participant added that perhaps the graph should not increase as a response to assignments, but rather as years are completed. She continued to note that the graph could also be used in a way to measure how much students partake in optional events and activities that are tied to the university itself, but not related to any courses or other mandatory assignments. She argued that this would help students with establishing a network, both within the university but also with companies; forming important relationships for the future.

**5.4.1.3 Concept 2 - Resource Pack**

One participant really liked the concept of the course “business-cards” as they seemed like an efficient way to summarize the most important information for courses, in a manner that would allow students to easily review the information anytime they wish. She added that the availability itself was a big plus; she often found herself having a hard time keeping track of assignments, lectures and due dates, so having a
system where she can easily check this information anytime she wants would be a benefit to her. The other participant added that if the cards also clearly displayed the assignments contained in the course, this would make it easier for her to “keep track of” what she has learned, which would be of benefit if she later on needs to apply prior knowledge to a new course. This last piece was something both participants deemed important; to accentuate connections and the relationships between courses as a way to show students how the knowledge is tied together, and how it can be applied in the future. They both considered the concept of the business-cards to have a potential to highlight this aspect. The idea that all this information would be presented in a clear and concise manner, avoiding the vague academic language often found in syllabi was something that was similarly appreciated by the participants.

Student F: “If I read a course description, then I want to know: what will you do in this course? I want to see that: ‘you will perform one project with the purpose of developing a concept for this thing, and then we will have an exam where we will, eh... talk about design theories regarding ‘blah, blah, blah’ [referring to a random subject].’ Like, I want to know, in clear terms, what will happen in this course. Not like: ‘you will learn this... after the course the student should be able to... discuss liberally regarding the subject about...’ Nothing like that, but rather purely practical.”

Student C: “You mean more, like, this assignment is connected to this goal. Connecting the purpose and goal of the course ... with what you are supposed to know, exactly what you will learn, and you will be practicing this through these methods.”

Student F: “For example, if we say Scientific methods for Design Engineering [mandatory course for those studying MSc in Industrial Design Engineering, focus product design], I know it explains [the assignments within the course] somewhere in the syllabus, but it would have been better if it said in the actual course description, if you are applying for the course independently from a program ... then I want it to say: ‘in this course you will have a written exam, a project that will be this big, and then you will make a clay figurine that will be like this.’ I think it rarely says
However, the fact that this concept was based on physical resources was perceived as a bit old-fashioned, which might decrease the usability and (more importantly) the availability of the student-guide. The participants noted that this may in turn deter some students from using it at all.

5.4.1.4 Concept 3 - Social School-App

The immediate impression the participants got from the third concept was the efficient overview and user-friendly aesthetic of the graphic design. They both appreciated the graphic nature of the concept, with big, friendly buttons that you want to press, and symbols that explain the functions. Overall, they found the digital app to be inviting to use. Despite this, they also noted that it might be desirable to offer some sort of customizability for the user, such as changing colors, add a background image, changer the order and appearance of buttons, etc. This would serve the benefit of both streamlining the user-experience by making it easier to use, as well as add a personal touch while not demanding too much effort. However, the participants argued that the timeline-feature would demand some slight alterations. The idea to give an overview of the estimated workload for students was in itself a good one. However, they noted that some might be stressed out by having a curve "telling them what to do", which might be a lot to take in for those who have just started studying. Additionally, the curve may not accurately represent the study-pace of every student, as everyone prefers to work in their own manner. This may cause it to hinder some students due to not really supporting their learning styles.

Student F: “When you haven't really gotten that far yet, that you know how you work, if you depend too much on something that does not match exactly with reality, it has to provide correct information. Or it needs to point out that 'this is just a guideline', not something you should depend on too much.” (Focus group, 23rd April 2015, author’s translation).
In other words, the timeline would be better off as a means to provide an overview of assignments and similar activities in order to aid students with planning their work, instead of something that plans everything for them. The participants specifically noted that the core idea was good, as providing students with a straightforward overview of assignments would probably help with decreasing stress.

Another aspect that the participants appreciated and that somewhat ties in with the last one was the availability of the concept, which comes with being an app for smartphones and tablets. Since a majority of students carry these kind of gadgets with them constantly, this means that the functions offered from such an app can be accessed all the time. For example, being able to review what assignments have been finished and which ones are left (as well as when they are due) at any time would thus be a considerable boon for students. One of the participants similarly thought it would be a good idea to allow students to review information from prior courses through the app, such as grades, assignments, and such. The reason was similar to that of the second concept, as it would be beneficial to have a single place where students can access this kind of information, both as a means to assess their earlier work as well as presenting it to others.

The concept also seemed to hold promise as a means to promote network. For example, one participant mused that the app could send notices to the user; promoting events and activities that would seem to fit his or her profile. Additionally, the notices could be used to send out tips and pointers, in order to let students make the most out of their time at the university. Similarly, the app may benefit from allowing the user to link their account with certain social media - such as LinkedIn – or to provide some way of sharing material and resources with other students.

Both participants agreed that the student finder system held potential, especially as a means to promote interaction between students.

*Student C:* “Being able to contact others that have taken the same classes [as I] and ask questions. Being able to talk with ‘passersby’ as well; I am looking for someone that is damn good at math, they may even have this kind of icon [on their profile], that shows that they would gladly help, so I can see that and go ‘shit, I should contact that person!’ So I liked that a lot.”

(Focus group, 23rd April 2015, author’s translation).
However, both participants agreed that there should likewise be an option to be anonymous on the app; either in order to avoid other students from initiating contact if that is undesirable, or if the app could be used to chat with teachers as well. The reason for the latter was an issue that has been mentioned every now and then during discussions with users (and similarly during this focus group as well); that many students find it awkward or embarrassing to ask the teacher during lectures. By allowing students to send questions anonymously, this may allow them to still be able to tackle issues that arise during lectures. In relation to the teachers, the participants also noted the importance of them getting a positive view of the student-guide, and not just consider it some tacky add-on. The teachers should be able to direct students in using the app and show them where certain information can be found.

5.4.1.5 General Discussion

Lastly, the participants also had some thoughts that did not apply to any specific concept, but rather to the student-guide in general. They mentioned that it was of utmost importance that it is easy to use, no matter if it takes the shape of a digital app or a bunch of physical resources. As the aim is to introduce the student-guide before or at the same time as new students start their studies – when there already are a lot of new information and impression – the student-guide has to be carefully implemented, so as to not make this situation worse (and thus deter students from using it all). Overall, both participants preferred the third concept before the other two, and one of the reason for this was due to the fact that they perceived both the first and second concept as being a bit tacked on and forced. In other words, they did not come off as natural to use, but rather you would have to remind students to take advantage of them at all. The third concept on the other hand appears to have a lot more to offer, and would appear more inviting to use for students. Still, in order to make sure that as many students as possible will take advantage of the student-guide, one of the participants mused that it might be beneficial to have a specific session during hazing specifically devoted to introducing the guide and getting used to it. This session could be led by older students who are both accustomed to the guide itself, and can give concrete tips of how to use it. By introducing the student-guide this early, it might help new students get comfortable with using it, as well as promote further usage. Another function of the student-guide the participants deemed important was as a gathering place for important resources for studies, work, contacts and similar.
This would in itself make it easier to keep track of due dates, assignments and the learning objectives, something that would hopefully make it easier for both new and old students to achieve a deep learning approach. Finally, a means to review concrete examples of earlier work and assignments by students was similarly sought after. The main purpose of this would be to allow students to get a better picture of what counts as a specific grade, instead of “shooting in the dark” and hope that the teacher will appreciate the end result. The participants noted that this is especially true in design-related courses, which usually have more “vague” objectives.

5.4.2 FINAL DESIGN

This chapter presents the final concept design of the student-guide, in other words the definite result of the whole project. The feedback from the third focus group pointed toward the third concept – “the social school app” – holding the most potential. As such, this was the basis for the final design, while the continued development still tried to implement the positive aspects of the other two concepts as well. Beyond the concept evaluation by the participants of the third focus group, no other evaluation was performed. This was partly because the feedback from the students so clearly pointed toward the third concept being superior the other two. Perhaps more importantly though, it was also due to the fact that there was not really any demands or requirements (beyond what had been mentioned by the focus groups) to evaluate the concepts on. This can probably be “blamed” on the open nature and lack of definitions for the student-guide at the project’s onset.

It might be noticeable in the description of the final result below that there are several functions being mentioned could be implemented, but which does not necessarily have any detailed description of how. The reason behind this is that the digital format of apps holds vast potential, and can be programmed to perform pretty much anything. As such, it would have been possible to simply tack on a lot of different functions and call it a day. Instead, the final result focused on a select few key functions – those that seemed to have the most potential in fulfilling the project objectives – while the other possibilities will only be touched upon. If one were to continue with developing the final design, an important part of that work would be to define exactly what functions are deemed necessary and should be implemented.
The final design thus consists of an app for smartphones and tablets, with a variety of functions that aim to streamline the studying experience of students. The app itself can be divided into two major “pages”, with each page providing their own set of functions. The first is the personal profile page, which can be viewed in Figure 22 above. This will be the main page of the app, where all the major functions can be activated from. The intention is for the app to be tied to the user name that every student receives when they start their education, which means that the app will automatically create a default profile like the one above when the user logs in. On the profile page, there are five buttons displayed, each providing a separate function.

Figure 22: The final design of the profile page on the app.
Starting from the top left, the button with the star-icon affords the “favorite page”. Here the user can easily reach specific pages in the app that they have marked as a “favorite”, in order to reduce the effort needed to get to specific pages they frequently use. The next button (the one with the monkey wrench) signifies the option menu, where the user can customize some of the layout of the app; changing colors, adding background images, changing notifications settings and similar alternatives to give the app a more personal look.

In general, one of the major influences of the graphic design of the app comes from the graphic profile of Luleå University of Technology. This mostly affected the color choice and fonts used for the final design, in order to match the overall image of the university. As for the placement of items and general layout, it was based on themes similar to what Scolari (2009) argues; functions of higher importance or that are intended to be viewed first were placed at the top, or top-left, of a page (such as the profile image in Figure 22 above). Similarly, objects that offered similar features were designed to have similar shapes, while also being grouped together, according to the Gestalt principles of similarity and proximity, as argued by Bergström (2001) and Lidwell et al (2010). For example, the three major functions in Figure 22 above are of similar size and divided from the smaller buttons and the profile description by a white line.

A majority of the functions available through the app are reached through buttons, whose designs where heavily influenced by theories regarding icons and archetypes. As Bergström (2001) and Crow (2010) notes, an icon is something that resembles what it represents, which was something that the design strived to achieve. By using icons that represents the functions they afford, the intention was that it would be easier for a new user to realize the purpose of each function, without any prior experience. As an example, the button labeled “Planering” (planning) in Figure 22 above is shaped like the timeline-bar that the function itself contains (which can be seen in Figure 27 further down). This can be related to what Norman (2013), You and Chen (2007) argues relating to affordance, in how the design features of a product determines how the user perceives it can be interacted with. In other words, by describing the available functions through icons and only a few key words, the user experience would become faster and more efficient.
As was mentioned above, archetypes also influenced the final design of the app. This influence can mostly be seen with the icons, and their shape. Lidwell (2010) mentions how archetypes are something akin to a "preprogrammed" bias in humans; in other words, a form of attribute that instills similar reactions and expectations in almost everyone. In a similar vein, Tsai (2006) also notes how the presence of archetypes in product design can change how a product is perceived, and thus interacted with. Thus, the design of the icons in the student-guide app then was an attempt to take advantage of the meanings of these archetypes, in order to play with the user’s expectations. For example, the design of the icon on the button labeled "Kurser" (courses) was based on a book, as this is something most people associate with reading and studying; two attributes commonly found in courses. Similarly, the option menu button in Figure 22 mentioned above was modeled after a monkey wrench, as this is a shape that is commonly found representing settings or options in various media (and even the action afforded by a monkey wrench itself; to tweak something).
The first of the major functions is the student finder system, represented by the button right below the profile picture in Figure 22. The function has remained largely the same as to how it worked as an initial concept in the earlier stage. When logging to the app, other users within a specified range will be displayed, who can be interacted with as seen in Figure 23 above. The extent of this interaction is yet to be completely defined, as plenty of possibilities exist. However, one of the student-guide’s objectives is to streamline sharing of information and knowledge between students and as such, the possibilities of interaction needs to highlight this. This includes being able to chat with other users, as well as sharing resources and work with each other.
Students who are registered to the same classes as the user will also have an icon next to their profile indicating this (represented by the book icons in Figure 23).

In Figure 24 below is an example of how another student's profile can look. As was mentioned, the functions provided are not yet completely defined but the example displays four convenient features.

![Figure 24: An example of another student’s profile.](image-url)
The first one provides a messaging system (the button labeled "Meddelande"), which is pretty self-explanatory; allowing users to chat with each other. The second button - right below the first one – contains a list of all the users that "Reggie" in this case has registered as friends ("Vänner"). The button labeled "Kurser" (courses) instead offers a list of the courses that the user is registered to at the moment, and potentially the ones they have already finished. Finally, the last button labeled "Portfolio" is once again pretty straightforward. This function would allow "Reggie" to share resources selected resources from his own page; both those he has made himself, or others that he links through his own page (such as YouTube-videos). Additionally, it might also be possible to provide a feature to share this portfolio on social media, directly through the app itself.

Returning back to the main page for the student finder system; when users interact with each other they will move from the passersby-section ("Förbipasserande" in Figure 23 above) in their respective apps, via acquaintances ("Bekanta") and finally to friends ("Vänner"), depending on the degree of interaction between the users. This will hopefully make continued interaction easier in the future. Some of the new features that were added to the student finder after the last focus group was the option to display an icon on the user's profile, which will signal to other students that the user is willing to help if others ask for it. This is represented by the exclamation bubble in Figure 23 above. Additionally, it should also be possible to activate a setting that stops other students from being able to interact with yourself for a period of time. Finally, a filter system will be in place as well, which for example allows the user to only search for students registered to a specific course. The main intention for all of the functions of the Student Finder is to make interaction among students more rewarding, as well as easier to perform. Hopefully the opportunities offered by the Student Finder will allow students to realize the value of reaching out to each other, both with the intention of providing help as well as receiving it. Haneda (2006) as well as Lave and Wenger (1991) argues that at least some degree of learning takes place in social communities, which the students from the focus groups seem to agree with. The Student Finder is thus a way of improving the potential of interaction at Luleå University of Technology, which is currently seen as lacking by students.
The second major function available from the profile page is the pages of the courses that the user is registered to (as well as those he/she has already finished). This function is available from the button to the right of the Student Finder-button in Figure 22, labeled “Kurser” (courses). An overview of one of those pages – in this case for the course “Scientific methods for Design Engineering” – can be seen in Figure 25 above. These pages (no matter which course) is also one of the more important aspects of the app, as several important functions can be reached from here as well. With the exception of the favorite button and the return button at the top right of the page, these correspond to the six larger
Starting from the top left, the first button (labeled information) basically provides information for the course itself. The information page will act similar to how the “course business cards” described in chapter 5.3.2 Concept 2 – Resource Pack were intended to work. There will be short and clear descriptions of the purpose of the course; what students can expect to learn, the assignments of the course and examples of earlier work by students. All accompanied by plenty of images of course. The second part of the “course business cards” - the images and contact information for the teachers - will be available through its own button on the course page; right below the information button in Figure 25, with the text “Lärare” (teachers) below it.

The next function provided by the button at the bottom left – labeled “Föreläsningar” (lectures) - would allow students to review short summaries of the lectures in the course. However, it is important to note that these would only be available as the actual lecture has passed. After all, there is a certain risk that some students would decide to skip lectures and simply read the summaries instead, which is not the intention of the app itself. Instead, the purpose is for it to offer students an easy way to backtrack to earlier parts, in order to quickly review what has already been covered. It might also be of interest to assign specific chat rooms to each lecture’s page. Doing so would let students have discussions regarding the topic of the lecture, and even address issues or questions that may have arisen during the lecture itself. This way, the necessary information will hopefully be only a few clicks away from students at all times. As a matter of fact, the three functions of the course page described so far (represented by the three big buttons to the left in Figure 25) all act as a way of providing the student with short, yet descriptive summaries of the course itself. That way, students will always be able to review earlier information, which will hopefully make it easier to build upon prior knowledge and connect it with future experiences.

Moving on the second set of functions available, the button at the top of the right column (marked “Material” in Figure 25) will provide students with various materials and resources related to the course. However, it might be vital to note that exactly what kind of materials offered here needs to be clearly defined beforehand. For example, if it is solely the teachers’ task to do so, there might be a risk of them filling it with lengthy videos and articles, which goes against the purpose of the app (to provide students with information that is readily available and easy to grasp). On the other hand, if only students get a say in what resources
should be available, they might end up completely unrelated to the course itself. Perhaps a way to combat this dilemma would be to allow the materials section to be a collaborated effort between teachers and students. For example, everyone could “recommend” resources, while other would be able to rate them. If a resource acquires a certain rating it will then appear in the resources section.

Below the “Material” button, there is a button allowing to access a list of all other students registered to that specific course. Through this list, it is possible to reach each students’ profile, thus making it a snap to contact other students in a specific course.

Finally, the last function available from the button at the bottom right of Figure 25 is called “Relationer” (relations). This function will present the user with a visual of how the current course is related to other courses at the university, as well as to how it could relate to work outside the university environment (see Figure 26 for an example). Not only would this allow students to get a better understanding of the relevance of a course and its objectives, but it would also make it easier to find similar courses to take (or perhaps avoid) in the future. Additionally, if a certain course is based on knowledge from an earlier one, this function would make it much easier to find it and review that information. Better yet, through the latter’s course page it would be possible to easily find the sought after information by simply using the “lecture summary function”.

![Figure 26](image)

**Figure 26:** An example of what the relation page could look like. The setup would employ a hierarchical layout, where pushing on a button (in this case “Relaterade kurser”) would reveal additional nodes with information.
However, in the end it might be necessary to consider whether all the functions of a course page should be available to all students; even those who are not registered to the course itself. For example, having students who are not registered to a course participate in lecture discussions may cause confusion and be inefficient. The app should by all means feel as easy to use as possible, so perhaps limiting some of the functions until they are actually necessary may support that goal.
Returning back to Figure 22 and the profile page, the final defined function available is the one labeled “Planering” (planning). Just as the name suggests, this function aims to provide students with a helpful tool to plan their studies. This is done through two distinct features, presented in Figure 27 above; a timeline and an objective summary. The former takes the shape of the orange and white bar in Figure 27 above. The bar itself shows the progress of a study quarter; as time goes on the bar is filled. Thus, students always have a quick way of measuring how far the study quarter has progressed.
The objective summary is visible right below the timeline, and as the name implies displays all assignments the user has in all of his/her courses. The list will update automatically as the user registers to new courses. As can be seen in Figure 27, in addition to being presented in a list, the objectives are also displayed just above the timeline bar (in the shape of an exclamation icon). Thus, students will get a better overview of when each assignment is due. The user will also be able to touch any of the assignments in order to highlight them, which will reveal an information window (Figure 28). This will give the user important information such as the objective of the assignment and when it is due.

![Figure 28: The information window that appears when highlighting an assignment.](image)
It is important to note that the planning page will keep track of all courses the user is registered to, which means that the objective list will contain all of the assignments for each course simultaneously. Naturally, the user should have the option to be able to customize the objective list, such as displaying the assignments by their due dates, only displaying assignments for a specific course, or only displaying assignments that have not been turned in yet.

One important aspect regarding the student-guide in general that was addressed more or less throughout all of the focus groups was how it would be perceived by new users. There is a risk when introducing the app to prospective users that they will perceive it as just a novelty; interesting at first but eventually not worth their while, unless they actually find some use for it. One way to prevent this, as discussed by the students in the third focus group, would be to introduce the app to new students during their hazing period. For instance, it would be possible to set aside a particular session together with older students, in order for them to guide new students in how to use the app. Additionally, a unique “course” could be created, where the goal of the assignments are to perform various task within the app itself, such as initiating a chat with another student, browsing through the course page, uploading a picture, and so on. As was mentioned by the focus group participants, the benefit of introducing the app this early is that most students do not know each other that well at this point of the hazing period. Since the app itself contains a chat function, it would be a natural way to initiate contact between new classmates, before they have traded phone numbers, or added each other on Facebook. If the app is introduced in such a natural manner that early, it is likely to have a higher chance of being used continually throughout their entire education.
6. DISCUSSION

As opposed to a majority of other master theses and projects performed at Luleå University of Technology, this one was never based on a request from a client (as was already mentioned in chapter 1.2 Project Objectives and Aims). This makes it somewhat difficult to discuss the final design in terms of how it fulfills its purpose, as there is not really any defined criteria to compare it with. This is further complicated by the fact that the final result of the project itself is "just" a conceptual design; one would have to try it out first to see if it actually will motivate, engage and support students with their learning, as was the original intention. Nevertheless, this does not mean that there is nothing to discuss at all. Quite the opposite, since the journey from the initiation of the project back in January toward where it is now has been considerably eventful, with lots of twists and turns along the way. This chapter aims to describe how these "twists and turns" have affected the outcome of the development process, as well as my own personal reflections to these topics.

6.1 STAGE 1 - BACKGROUND RESEARCH

The background research can probably be considered to be the most substantial stage, due to the fact that a considerable amount of time was spent in this particular phase. Additionally, I found myself frequently returning in order to add, remove or edit the information that had been collected during the literature review. But as was mentioned above, this was something that had been expected all along, and so it did not affect the project planning significantly. Perhaps more interesting though, was the discussion generated by the first focus group, where quite a few parallels could be drawn to the theory from the literature review. For example, one issue that was frequently brought up during the first focus group (as well as the subsequent ones) were how, and when, the students felt that they had learned something. The participants made two distinctions here; courses that made a clear connection with how knowledge could be implemented in future work, as opposed to those that simply taught the students to "pass the exam" without signifying any sort of relevance for the knowledge. When it came to classes of the first kind the students often found themselves more motivated to
participate and to actually learn, whereas the latter courses were more considered a necessary must; an inconvenient obstacle. In other words, the former made the participants more inclined to take a deep learning approach, while the latter led to the less desirable surface learning approach, as defined by Biggs (1999), Gibbs and Habeshaw (1989). Similarities can also be seen in the three levels of learning coined by Biggs (1999). The participants noted that if they understand beforehand what they are supposed to learn (as well as why), and the tasks and assignments are similarly attuned to that goal, they found themselves more inclined to actually make an effort to achieve that level of knowledge. The “goal” in this case, was usually considered to be knowledge that would be useful in future work, both in and out of the university setting. This is quite similar to the definition of the third level of teaching, which was mentioned in chapter 3.3.2 Constructive Alignment. In contrast, a majority of the participants noted that in the kind of classes where they were merely taught to “pass the exam”, the teachers often gave of a vibe of lacking motivation to teach. In other words the teachers seemed aloof, as if the teaching was an unwelcome means to an end. This can similarly be seen in the first level of teaching (which was also mentioned in chapter 3.3.2 Constructive Alignment), where the teachers consider themselves experts tasked with simply presenting the information to the students, but nothing else. As was noted by both Biggs (1999) as well as the participants of the focus group, this is a very ineffective method of teaching, and should be avoided at all costs. It is often considered that motivation is one of the most important aspects to a successful education, and the participants agreed to this. However, this is just as true for the teachers as for the students. The focus group showed that the participants had the most motivation when the teachers were dedicated to their teaching, and provided students with clear, yet challenging goals to strive towards. As such, the challenge of an assignment should not come from difficulty of understanding the purpose, but rather how students should use their prior skills, as well as building new knowledge, in order to conquer the tasks.

The participants also briefly touched on the subject of assessment, specifically regarding the current grading system. They felt that the present system - which basically amounts to receiving a single number - in order to define the success of your performance does not really mean anything. The number is supposed to represent an overall judgment of your capabilities, but it does not define what parts of your work that are positive, and what parts that needs to be improved.
The participants argued that it is impossible to improve without some sort of feedback from teachers as well as peers, since just receiving a grade after a course has been finished (sometimes several weeks later) does not really leave any room for personal reflection. This seems to correspond with Gibbs’ and Habeshaw’s (1989) theories regarding proper assessment, as they noted that this could be an important factor in affecting the motivation of students.

Interestingly related to the theories regarding communities of practice, the first focus group revealed a desire to be able to interact with other students, mostly as a way of sharing knowledge. The participants mentioned that often when they would have problem with an assignment, their first response is to contact a peer for assistance. However, they also noted that it could be difficult to contact someone beyond their immediate circle of friends or classmates, which could be troublesome if none of those could help. The participating students specifically mentioned the benefit of being able to contact older students, as they would likely have a lot of useful information and experience to share. But as things are currently, doing so is quite difficult, mostly due to the fact that neither the physical nor digital university environment support this kind of interaction. Thus, in order to increase students’ chances of grasping potential threshold concepts as defined by Meyer and Land (2003, 2005), it would make sense to see the university environment as a community in itself. After all, as Haneda (2006) and Wenger (1998) notes, the social interaction within a community causes the participants to learn and evolve, no matter if it is intentional or not. By promoting this kind of interaction between students, it might very well be possible to increase learning, even outside the classroom. However, just as the students participating in the focus group noted, it is important to make sure that the interaction is beneficial for all parties involved, otherwise some might not feel inclined to participate at all.

Another important point regarding the focus groups that I need to address is regarding the participants themselves. The initial intention was to have a recurring reference group with the same students participating each focus group. However, most of them were unable to attend simultaneously, or did not even respond to the callings at all. This meant that over half of the participating students in the second focus group were “new”, while only two of the remaining students participated in the third. So while this differed from how I had planned the development process, in the end I would still be as bold as to state that it didn’t really affect the end result in a negative way.
6.2 STAGE 2 - IDEA DEVELOPMENT

While there was a quite substantial amount of ideas generated during the idea development stage, they were still able to be sorted into four separate categories. One can also notice some repeating themes regarding the ideas in each category, relating to the theories of pedagogy described in chapter 3.3. For starters, the category detailing ideas related to gamification had several ideas that touched upon an improved method for assessing students’ capabilities. In this case, the specific nature of games would allow students to receive immediate feedback on their performance in the game, something they noted was lacking from the present assessment system. As was mentioned above, currently a grade is assigned often several weeks after a course has ended, and there is rarely any noticeable feedback explaining the motivation behind that particular grade. As Gibbs and Habeshaw (1989) noted, assessment is an important factor in determining the motivation of students, but according to the students who participated in the focus groups it is rarely treated as such.

The second category regarded digital media and probably had the widest variety of ideas. A majority of them seemed to suggest some manner of summarizing information both as a means to make it easier to understand, but also to streamline the process of reviewing it at a later time. As noted by Biggs (2011) and Chang et al. (2008), constructivist theory depicts that learning is based on earlier experiences, and implementing that prior knowledge to new scenarios. The desire to have the intended learning outcomes summarized for easy access thus makes sense, as it could make it easier to retrace old steps with new information. Thus it might be possible to view things in a new light which could hopefully result in new knowledge being formed. This was a major contribution to the design of the course page of the app, where several functions provide information in one way or another. The intention was to reduce time spent on trying to retrieve earlier information (by making it readily available), so that students can instead focus on building new knowledge.

Another aspect that was touched upon with the ideas in the second category was the possibility of social interaction that many forms of digital media provides. Of particular note here is the study performed by Chang et al. (2008), which showed that there is indeed potential for implementing the social aspects of digital media into education. Similarly to the second category, a majority of the ideas from the next one saw some similarities with the theories of constructive alignment.
The ideas themselves mostly consisted of various ways to acquire information summaries beforehand, as a means to prepare oneself for what is to come. In other words, the students wish to have a clear understanding of what they are supposed to learn - i.e. the intended learning outcomes - in order to become motivated. This is similar to how Biggs (2011) notes the importance of defining what students are to learn, in order to be able to align the assessment tasks to reach that outcome.
6.3 STAGE 3 - CONCEPT DEVELOPMENT

The first concept - “the digital character profile” – was heavily based on the game-related ideas from the second focus group, as well as some of my personal experiences with gaming. The intention was for the students to get a personal “bond” with their own profile, hence why they would be able to create a digital version of themselves that they could customize to their own liking. The aim with the “competence profile graph”, as well as the traits and accolade system, was twofold. Firstly, it would act as a motivation to study; by performing as many exercises as they could, as well as performing them well, they would be able to acquire more “points” and level up, providing them with fitting rewards. Additionally, if the rewards themselves would be clearly visible even before the corresponding level has been reached, this too may cause students to become more motivated to try a little harder, just to acquire a particular reward. Secondly, the system would also be a way to clearly visualize the intended learning outcomes for the students, as well as feedback of whether they have met these outcomes or not. Initially, this was probably my favorite concept, out of the three that were developed. The accolade system was based around a common trope found in many video games, where you get concrete feedback of your progress in the shape of a tangible reward. This can range from alternate costumes for your characters, to power-ups, or special skills that makes your character more powerful. For me, there is a certain satisfaction in acquiring those rewards, as it gives a sense of improvement; a direct feedback of my own progression. Additionally, the charm of many of these kinds of games is that you are constantly motivated to go just a little bit further, in order to get that next reward that is just out of reach. With this concept, I tried to simulate that feeling of always having that motivation; the carrot dangling right in front of your nose. Of course as the students from the third focus group pointed out, there is a risk of the carrot instead becoming the stick for some students. While my vision was to have the rewards as a form of motivation to spur students to reach for new heights, this might end up becoming a reward for those who already have a high motivation to study. Those who have a hard time studying, or lack motivation, might instead find themselves punished; their friends who were already performing well to begin with gets showered with even more praise, while the lack of rewards for others serves as a grim reminder of their lacking performance. As such, the concept may sound pleasant and useful in theory, but it would be difficult to implement in a way that is fair to everyone. In a worst case scenario it would result in rewarding
those who do not necessarily need it, while those who do instead get left behind even further.

The second concept was obviously the most conventional of the three, as it contained variations of solutions that already exists in some way. The main theme for this concept was to provide quick information that is easy to review, as a means to prepare students for both new courses, as well as their education as a whole. When designing this concept, I drew some inspiration from Biggs (1999) theories of constructive alignment. Specifically how students may benefit from having clearly defined learning goals, as well as assessment tasks aligned toward these. My intention was for the “course business cards” to act as a way to provide students with a quick overview of what a course contains, both in terms of what knowledge is to be learned, as well as concrete examples of how this knowledge will be used. This would hopefully give students a better understanding of the courses themselves and make it easier for them to decide which courses suits them, as well as prepare students for what to expect when starting a new course. The “welcome booklet” worked in a similar manner, though in this case related to the entire education. As the customer journey performed by the students in the third focus group showed, they were often psyched whenever they started a new course, filled with anticipation of what to expect. However, this anticipation was soon replaced with dread, as the first lecture often attempted to provide students with an overview of what to expect. Due to unnecessarily complicated and academic language, as well as confusing syllabi, students often found themselves more confused after the introductory lecture than they were before. The entirety of this concept (the booklet, business cards, as well as the calendar poster) were an attempt to mitigate this issue, by providing quick summaries of the most important information. Both participants of the third focus group appreciated the aspect of availability of the concept, as well as the potential it had for linking courses together. The way courses are set up currently they often appear to be entirely separate from each other. Even in the case that one course is building off of another, this connection is often downplayed to being in name only. This results in students only considering each course separately and not how the course itself - as well as the knowledge contained within - relates to their education in its entirety, as well as the “reality” outside of the university. The focus group participants noted that this concept could be used to emphasize these connections, which may help students to better realize the relevance of the courses themselves. However, they also argued that physical format of the concept - i.e. using books, papers, and similar “old-fashioned” resources - might make it
unnecessarily cumbersome to manage, which might diminish some of the usability. While the business cards could possibly be sized in a way that they would be easy to stow away in your wallet, they could just as easy be implemented into a digital concept available through a smartphone. This would make it even easier to manage, without losing any of the benefits of the original idea. Additionally, the participants mentioned that having that kind of information on your smartphone could also make it possible to synchronize it with the phone’s calendar, which would make it easier to keep track of important due dates and similar.

The third concept was probably the most “defined” out of the three, with a more extensive description of how it would work. I partly feel that this was because all the functions and possibilities of the concept felt so natural when I designed them, as if their inclusion had been obvious from the start. But this was not the only reason however, as a large part of the concept – namely the possibility of searching for other students using the app – was heavily influenced by a specific video game. If I am going to be perfectly honest, the system in question was the “Player Search System” (or PSS for short) found in the video games Pokémon X and Y. Without going into too much detail regarding the games themselves, the PSS works by letting the player log on to the internet, where other players who are online simultaneously can be found. These players can be instantly interacted with, ranging from trading, battling, or just sending a brief message. If two players interact frequently with each other, the PSS will remember this and eventually inquire the two players whether they want to register each other as friends, which make further interaction much easier. The ingeniousness of the PSS is that it allows players who are otherwise unable to trade and battle with others to easily do so through the internet, without even having to know the other person beforehand. Thus, the interaction is not even limited to physical presence, expanding the experience even beyond the player’s own home. This in itself was something I attempted to achieve through “the social school app”; to create an artifact that can extend the learning experience beyond lectures and classrooms. Similarly, it was my intention that the app would also allow those who might otherwise have a hard time to find peers that can assist them to still have a fair chance.
6.4 STAGE 4 – DETAIL DEVELOPMENT

The main factor that ended up deciding the third concept as the basis for the final design can be summed up in one word; availability. Not only does the nature of a digital app mean that it is almost constantly available (as most students always carry around their phones), but information can also be linked and shared within the app itself, removing many of the boundaries traditional resources are burdened with.

In regards to what was kept from the three concepts of the former stage, the timeline feature presented in Figure 27 tried to implement the friendly aesthetic that emphasized progress, but without adding the pressure of the competence profile.

Due to the contrast between the “analogue” nature of the second concept, and the digital nature of the final design, what was implemented from the former was mostly the aspect of summarizing information and objectives (found in the “course business cards”), as well as the possibility of highlighting how courses and knowledge are linked together.

As can be seen if one compares the timeline of Figure 20 with the one in Figure 27, there are some slight changes. The change mostly consisted of removing the “anticipated workload”-feature, as the participants of the third focus group noted that some students may become stressed out with having something “telling them what to do”. Instead, the timeline was implemented solely as a visible tool that clearly shows students how far the study quarter has progressed, and when assignments are due. The intention was that this would help them with planning their time accordingly. The student finder system remained largely unchanged, however some slight additions were implemented as per the focus group participants’ requests. The additions meant that students would be able to either make themselves unable to be interacted with or anonymous, and that they would also be able to assign an icon to themselves; indicating that they would gladly assist other students.

Interestingly, the participants also noted that there could be additional functions included, such as a way of linking their student-guide profile with social media (such as Facebook or LinkedIn). However, I personally deemed that the process of defining how this relation would work is as substantial as a project in itself.
Thus, I acknowledge that the possibility for this function is absolutely relevant, but exactly how it would be implemented is more of a matter for future work.

Another important point regarding the final design that was frequently mentioned in all focus groups considered the amount of information available to students. During the first discussion, the participants mostly noted how teachers often expect students to read large amounts of text for a specific subject, when in reality only a fraction contains information of actual importance. During both the first and second meeting, ideas regarding ”interactive textbooks” came up; literature that would initially present only the most important and useful information in short, straightforward summaries. If students want to immerse themselves in a subject they find interesting, the textbook would be able to provide more information continuously. This would allow those who only desire a quick overview to get their fill, while students who may be particularly interested in a certain topic can get extended information.

Finally, during the third focus group, both participants noted that one of the aspects they liked about the social school-app was the stylish presentation of the concept, that focused on self-explaining icons and as little text as possible. Similarly, the participants noted that the parts of the concepts that would require a more extensive amount of text needed to be as short and to the point as possible, as a means to promote usability. As such, the issues touched upon here seemed to point to an important aspect in how to ensure that the student-guide would be intuitive and easy to use. Large sections of text should be avoided at all cost, and instead substituted with explanatory images whenever possible. The final design of the student-guide thus attempted to utilize the gestalt principles of perception, as mentioned by Bergström (2001) and Lidwell et al. (2010) in chapter 3.2.1.2 Gestalt Psychology, in order to promote a good affordance. Specifically, the

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Figure 29: Drawing of a woman wearing a mortarboard. Photo: Pearson Scott Foresman; covered by Wikimedia Commons.
laws of closure, good continuation, proximity and similarity were all used when developing the design and layout of the buttons for the social school-app. The intention was that this would make it easier to perceive the function of the buttons, and make it possible even for someone new to the app to use it correctly. Similarly, theories regarding archetypes played a significant role in the design process of the button icons. The purpose was for the design to explain the function of each button through visual perception alone, in part by using descriptive images. For example, the icon for the “teacher page” (Figure 25) in the school app was designed after a teacher archetype, by using stereotypical aspects of teachers (such as big glasses and a mortarboard, see Figure 29 above). Similarly, a monkey wrench was chosen as the “option”-icon, due to the fact that these have almost unanimously been chosen to depict such functions in many forms of digital media. In this sense, as both Bergström (2001) and Crow (2010) notes, the monkey wrench-icon resembles the function it represents; in this case to “tweak” a system.
6.5 FINAL DESIGN

Overall, whether the student-guide will actually create any significant change or not – and whether this change will be positive or negative – is difficult to say at this point. It was developed according to the needs defined by the participants of the focus groups, with a healthy dose of subjective input from myself (based on the literature review, of course). As such, I would at least be confident enough to claim that if the student-guide (i.e. the student app) were to be implemented as it is now, there would at least be some students at Luleå University of Technology that would be pleased. The problem is though whether the app would be used continually by students, or simply considered a momentary novelty. Similarly, one would have to question if only a handful of students would consider the app to be useful, and if this is the case; how would it possible to expand its relevance to a larger group of students? Nevertheless, the three main functions of the current iteration of the app would certainly assist both students and teachers with their experience at LTU. The profile page helps students with keeping everything at a single place always within reach, while the course pages does the same for the teachers. While there would certainly be a lot of initial work in setting up the app; defining the necessary information to be included, what functions should be implemented, and programming the app itself, the benefit of doing so would certainly outweigh the negatives. In today's day and age, digital media are becoming more implemented in all aspects of society, so developing this app could be seen as Luleå University of Technology's first step toward entering the forefront of this novel development process.

As has been touched upon before, the beauty of the app is that it would reduce the amount of time needed to find information for students, both old and new. If the app would truly be able to reduce this often unnecessary waste of time, students can instead focus on the important issues; reaching the intended learning outcomes. In a perfect world, this would no doubt lead to students favoring a “deeper” learning approach, and hopefully becoming more independent and responsible. Additionally, since the app could act as a meeting ground for both students and teachers, there is a lot of potential in developing this aspect further; I am confident that both parties would have a lot to gain from such interactions taking place.
6.6 RECOMMENDATIONS

The final design developed in the current project is by no means final in the sense that it is absolute. On the contrary, there are many ways one could take the final concept and develop it further. In this section I will discuss more about what I personally consider to be specific points of interest when it comes to continued work for the student-guide. These range from issues and thoughts that arose as the project progressed, as well as certain topics that I wanted to research further, but found myself lacking the time to do so.

Since the student-guide was developed mostly with those studying Industrial Design and Engineering in mind, the final design also reflects this. It is my personal intention however, that in the end all students should be able to use the app. Thus, it would probably be a good idea to gather more input from those within other educational fields, and especially those who are not engineering students. This is particularly important in regards to two aspects. First it would be necessary to see if the needs differ between those from different educational fields (which it probably does), and make sure that the student-guide takes these differences into account. Secondly, it would probably be a good idea to present the concept images for the final design of the app to a variety of students, in order to acquire feedback of what is working and what can be improved.

I have also briefly mentioned that the nature of the student-guide – an app – provides almost limitless possibilities. This means that one could fill it with a variety of different functions intended to support both students and teachers. However, due to this limitless nature, it is equally important that the functions that are added actually have some sort of purpose; fulfilling a need defined by students, and doing so in a manner that is backed by relevant theory. Failing to do this might not only result in an app that is annoying and difficult to use, but is also unable to satisfy its purpose. Continued work thus needs to carefully consider what functions to implement, and which ones should get the ax.

Finally, from an entirely personal view, I also feel that it would be necessary to re-evaluate the final design of the student-guide. The ambition of the project Pedagogical Idea is to support students in becoming independent agents. Similarly, the student-guide was also intended to help students in achieving more of a deep learning approach when studying. From this point of view, I personally fear that the student-guide may have become lost in all the promises of digital media,
together with the subjective opinions of the students from the focus groups (and myself too, of course). In other words, I would prefer that one of the first steps for future work to consider would be to evaluate the student-guide from a pedagogical point of view; does it actually aid students in the way it was intended? If not, how does it need to be changed in order for this to happen? If it does, how can we make it do so even better? Because if there is something my education here at Luleå University of Technology has taught me (and the current project has confirmed), it is that a development process never really ends; they just iterate.
7. CONCLUSION

In this final chapter of the report, I will review the objective and aim for the current project, as well as the research questions that was defined at the very beginning of the development process. I will relate these to the final result of the project; discussing to what degree the final conceptual design of the student-guide actually fulfills its purpose.

7.1 RESEARCH QUESTION 1

How can social and/or digital interaction stimulate learning?

The main benefits of interaction in relation to learning seems to be the opportunity to share knowledge with others. Wenger (1998) notes that learning in itself is largely a social phenomenon, and - as argued by Biggs (2011) and Chang et al. (2008) - the constructivist theory of pedagogy states that students construct knowledge through their own activity and observations of events, based on earlier experiences. In relation to this, it would make sense that increased opportunities for interaction may lead to increased opportunities for learning. The participants of the focus groups similarly noted that being able to contact other students, either in a physical or digital environment might make it easier to acquire help from one another. Especially if someone might normally be uncomfortable with initiating contact with other students, being able to do this anonymously (such as through a digital platform) might help them in doing so anyway.
7.2 Research Question 2

*How is the student-guide supposed to be designed (both regarding visual communication and function) in order to be as pedagogic as possible?*

Biggs (1999) stresses the importance of clearly defining the intended learning outcomes, so that students know what they are supposed to achieve, as well as what is expected of them. Similarly, the participants of the first focus group noted that they are more motivated in courses where they both know what they are supposed to learn, as well as how this will benefit them in the future. As such, one of the key points when the student-guide was designed was for it to present clear and useful information to the user, and attempting to clarify where it may be deemed necessary to do so. On a slightly related note, the focus group participants argued that there needed to be a clear purpose of the student-guide, and this purpose needed to be plainly presented to the user. In other words, in order for students to want to use the student-guide, the benefits of doing so must be obvious. One way of doing this was to avoid making it needlessly complicated; as was mentioned by the participants of the third focus group, it was important that the student-guide only contained the most important functions that contribute to the support of student learning. Otherwise, there was a risk the student-guide might appear cluttered with unnecessary features, reducing the enjoyment of actually using it. Relating to what Hassenzahl and Tractinsky (2006) and Kujala et al. (2011) mentions regarding user experience, if the student-guide would have been too cluttered with functions and features this might have deterred from the experience as a whole. Thus the theories regarding visual communication played a significant role in the design of the student-guide; using “self-explaining” icons for the buttons, the gestalt principles of perception when designing the student-guide layout, and taking advantage of common archetypes to signify meaning without using words.
7.3 RESEARCH QUESTION 3

What kind of resource or study-aid do students need and desire, as a complement to regular lectures and course literature?

Based on the information gathered from the focus groups, there seemed to be an overall desire of being able to quickly review information. This was meant in the sense of easily finding "old" information (such as from prior courses), but also as a means of finding new information. While the participants were aware that they could not be served everything on a silver platter, they sometimes felt that a lot of time had to be spent searching for and reading through information that they might not even need. In other words, the participants know that they are expected to spend a certain amount of time studying, but at the same time they want that time to feel like it actually amounts to something.

Additionally, students also desired further methods of interacting with each other. In this case, interaction mostly referred to sharing information and knowledge among their peers. As the section above addressed, students sometimes found that they have to spend a lot of time "searching blindly in the dark" trying to solve a problem or finish an assignment. A major contribution to this kind of situation was that the intended outcome of an assignment was vaguely defined, leaving the student to guessing what they were supposed to do. The participants of the first focus group thus argued that a means of interacting with more experienced students could help clarifying what the purpose of an assignment is. If less time would be spent trying to decipher the purpose of an assignment, then more time could hopefully be spent in realizing it instead.

However, it was also important to note that simply providing the students with an example of what accounts as a specific grade – which was a request from some of the participants of the focus groups – would have been the wrong way to go about things. In doing so, there was a risk of students just trying to "mimic" the examples with good grades, without reflecting over what they were supposed to learn from the assignments themselves. After all, sometimes the journey would be more important than the destination.
7.4 RESEARCH QUESTION 4

What would motivate the students to use an interactive student-guide?

From a subjective point of view, the participants of the focus groups agreed that students needed to feel that using the student-guide would benefit them. This was probably the most important aspect in promoting its usage; if students felt that it was something that would help them with their current studies as well as with establishing a future network, they would feel more inclined to use it.

In regards to a more theoretical approach, the student-guide needed to be intuitive and easy to use. The information gathered regarding user experience design as well as usability thus played a big role here. As such, one important aspect that was considered was to use a lot of images and icons - while keeping the amount of text as low as possible - for the final design of the student-guide. This was also noted by the two participants of the third focus group, who enjoyed the visual layout of the Social School App concept.

Similarly, the three important aspects of usability defined by Scolari (2009) - effectiveness, efficiency, and satisfaction - played an important role in the final design. The app was designed in a way that aimed to make it easy to use; by keeping everything in one place and only a few “touches” away. In a similar manner, the option to “favorite” a page was added as a way to reduce the amount of steps needed to access pages that the user would browse often.
7.5 RESEARCH QUESTION 5

Are students interested in increased opportunities to interact with other students and if so, how should this interaction take place?

The very first focus group actually gave a quite clear response to this particular question; yes, there is definitely an interest in being able to interact with other students. However, the participants noted that this desire mostly stemmed from being able to contact students who are “ahead” in their education, as they most likely held a lot of knowledge and experience to share. As such, they noted the importance of making sure that these kind of interactions would also benefit the older students, or else they might feel inclined not to partake in such exchanges. As to how these interactions should take place, a few examples where mentioned, such as having specific locales where students can meet up (for examples, certain areas for those studying Industrial and Design engineering, while other areas would be for Architectural Engineering, and so on), creating digital forums for students to share their knowledge, and in general just provide students with better in-school environments where they can study. As Haneda (2006), Lave and Wenger (1991) mentions however, learning can take place in any kind of social environment as the participants adapt. Similarly, the research by Chang et al. (2008) shows that even a digital social platform can support learning, meaning that the interaction does not have to be limited to a physical one.
7.6 IN CONCLUSION

The overall objective of the current project was to develop some sort of interactive student-guide to be used by students at Luleå University of Technology. Now, a major part of the development process was to define exactly what the final design of the student-guide should be. While various resources and solutions were suggested (both physical and digital), the final design ended up resulting in an app for students to download. Just as was intended, the project itself resulted in a detailed concept. However, it would be a mistake to claim that the concept is ready to be produced and implemented as is (which was the initial intention at the project’s start). Due to the fact that the end result is in the shape of an app, there are countless possibilities for additional functions to be added. Nevertheless, I decided to only focus on the functions that I deemed were most important (based on the information gathered from the focus groups and the literature review), as there simply was not enough time to collect further data regarding what additional functions would be beneficial to add. Thus, I would recommend that further work is needed regarding this aspect, before the app is put into action.

Whether the app will motivate, engage and support students with their learning – as was the intention – is difficult to answer without first letting prospective users evaluate it. On one hand, the app does provide the user with vital information at one place with everything being constantly available, while simultaneously providing increased opportunities for interaction with other students. On the other, it is not necessarily something that alone will make all students take a deep learning approach, or become independent agents. However, it was a function that was desired by students as a means to reduce some of the annoyances and inconveniences of the current educational situation. As such, it could very well set the stage for those kind of improvements in the future. In the end, the development of the student-guide was heavily influenced by students and their opinions, but that was also always the intention. A student-guide for students, by students.
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PROJEKTPLAN

Utveckling av interaktivt hjälpmedel för att stödja studenters lärande

Namn: Douglas Karlsson
Datum: 21/1-2015

Handledare: Åsa Wikberg Nilsson

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Civilingenjör i Teknisk design
Institutionen för ekonomi, teknik och samhälle
Luleå tekniska universitet
## INNEHÅLLSFÖRTECKNING

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INTRODUKTION

Detta dokument beskriver projektplanen för utvecklingen av ett interaktivt hjälpmedel, tänkt att användas av studenter på Luleå tekniska universitet. Syftet med hjälpmedlet är att motivera och underlätta inlärningen. Utvecklingsarbetet utförs som examensarbete för civilingenjörsutbildningen Teknisk design (D7014A), på Luleå tekniska universitet. Arbetet utförs under en period på ungefär 18 veckor under vårterminen 2015.

BAKGRUND


FRÅGESTÄLLNINGAR

- På vilket sätt kan social och/eller digital interaktion gynna lärande?
- Hur bör hjälpmedlet utformas (sett både till funktion och design) för att vara så pedagogiskt som möjligt?
- Vad vill studenter ha för hjälpmedel som komplement till föreläsningar och kurslitteratur?
- Vad skulle motivera eleverna att använda detta interaktiva hjälpmedel?
- Är elever intresserade av utökade möjligheter att kontakta andra elever och i så fall, hur ska denna interaktion ske?

INTRESSENTER
De primära intressenterna i detta arbete är naturligtvis beställaren Luleå tekniska universitet, handledaren samt projektgruppen. Dessa tre är den främsta anledningen till projektets initiativ och spelar alla en viktig roll i arbetets utveckling.

Utöver detta så har även de tänkta användarna - det vill säga universitetsstudenterna – en viktig roll i projektet och dess mål, då produkten som utvecklas i detta projekt är främst tänkt att användas av denna målgrupp. Eftersom produkten också är tänkt att kunna användas självständigt av eleverna (det vill säga utan anslutning till varken lärare eller kurser) så är det av stor vikt att den utformas efter deras behov. Hjälpmedlet ska underlättas användarnas studier och ska fungera som ett komplement till övrigt studiematerial tillgängligt på skolan. Den främsta skillnaden är att detta interaktiva hjälpmedel utvecklas efter devisen ”för elever, av elever”.

APPENDIX I – 5(14)
SYFTE OCH MÅL


Då det interaktiva hjälpmedlets slutliga natur ännu ej är definierat är det svårt att säga hur slutresultatet kommer att te sig. En stor del av projektet kommer att bestå av att undersöka vilket typ av medium som är bäst lämpat för hjälpmedlet. Målet är dock att leverera ett koncept som är redo att "produceras" vare sig det rör sig om en fysisk eller digital produkt.

Parallellt med utvecklingsarbetet kommer även en rapport att skrivas. Denna rapport ska dokumentera hela utvecklingsarbetet och kommer att lämnas in till examinator, handledare och eventuell opposition som ett avslutande moment av hela projektet. Rapporten kommer att skrivas fortlöpande under arbetets gång.

OMFATTNING OCH AVGRÄNSNINGAR

Då slutresultatet i detta projekt inte är särskilt väldefinierat är det svårt att bestämma helt exakta avgränsningar. Dessa kommer istället att växa fram under projektets gång. Det finns dock vissa riktlinjer som kan sättas upp i nuläget.

Det interaktiva hjälpmedlet är tänkt att användas av studenterna själva och det kommer därför primärt att fokusera på deras behov. Detta innebär att ingen direkthänsyn kommer att tas till specifika kurser eller utbildningar. En del information och synpunkter kommer med största sannolikhet inhämtas från lärare, men i den mån dessa inte stämmer överens med studenternas behov kommer det sistnämnda att ha större prioritet.

Både på grund av tid- och kunskapsbrist så kommer eventuell planering om hur produkten ska produceras och distribueras att utgå. Detta gäller oavsett om hjälpmedlet resulterar i en fysisk eller digital produkt (eller något helt annat). Istället är planen att utvecklingsarbetet ska resultera i ett detaljerat koncept för det interaktiva hjälpmedlet, som kan skickas vidare för produktion, om det anses aktuellt.
GENOMFÖRANDE

I detta kapitel beskrivs projektets olika faser gällande utförande och förväntat slutmål för varje steg.

PROJEKTPLANERING

I projektets förberedande uppstartsfas är det en hel del information och liknande som behöver struktureras upp och planeras. Inledningsvis så klarläggs alla projektets moment; vad de ska innehålla, vilka metoder som ska användas, hur mycket tid varje moment ska ha tillgodo och det förväntade slutresultatet. En tydlig planering i ett tidigt skede underlättar för det vidare arbetet och säkerställer att arbetet håller en genomgående hög kvalitet. Om något oväntat bakslag inträffar fungerar dessutom projektplanen som en extra säkerhet för att den negativa påverkan på projektets ska bli minimal.

LITTERATURSTUDIE


Utöver det krävs även att relevant information inom semiotik och liknande designrelaterad teori inhämtas, för att den slutgiltiga designen ska bli både visuellt attraktiv, men även lättanvänd. Eftersom produkten är tänkt att användas av helt nya universitetsstudenter likväl som de som snart tar examen, så bör slutproduktens utformning reflektera detta.
KONTEXT & BEHOVSANALYS


IDÉARBETE


KONCEPTUTVECKLING

När de idéer som generades i föregående fas har presenterats för både tänkta användare, samt handledare har detta förhoppningsvis resulterat i värdefull feedback. Det fortsatta arbetet kommer därför innebära bearbetning av de idéer som tagits fram, med utgångspunkt från denna återkoppling. I denna fas ligger fokus på att begränsa mängden idéer för att istället förbättra kvaliteten. Därför kommer både användarnas behov och den vetenskapliga teori som inhämtats att spela en större roll i detta skede. Dessa kommer att fungera som både begränsningar och viktning för vilka koncept som har mest potential för utveckling. Målet är att endast ha ett fåtal (runt 3-5 st.) relativt detaljerade koncept i denna fas slutskede.
DETALJUTVECKLING

Den första prioriteten i denna fas är att utgå från de koncept som är kvar från föregående process, och slutligen begränsa dessa till ett enda slutkoncept att färdigställa. Denna urvalsprocess kommer återigen att utgå från återkoppling med användare och handledare, samt genom viktningsanalyser baserade på användarbehoven (eftersom hela utvecklingsarbetet är en väldigt iterativ process är det fullt möjligt att viktningskraven kan utvecklas och uppdateras under projektets gång). Förväntningen är att de koncept som togs fram i slutet av föregående fas är relativt detaljerade, vilket denna fas sedan ämnar att arbeta vidare med. Detta innefattar bland annat faktorer som en detaljerad beskrivning av produktkonceptets funktioner, dess design, och hur det ska kunna gå vidare till produktion eller utveckling (beroende på om det rör sig om en fysisk eller digital produkt, eller något helt annat).

AVSLUTNING

Den sista fasen är främst tänkt som en avrundning/avslutning av hela projektet. Här planeras rapporten bli färdigställd, liksom majoriteten av förberedelserna inför slutpresentationen för handledare, examinator och eventuell opponent. Implementering eller planering för vidare arbete med slutprodukten kan även komma att ske i detta stadie.
PLANERING

I detta kapitel definieras planeringen för detta projekt; upplägget av varje fas, tidplan, samt hur projektets budget har lagts upp.

TIDPLAN & MILSTOLPAR

Projektet är indelat i fem olika faser, där varje fas definieras av en specifik huvuduppgift. Upplägget är strukturerat uteftre en "stage-gate"-modell, vilket innebär att varje fas avslutas med en milstolpe där ett förväntat resultat ska ha uppnåtts. I de fall detta resultat inte har uppnåtts i tid, eller inte håller tillräckligt hög kvalitet, kan ytterligare tid behöva adderas till den aktuella fasen. De flesta faser är dock upplagda på så sätt att de kan påbörjas till en viss grad medan den föregående fortfarande pågör om detta skulle vara nödvändigt. På så sätt erhålls en viss flexibilitet i planeringen, och inget moment är helt bundet av något annat. Utöver detta så är den sista fasen främst tänkt som en avrundningsfas, vilket tillåter den att agera som "tidsbuffert" om mer tid behövs.

En mer detaljerad beskrivning av detta upplägg återfinns i tidplanen (bilaga I).

Fas 1 – Informationsinsamling (V.4 – V.9)

Den första fasen ämnar att ta fram information - både baserat på vetenskaplig forskning samt användarnas behov - för att kunna utföra utvecklingsarbetet. Eftersom det alltid går att samla in mer information går det inte att säga att denna fas någonsin är helt "klar", utan målet är att samla in så mycket relevant information som möjligt under fasens tidsperiod. Av denna anledning går den sista veckan för denna fas in i den inledande veckan för nästa; på så sätt tillåts en viss flexibilitet i övergången om mer information behöver samlas in.

Fas 2 – Idéarbete (V.9 – V.13)

Fas 3 – Konceptutveckling (V.14 – V.17)
I den tredjefasen används den feedback som erhölls i föregående fas för att utveckla lösningsförslagen som togs fram. Om idearbetet kan definieras som en divergent fas med fokus på kvantitet, så kan konceptutvecklingen istället definieras som konvergent med fokus på att utveckla kvaliteten. På så sätt är målet att slutligen landa med ett fåtal detaljerade koncept (runt 3-5 st.) som sedan utvärderas av potentiella användare samt handledare. Eftersom projektgruppen inte kommer att befina sig på Luleå tekniska universitet under arbetsperioden för denna fas så är heller inga möten med varken handledare eller användare inplanerade. Istället kommer majoriteten av allt arbete i denna fas att ske på distans.

Fas 4 – Detaljutveckling (V.18 – V.21)
Utvärderingen i föregående fas leder förhoppningsvis till att de koncept som är kvar kan resultera i ett enda slutkoncept. Detta ska sedan bearbetas till ett slutgiltigt, konkret lösningsförslag, vilket kommer att ske i denna fas. Här färdigställs slutprodukternas design, funktioner och liknande aspekter. Slutmålet blir således att ha en detaljerad produktbeskrivning samt eventuellt en prototyp, om detta anses realistiskt.

Fas 5 – Avslutning (V.21 - V.22)
Den sista fasens primära syfte är av administrativ karaktär, vilket innebär att färdigställa arbetet med det interaktiva hjälpmedlet och eventuellt definiera hur fortsatt arbete med produkten skulle kunna ske. Utöver det så planeras även den skrivna rapporten bli klar i denna fas, likaså förberedelserna för slutpresentationen, vilken hålls i mitten av vecka 22.

BUDGET
Utav de moment i detta projekt som planerats hittills är det få som kommer kräva någon kostnad. Alla intressenter för projektet finns på plats på Luleå tekniska universitet, så inga resekostnader uppkommer.

De kostnader som skulle kunna uppkomma täcks i så fall av projektet Pedagogisk Idé, som är uppdragsgivaren för detta arbete. Potentiella kostnader rör exempelvis utvecklingen av produktprototyper eller mock-ups, samt materialkostnader för eventuella workshops. Om det interaktiva hjälpmedlet slutar i någon form av fysisk broschyr eller liknande så tillkommer även tryckkostnader för dessa.
Projektgruppen består av en person med helfarts studietakt, vilket motsvarar 40 timmar i veckan. Med en arbetsperiod på 18 veckor motsvarar detta en total arbetsbelastning på 720 timmar.
PROJEKTORGANISATION

Nedan återfinns kontaktinformation om projektets primära intressenter, samt beskrivning av hur kommunikationen mellan dessa kommer att ske.

KOMMUNIKATION
Då hela projektorganisationen inklusive handledare finns på plats på Luleå tekniska universitet kommer majoriteten av all kontakt ske genom personliga möten. I de fall då detta inte går att uppfylla sker kontakt antingen via mail, eller telefon.

KONTAKTUPPGIFTER
Nedan redovisas kontaktinformation för intressenter involverade i detta projekt.

Projektmedlem
Douglas Karlsson  doukar-0@student.ltu.se  Tel. 070 - 86 85 924

Handledare
Åsa Wikberg Nilsson  asawi@ltu.se  Tel. 092 – 04 91 342

Beställare
Luleå tekniska universitet  Tel. 092 - 04 91 000
Referenser

APPENDIX II

GANTT CHART

**Observera:** Vikten med handikapet och anmundare på prioriteringen och kan komma att ändras.

**Möte med handikapet**

**Möte med anmundare**

**Möte med handikapet**

**Möte med anmundare**

Målsättning 5 (27/5) - Förväntat slutet: Förändring av hela projektet.

Målsättning 4 (22/5) - Förväntat slutet: En detaljerad produktbeskrivning eventuellt en prototyp.

Målsättning 3 (24/4) - Förväntat slutet: Ett färdigt viktigt lösning ekonomi.

Målsättning 2 (27/3) - Förväntat slutet: En stor konceptuell förändring.

Målsättning 1 (20/2) - Förväntat slutet: Insmällning av varje och relevant information.

**Rapportfrågning**

**Avsnittsbilagor**

**Deliverables**

**Konceptuell**

**Idébrytare**

**Informationssamling**

**Fas:**

**Vecka:** 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
FOCUS GROUP – TOPIC GUIDE

INTRODUCTION

Welcome
Välkomna och tacka deltagarna för att de tagit sig tid att vara med.

Statement of the purpose of the interview
Berätta vad syftet med projektet är; exjobb för att utveckla ett interaktivt hjälpmedel för studenter på LTU.

Främsta syftet till deltagarnas input är för att kunna bestämma vilka funktioner som är önskvärda hos denna typ av hjälpmedel, och vilken typ av produkt det ska vara.

Påpeka vikten av att det ska uppfattas ”för studenter, av studenter”.

Guidelines to follow during the interview
Vill veta era egna erfarenheter och åsikter = finns inga fel svar. Lika viktigt att få åsikter från de som precis påbörjat sin utbildning, som från de som snart är klara (eller någonstans emellan).

Jag kommer själv inte att delta i diskussionen, utan kommer bara överse den.

Behöver ej prata i någon ordning, utan har ni något att säga så är det bara att göra det. Ser gärna att ni bygger vidare på varandras svar: ni inte instämmer med en kommentar från någon annan deltagare ska ni inte vara rädda för att kommentera detta.
Tänk dock på **att visa hänsyn** så ni inte talar i mun på varandra.

**Begränsat med tid**, och **ett antal punkter som ska diskuteras**, så det kan hända att jag kan behöva **avbryta er** om en diskussion drar ut på tiden.

**Anonymitet:** Intervjun spelas in (**video och ljud**), för att jag lättare ska kunna **dokumentera den** till rapporten. Detta är dock endast i **administrativt syfte**, i det fall jag behöver någons citat till rapporten så kommer jag att använda en pseudonym (Student A, B, C, etc.)

**WARM-UP**

*Set the tone & set participants at ease*

**Deltagarna berättar om sig själva:** vad de heter, vad (och hur länge) de studerat. [Skriva namnskyltar]

**CLARIFICATION OF TERMS**

*Establish the knowledge base of key terms through the questions and provide definitions of them*

Inom pedagogik pratar man om så kallad **ytinlärning** och **djupinlärning**. Känner ni till dessa uttryck? Beskriv.


Projektet **Pedagogisk Idé** är vad som ligger bakom skapandet av detta exjobb. Hur många känner till detta forskningsprojekt? Känner ni även till deras **lärarguide**? Det interaktiva hjälpmedlet ska fungera som ett **studentalternativ**; det ska inte vara **onödigt svårt** att klara en kurs bara för att läraren inte är engagerad i sitt lärande.
INTRODUCTORY QUESTIONS

The initial questions should be general and less threatening

Vad tycker ni att ni har lärt er sen ni började på LTU?

Vad är det som gjort att ni tagit till er just denna kunskap?

ESTABLISH MORE DIFFICULT QUESTIONS

The more difficult or personal questions should be determined

Om ni tänker tillbaka på de kurser ni läst, kan ni nämna en kurs som ni kände var riktigt bra? Vad gjorde den så bra?

Vad har ni för skräckexempel på riktigt dåliga kurser?

Vad skulle ni säga är de främsta faktorerna till att man antingen intar en ytlinlärnings-approach, till skillnad från en djupinlärningsapproach?

Om ni stöter på en svår uppgift, hur bär ni er åt för att lösa den?

Vilka genvägar hade ni velat ha i dessa situationer?

Resurser

Vilka universitetsresurser är användbara under första året?

(Khan’s Academy)

(Skillnad mellan första och senare år?)

Brainstorm

Kompetensprofilen är ett utvecklingsverktyg som är tänkt att implementeras i utbildningar framöver. Här kan ni se en tidig version av detta verktyg. Först vill jag att ni undersöker bilden i 3 minuter, så kan ni sedan diskutera kring hur ni tror den fungerar.

Jag vill nu att ni ska köra en brainstorming-session där ni får komma på alternativa idéer på hur denna kompetensprofil skulle kunna implementeras.
WRAP-UP
[Summera huvudteman, de främsta åsikterna från deltagarna]

[Nämn eventuella diskussioner som var tvungna att lämnas oavslutade]

MEMBER CHECK

Determine how each member perceives selected issues

CLOSING STATEMENTS

Answer any remaining questions

Express thanks
<table>
<thead>
<tr>
<th>Function of the Survey</th>
<th>App</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Information</td>
<td>-</td>
<td>Provides data on the engineering aspects of the project.</td>
</tr>
<tr>
<td>Funding</td>
<td>-</td>
<td>Details on the financial support for the project.</td>
</tr>
<tr>
<td>Project Management</td>
<td>-</td>
<td>Overviews the project management processes and stakeholders.</td>
</tr>
<tr>
<td>Environmental Impact</td>
<td>-</td>
<td>Analysis of potential environmental impacts and mitigation strategies.</td>
</tr>
<tr>
<td>Economic Benefits</td>
<td>-</td>
<td>Assessment of the economic benefits and cost of the project.</td>
</tr>
</tbody>
</table>

**Additional Notes:**
- The survey aims to gather comprehensive data on various aspects of the project.
- All responses are anonymous and confidential.

*Survey Conducted by: [Organisation Name]*

*Date: [Date]*
SKETCHES
CUSTOMER JOURNEYS

[Diagram showing customer journey with various stages and emotions indicated by icons and annotations]