Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Architecture and Design
Department of Design

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Design-Sustainability Month

Solution Proposal for Implementation of Sustainability in Design Bachelor Degrees at NTNU Gjøvik

Master's thesis in Master in Interaction Design
Supervisor: Mari Bjerck
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Abstract

There is a real potential in helping the environmental issues we have today, by implementing sustainability and circular design strategies in everything we can. And as digital services and our interaction with those are a huge part of everyone's lives, a lot of potential lies here. But, there is a lack of knowing how to do this effectively. Therefore, this thesis' aim is to find a solution which can help implement a more sustainably focused way of teaching sustainability to design students, as they are the creators of the digital services of the future. This thesis aims to provide students and lecturers with the tools to always have sustainability in mind. To put this idea to the test, this thesis will investigate how sustainability can be implemented in the teachings of design bachelor students at NTNU Gjøvik. The study will focus on bachelor students, as embedding sustainability at this stage of their learning has the potential to make them see it as a priority throughout their studies and future working life. The Design study programs also focus on the users and how they interact with services, which means there is great potential for these students to motivate users towards greener choices through sustainable thinking. To investigate how sustainability can be implemented in the most efficient way, design-motivated qualitative methods were used. Interviews gave a look into the students' and lecturers' thoughts on school, work and sustainability, which brought forward data on what is already taught, where there are possibilities to teach more, and their knowledge on the topic of sustainability, with roots in what they learn/teach. The workshops brought forward their ideas for solutions, and thoughts on what is most wanted and possible to implement. By looking into their studies, and getting first-hand data from students and lecturers through interviews, workshops, SDI and thematic analysis, as well as an idea portfolio, service blueprint and other qualitative design methods, a solution became apparent. Students crave to learn new and relevant aspects of sustainability, and lecturers would like to learn more, to teach more, both by out-of-the-box methods. Therefore, based on ideas both parties suggested themselves, a sustainability month became the proposed solution. This month will contain seminars, guest lecturers, sustainability-focused classes, workshops and the like. The overall focus will lay on creative ways of learning, where both parties can take part in learning and reflections on the topic. By implementing a specific month with a sustainable focus, both students and lecturers will be better equipped to include it in courses and deliveries. The month is envisioned to be adapted to study level, and offer a varying information-base with options. There is also a potential for this solution proposal to be widened, and make it a solution for all studies at NTNU. There needs to be extensive user testing, and more information gathering, before this can become a reality.

Keywords: Sustainability, Education for Sustainable Development (ESD), bachelor studies, interaction design, graphic design, web development, sustainability month

Sammendrag

Det er et reelt potensial i å hjelpe miljøspørsmålene vi har i dag ved å implementere bærekraftige og sirkulære designstrategier i alt vi kan. Siden digitale tjenester og vår interaksjon med disse er en stor del av alles hverdag, ligger det mye potensial her. Men, det er en mangel på å vite hvordan man gjør dette effektivt. Derfor er denne oppgavens mål å finne en løsning som kan bidra til å implementere mer bærekraftig undervisning i bærekraft til designstudenter, ettersom de er skaperne av fremtidens digitale tjenester. Denne oppgaven har som mål å gi studenter og forelesere verktøy for å alltid ha bærekraft i tankene. For å sette denne ideen på prøve, vil denne oppgaven undersøke hvordan bærekraft kan implementeres i undervisningen til design bachelorstudenter ved NTNU Gjøvik. Studiet vil fokusere på bachelorstudenter, da det å forankre bærekraft på dette stadiet av deres læring har potensial til å få dem til å se det som en prioritet gjennom hele studiet og deres fremtidige arbeidsliv. Designstudiene fokuserer også på brukere og hvordan de samhandler med tjenester, noe som betyr at det er et stort potensial for disse studentene til å motivere brukere til grønnere valg gjennom bærekraftig tenkning. For å undersøke hvordan bærekraft kan implementeres på en mest mulig effektiv måte, ble design-motiverte kvalitative metoder brukt. Intervjuer ga et innblikk i studentenes og forelesernes tanker om skole, arbeid og bærekraft, som brakte frem data om hva som allerede undervises, hvor det er muligheter for å undervise mer, og deres kunnskap om temaet bærekraft. Workshops brakte frem deres ideer til løsninger, og tanker om hva som er mest ønsket og mulig å gjennomføre. Ved å se på studiene deres, og få førstehåndsdata fra studenter og forelesere gjennom intervjuer, workshops, SDI og tematisk analyse, samt en idéporteføljе, tjenesteplan og andre kvalitative designmetoder, ble en løsning åpenbar. Studenter higer etter å lære nye og relevante aspekter ved bærekraft, og forelesere vil gjerne lære mer, for å lære bort mer, begge ved nytenkende metoder. Derfor, basert på ideer begge parter foreslo selv, ble en bærekrafts måned den foreslåtte løsningen. Denne måneden vil inneholde seminarer, gjesteforelesere, bærekrafts fokuserte klasser, workshops og lignende. Det overordnede fokuset vil ligge på kreative måter å lære på, hvor begge parter kan ta del i læring og refleksjoner rundt temaet. Ved å implementere en spesifikk måned med bærekraftig fokus vil både studenter og forelesere være bedre rustet til å inkludere dem i klasser og leveranser. Bærekrafts måneden er tenkt tilpasset studienivå, og tilbyr et varierende informasjonsgrunnlag med valgmuligheter. Det er også et potensial for at dette løsningsforslaget kan utvides, og gjøres til en løsning for alle studier ved NTNU. Det må til omfattende brukertesting, og mer informasjonsinnhenting, før dette kan bli en realitet.

Nøkkelord: Bærekraft, Undervisning for Bærekraftig Utvikling (ESD), bachelorstudier, interaksjonsdesign, grafisk design, web utvikling, bærekraftsmåned

Preface

After taking a semester abroad in Australia, at the University of Queensland, my interests in sustainability within design heightened. As the offer of sustainability-focused design courses were significantly higher down under, and after learning new and interesting things on the topic, I noticed a lack at my home university. When looking back at my bachelor in graphic design, and current master in interaction design, I felt more enlightened on the topic from one subject at UQ, than I did from two degrees at NTNU Gjøvik. After chatting to my former and current fellow students, I acknowledge that there was a need for there to be more sustainability implemented into design studies, as I was not the only one who felt the lack. It was also identified that most do not feel ready for working-life in that aspect. After bringing the issue to the lecturers at NTNU, a great interest was identified within the Department of Design. And so, created out of interest at a personal and institutional level, this thesis was born.

Dedications

I would like to dedicate this master thesis to my parents and brother. They have been my driving factors and motivators during my research and writing. By devoting their interest and indulging in this subject with me, they have pushed me to do my absolute best and deliver the best thesis to my ability.

Acknowledgements

I would like to give an honourable mention to my supervisor. Our common interest in the topic, and your motivating knowledge and insights have helped me greatly, and driven my process along.

To my lecturers and tutors at UQ, thank you for introducing me to sustainability in design and widening my horizons on the topic. You helped me realise its importance, which I am grateful for.

Thank you to all informants and participants in this project, as there would not be a thesis without your inputs and thoughts. You have been the driving factors for the research processes.

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List of Abbreviations

AASHE	Association for the Advancement of Sustainability in Higher Education
BIXD	Bachelor of Interaction Design
BMED	Bachelor of Graphic Design
BWU	Bachelor of Web Development
DSM	Design Sustainability Month
ESD	Education for Sustainable Development
HE	Higher Education
ID	Department of Design
IPCC	Intergovernmental Panel of Climate Change
NSO	Norwegian Student Organisation
NTNU	Norwegian University of Science and Technology
SD	Sustainable Development
SDG	Sustainable Development Goals
SDI	Step-by-step Deductive Inductivation (Stegvis-deduktiv induksjon)
UN	United Nations
UX	User Experience

1 Introduction

1.1 Thesis Topic

During the global Covid-19 pandemic, the world's complex and interwoven issues rose to the surface and became visible. Manufacturing and emissions suddenly froze worldwide, and human-induced climate change turned around overnight. CO2 emissions worldwide decreased by 10,8% during the pandemic, which was the biggest reduction ever registered (European Commission, 2022). It was suddenly visible how much had to be done to reduce emissions and that it would be impossible to get the same results without a pandemic that forced almost all climate changing businesses to close. To have that effect, now that the world is more so back to normal, will require change across all sectors. There needs to be coordinated and innovative knowledge implemented into every sector. All in all, there is a great tension between the consumerism reaching across the western societies, and environmental and social sustainability. This tension has given the exigencies of the current climate issues, which has led to less time to solve the issues at hand, than it took to create them (Intergovernmental Panel on Climate Change, 2018). As these issues need to be handled in all sectors, there is a need for youngsters to develop mindsets and skill-sets on sustainable topics before entering the workforce. And one can look towards higher education (HE) to find these answers (Cebrián et al., 2015). If sustainability is included at this stage of education, there is a grave potential for knowledge about sustainability to be more included in the future business sectors. This knowledge can involve promoting environmental issues, encouraging critical thinking and reflection around ideas and learning materials. All in all, these methods should focus on creative thinking and the generation of ideas when students are searching for solutions in assignments and other aspects of their studies.

1.2 Scope

Finding ways to implement and include sustainability in a holistic sense, in a way that suits all types of studies at university level, is a difficult task (Jones et al., 2010). Therefore, this paper will narrow its aims down to bachelor-level studies, under the Department of Design (ID) at Norwegian University of Science and Technology (NTNU), campus Gjøvik. This includes the studies called Interaction Design (BIXD), Graphic Design (BMED) and Web Development (BWU). This thesis will focus on bachelor students, as embedding sustainability at this stage of their learning has the potential to make them see it as a priority throughout their studies and future working life. The ID study-programs also focus on the users of digital services, how they interact with services, what these services look like, and the development of these, which means there is great potential for these students to motivate users, companies, institutions and the like, towards greener choices through sustainable thinking. Digital services and our interaction with those are a huge part of everyone's lives, so a lot of potential lies here. But, there is a lack of knowing how to include sustainability into all aspects of design, including digital services, effectively. Implementing a more sustainably-focused way of teaching this to design students, who will create the digital services of the future, can provide them with the tools to always have sustainability in mind.

This thesis' objective will be to describe the author's efforts to propose a new design solution, which will help integrate more focus on sustainability in higher

education, with the focus on bachelor-level studies under the Department of Design at NTNU Gjøvik. The intention is to find a solution that will build upon their entrepreneurial mindsets, through adapting the solution-proposals based on the contents in various courses, and by looking at ways to motivate the student towards thinking more sustainably in deliveries and assignments at school. The solutions will be an offer of a potential model that can be implemented into these studies in the future.

Research Question:

The overarching research question of this paper is: How can students be provided with tools that will help them address sustainability related issues in their education?

2 Background

In this thesis, the focus on education towards sustainable development (ESD) will lay on potential processes that will help equip students with understanding and knowledge, as well as a set of skills that will help them be able to work with sustainability in mind. In the term sustainability, all three aspects of the word will be included, which is environmental, social and economic wellbeing. These terms also go under the overarching concept called "the three pillars of sustainability", which will be presented below. These aspects of sustainability focus on the present day and the future (Longhurst, 2014). After the exploration of the three pillars, sustainability is looked at in correlation with education and design, in connection to its complexity and background. With these different perspectives and studies within sustainable development (SD), design and ESD in mind, different methods and approaches towards exploration can be conducted.

2.1 The Three Pillars of Sustainability

Sustainability as a whole is a large and abstract concept that has an indefinite number of definitions. Sustainability can be seen as an overarching concept, which consists of ethics, social injustice, climate change, development, and many other things. A goal within sustainable development (SD) as well is calling to action, which is what many believe to be the way to push progress ahead. This brings SD to the forefront of political processes today. Overall, it's difficult to define specifically and most definitions struggle to cover all aspects of it. The UN's definition, presented in 1987, is one definition that manages to communicate the general idea of the concept in a succinct way. It says as follows: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (United Nations, n.d.). A way of generally describing the goal of SD, would be to say that it aims to develop and provide solutions to the issues that have been created by today's social, economic and environmental status quo. Another general idea within sustainable development that is universally accepted is the concept of "The Three Pillars of Sustainability". These consist of an environmental, social and economic pillar. It could be said that the ultimate goal within SD is to have these pillars be reconciled.

Climate change

The concept of climate change and sustainability are known for being interdependent, as well as interlinked, with each other. Looking towards a sustainable future, the climate crisis is the biggest issue that needs solving.

Climate change affects all places on our planet. The effects can be seen on the poles, the tropics, mountains and oceans. The effects can already be felt around the globe. Water supply is decreasing, extreme weather is more frequent and violent, forests are burning, glaciers are melting and coral reefs are dying. The most catastrophic climate changes can still be avoided, but for this to happen, the global emissions of greenhouse gases must be reduced quickly. Use of fossil energy, such as coal, oil and gas, needs to be phased out. There needs to be a large-scale shift towards a sustainable society, based on new technology, renewable energy, energy efficiency and taking care of nature, on which we are dependent on (WWF, 2023).

Humans contribute approximately 41 billion tonnes of CO2 each year. In order to keep the temperature below 1.5 degrees, the UN climate panel shows us that global emissions must be halved by 2030 and go down to zero around the middle of this

century. The degrees have already increased by +1.2 degrees compared to pre-industrial times. This global warming phenomenon, according to calculations from the Climate Action Tracker (2021), is headed for a warming of 2.7 degrees by the year 2100, even with the measures that have been implemented today (WWF, 2023).

Children and youngsters demand that adults take responsibility for cutting emissions quickly enough, so that the future is a climate-safe one. When enough people want change, the politicians will listen. Everyone has the opportunity to contribute to creating change every day, in parliamentary and local elections, in the actions made at home, in decisions taken at work, in meetings with other people and in what occupies us. Action needs to be taken towards making sure to make the decisions that are best for the climate. The climate challenge must be solved both locally, nationally and globally (WWF, 2023). All possible opportunities one has should be used to put climate and the environment at the top of the agenda.

Economic sustainability

Climate change and sustainability is as mentioned quite important, and the most known pillar within SD, but it also includes the world's economy and societies. Economic sustainability is about using resources in such a way that current economic development does not come at the expense of future economic development. There will be more people on earth and the average world citizen will become richer. How we use the available resources is absolutely central to long-term economic sustainability. The economy of today, on a global level, needs to grow continuously. If it stays the same, or contracts, the economy goes into recession. Therefore, growth must be pursued at all costs (Safdie, 2022). Economic sustainability can also be seen in a national context, for example linked to the national budget. An important question then is whether the central government's expenditure is at a level which means that it is balanced against income in the long term. In order for the welfare society to be financed in the future, enough jobs and export income must be created (Safdie, 2022).

Most of these actions must be completed by governments and politicians. Many sit on the sidelines, waiting for today's politicians to take action, as many politicians also promise to do in their election campaigns. But, we all need to take a lead on the politics for effect to happen. Governmental policies need to change across the globe for change to start. As proven in a new report from the UN (n.d.), the world is far behind salvation for the next hundreds of years, which means that instant change is the only saviour. Realistically, with the governments and the empty promises they bring, the people of the world need to show them and create the change they know is required to bring change. Time is of the essence.

Social sustainability

The social aspect is about ensuring that all people get a fair and good basis for being able to live a decent life. Human rights are the most important starting point for this. Education, decent work, equality, cultural diversity and a good health service are just some of the areas affected. Social conditions say something about how people feel in a society, whether they get their rights fulfilled and whether they can influence their own lives and the society in which they live (UN Global Compact, n.d.).

Investing in education is one of the most important things we can do to reduce poverty, contribute to the development of democracy and ensure positive development. Competence is also an important key to ensuring that people have a job to go to after

completing their education, or in case of major changes that mean that you have to change jobs (UN Global Compact, n.d.).

2.2 Education towards Sustainable Development

There is a need in today's society to look into how humans live and act in their everyday life, and how it can be reoriented. These needs come with demands, particularly within education. An initiative that looks into this challenge is the United Nations' Educational, Scientific and Cultural Organization's Education towards Sustainable Development (ESD). The United Nations' Educational, Scientific and Cultural Organization (UNESCO) developed ESD as their urgent response to the challenges the planet is facing. UNESCO's goal is to tackle global warming and other environmental issues by addressing economic, environmental and social issues (the three pillars) with a holistic approach. Their aim is to bring transformation at a personal and societal level, so that necessary change will happen within 2030 (UNESCO, n.d.-a). This transformation happens through bringing knowledge, skills, attitudes and values into classrooms. All who include sustainability in their teachings, are said to be a part of the ESD movement, by contributing towards change. UNESCO can provide frameworks, tips and success-stories to help initiative people on their way (UNESCO, n.d.-c).

When thinking of sustainability, there is no doubt that the characteristics of the word lies in a future-focused way of thinking. Learning about sustainability starts at a very early age, where the basic skills and knowledge exist in the values and attitudes we learn from our parents and other people of importance. These years, where people form these aspects of themselves, are seen as quite crucial in the aspects of ESD. This knowledge and skills continue to develop in the years of compulsory learning at school, which usually lasts up to 12 years. Here, issues that are related to Sustainable Development (SD) will be explored more in-depth. When this education-period is over, education turns into a phase where students are more prepared towards their future working life. Their post-compulsory education is characterised by focusing on a specific job or a profession. During this phase, the students have the potential and opportunity to implement the SD-focused theory they have collected towards a future workplace, or continue to build upon this knowledge.

For change to happen, change needs to happen within people's mentality and beliefs first. These steps towards change also need to involve institutional and individual aspects, considering values and actions. These steps need to be initiated by universities, as they carry the responsibility of preparing the future professionals (Filho, 2010). Students need to solve these systemic issues when they enter the workforce. ESD contains objectives, where one of them focuses on forming professionals who can deal with social and environmental conflicts, both ethically and responsibly (García-González et al., 2017). These skills need to be developed in compliance with the exercise of the future professions of the students. By doing this, progress will be seen in universities, in regard to the different knowledge areas within integrating sustainability. How to do this, however, poses a problem, as it is a challenge to integrate sustainability in a holistic and broad sense at universities (Jones et al., 2010).

2.2.1 The Complex Nature of Teaching ESD

As seen and explored earlier, the environmental, social and global economic problems are still at large, as the paradigm towards development used today is not delivering as it has promised. There needs to be a shift in people's mindsets which focuses on

sustainable ways of thinking, that collectively will result in improvements in the environment, life quality and global economics (Besong & Holland, 2015). But, these efforts meet challenges in the HE system, such as the complexity and various natures of educational systems, the hierarchy and levels within decision-making, and sticking to traditional structures for curriculum.

Preparing students for their future working life is one of the very important aspects that HE focuses on, but, as for ESD, this goal needs to be wider. The target for ESD should be on preparing HE students for a future that is unknown to us today. How can this be done? To prepare students for something unknown, there needs to be provided a learning experience that helps them develop specific skills for the unknown. This could include thinking more critically, developing techniques towards thinking more creatively, problem solving, skills towards innovation, how to collaborate in groups, communication, self direction, reflection, etc. (Iliško et al., 2014).

An implication that appears when considering altering someone's education, is that HE students are no longer passive consumers, learning in a compulsory manner. They participate in an active way, completely driven by their own will and interest. But, as ESD also implies, student's perspectives are getting wider and wider, as they are the product of the Information Age. Born into a world driven by multimedia, they develop a more deep and wide outlook on life and ways of analysing experiences. They do not only learn independently at school, but in the multimedia world as well, which is independent of any physical location (Nurmilaakso, 2015). Especially after Covid, where school institutions all over the globe, at all levels of education, turned to digital surfaces to have classes commence when physical attendance was not possible, it was seen that learning environments could be remote, and held virtually online (Kay & Greenhill, 2011).

According to Coyle (2010), the current generation in HE today is not as equipped as the previous generation, considering physical health, social interactions and effectiveness in classroom settings. Today's generation of learners need more challenges, and opportunities in their learning, which should be based on real life ways of interacting. By focusing on these ways of learning, they will develop skills for the 21st century (Coyle, 2010). Also, within formal educational institutions, the sole prerogative is not only learning. These institutions also require to have a widened HE base, and to go beyond the confined walls within traditional classrooms. Creative, outside-the-box ways of learning, such as workshops, excursions, seminars, and the like, could engage and interest the students more than the traditional classroom-lectures does. Bringing in these experiences can enhance learning, increase social responsibility, and increase student's commitment towards HE institutions.

The issues related to SD tend to be conveyed by moulding sustainable behaviours and practices through using scare tactics. This approach is quite common in the media, where they tend to convey/skew information by sensationalising news about sustainability issues. But, this has been proven as ineffective by research and experience. When people are being faced with the issues of SD and the idea of an uncertain future, they tend to feel frustrated, overwhelmed, discouraged and powerless when considering how to act. In a study done by Iliško et al. (2014), the results showed that bachelor's degree students, who had been provided with opportunities to consider their preferred future in tasks, got better results than the students who did not receive this opportunity. In these tasks, they suggested solutions, but not only that, they felt more personally responsible when drafting these answers, as they wanted to be a part of the solutions, instead of the issues (Iliško et al. 2014).

The arts of teaching and learning are undeniably related, and the most effective kinds of educators and lecturers are the ones who choose pedagogies that are the most

fitting and appropriate for different contexts and learning needs their students might have (Nurmilaakso, 2015). These lecturers do not, unfortunately, exist in high numbers. The educational path of lower-grade teachers has been reoriented towards more sustainable focuses, and it's widely seen as an important step towards addressing the pressing need for better educated teachers, in SD. But, there is a lack of this same preparation level for university lecturers, and it is seen that they have not been given the same specific and meticulous attention to SD as the teachers of lower levels of schooling (Raus & Falkenberg, 2014). This might be because of the focus HE institutions have for choosing their lecturers, which is characterised by them mastering specific subject matters, instead of them knowing how to develop students as persons that will be responsible for earth's future inhabitants (Orr, 2004). By involving more ESD focused education of lecturers, the students they teach will become more informed, and involved, where they will develop the skills to solve problems and commit to engage in both personal and institutional actions. By implementing these actions, the environment will become more sound, and the social and economic future will become more prosperous. ESD needs to be seen as a tool towards building bridges. Strong bridges at that, which connects classrooms, future business, and communities (UNESCO, n.d.-b). The so-called "future school", primarily in HE, needs to be driven by this mission, and work in line with sustainable societies and the goals of ESD.

2.4 The Intersection of Design and Sustainability

There are many suggestions towards business and technology being the answer to improving innovation and sustainability, but these issues should instead be framed more towards human needs. By focusing on this aspect, the main focus within innovation in design should not be on technology and its possibilities, but rather how to implement change towards changing human behaviour. Uber is a good example. It pushes people to share a car, which indirectly reduces the desire to use their own car, and use it alone, which lowers the gas emissions. All examples of this effect are successful because they provide a smooth, easy, and affordable experience to fulfil these needs by connecting people via technology, not because they provide new solutions to common human needs. Human needs is the focus of user-experience design (UX). User-experience design revolves around the user-centred focus in design research, which is an important aspect within the digital aspects of graphic, interaction and web design-bachelors at NTNU. Through generations of designers, the domain is rapidly moving towards recognizing the environmental issues in the world today. As most services and products, from our current age of industry, exist in both a physical and digital form, UX-development is practically inseparable from all existing design practices, and it needs to be included in all design processes.

The design-field is known for sometimes stimulating a consumerist based economy, pushing materialism on the user, and manipulating needs with goals of unsustainable growth, in collaborations with professions such as marketing. The field has faced the music for doing this (Skjerven & Reitan, 2017; Walker, 2017), as these actions lead to higher consumption and wasting materials (Michl, 2017). But, design has the possibility to have the opposite effects as well. Design can reduce waste, better human well-being, increase reusability and longevity, and engage consumers, by making specific sustainable and ethical choices when creating patterns, structures and tend to behavioural actions the user might take (Fuad-Luke, 2009; Skjerven & Reitan, 2017; Walker, 2017). These methods would be possible to include in designs, without breaking promises to one's business partner or employer.

It is possible to identify design choices within the three pillars of sustainability categories. The environmental pillar, can for instance involve material use, and managing server space when creating websites. The economic pillar can entail producing a circular economy and welfare, while the last pillar, society, can entail universal and durable design which is made to last. By putting all of these pillars together, they create a circular design strategy. By having these pillars in mind, one can set the conditions for how easy it is to reuse materials and/or develop for longevity. The product or solution can be designed to work as it should, with good quality and a long life. By having this in mind, when making a product, one can take it apart and send the metals, plastic, wood, etc. on to new circuits, new products, and give the product eternal life. As for digital solutions, they can either assist these circular actions, or be a part of it themselves. Designing in high quality, so updates are not necessary, and with behavioural change and server-space in mind, digital design can also assist with sustainable change. Within all of these methods mentioned, there are endless opportunities to make change for the better.

2.5 Sustainability in Design Teaching

On the subject of teaching sustainability in relation to design, the relationship between product and environment has been the subject of discussion sporadically since the mid-20th century. The importance lies in designing each individual product with the least possible environmental impact (Ceschin & Gaziulusoy, 2016).

The German pedagogue Wolfgang Klafki (2001) wrote the ‘theory of categorical formation based on a critical analysis of formation theories', which is a one-sided view of the purpose of education (Klafki, 2001). These educational theories emphasise either students' learning of academic content (material educational theories) or students' development (formal educational theories). Klafki argued that students' learning and development depend on each other and grow in interaction with each other. Klafki called this ‘categorical formation’ (Klafki, 2001). He described it as a phenomenon that a student experiences when the objective academic content and the student's subjective understanding open up to each other, so that the student develops a holistic understanding of the teaching topic. Klafki described this as "knowledge", but in design, "understanding" may be a more suitable term, as students develop understanding within both knowledge and skills (Klafki, 2001). Klafki highlighted four factors as particularly important in teaching to promote this holistic understanding among students, which is holistic understanding, student’s view on topic’s purpose, exemplification, and having themes in line with purpose.

Based on these points, Maus (2017) has developed a model for teaching with environmental considerations in design. According to her, holistic understanding is developed in the meeting between the student (subject) and the teaching material (object), which shows the theme of the teaching. In the topic of design and teaching, there are two subtopics that must appear in the teaching material. One is how to design solutions, and the other is the potential environmental impacts from design solutions. These two topics have completely different characteristics as teaching materials. A design solution is a present subject and can be sensed, while the solution’s potential environmental impact is absent from the physical world, and must therefore be experienced through reflection on information. Looking into a design solution, and reflecting on its potential environmental impact, opens the way to engage the student in the SD process (Maus, 2017).

Design processes with creative problem-solving and practical work engages the students' critical thinking, assessment skills, will and imagination in the encounter with scientifically based knowledge about the topic. By using examples of products and their environmental impact, it could inform and give students challenges where they can use their critical reflection in creative problem solving. This understanding is based on that students develop beyond the individual product and school project. The design process consolidates the students' understanding of concepts about the direct and indirect influence of design qualities on environments, in practical experiences with the product they design. SD has the potential to exemplify sustainable development that is not only understandable, but also relevant because it opens up for students' participation (Maus, 2017).

Goals for sustainable development in the ecological, social and economic environment are high on the agenda in national and international education policy. These are such extensive topics that both teachers and students can feel powerless. SD's inherent idea that design is part of both the cause of, and the solution to, environmental problems can seem challenging in teaching-planning. The question is whether the teaching should include examples of either problems or solutions (Maus, 2017). Exemplifying design problems can seem risky to the teacher. When students reflect on problems, it opens the door for criticism of current teaching practices and everyday life, as there are environmental concerns linked to most solutions. This makes most solutions examples of non-sustainable design. They also bring questions about problem-solving to which the teacher has no answer, either because the teacher lacks the knowledge or because the solution has not yet been developed (Maus, 2017).

Examples of sustainable solutions show what we want to achieve with design, but that brings other challenges. This excludes most everyday products and products that students can make at school, and thus shows SD as a niche with few solutions. Including solutions with half-baked sustainable content, and focusing only on the sustainable solutions, can lead to a greenwashing of the teaching-practice, by portraying it as more sustainable than it is (Maus, 2017).

Maus (2017) explains that the purpose of education is, as Klafki mentioned, that students should develop autonomy in self-determination, co-determination and solidarity in democratic processes. The purpose of the design and craft education is for students to develop a holistic understanding of environmental considerations in solution design. In this way, they can assess good and bad solutions, recognize greenwashing and have the skills to be able to take part in the development of new and more sustainable solutions. In order to achieve this, students must gain experience with design that tries in different ways to reduce products' negative environmental impact (Maus, 2017).

There exists some examples as to how sustainability can be implemented in education. By using methodology, García-González et al. (2017) aims to include sustainability in university classrooms. They present a solution called HAMS. HAMS is an analytical instrument which aims to include ESD through methodology methods in teaching. This instrument focuses on how to teach and how to make decisions in university classrooms at the stages of planning and intervention. HAMS is made to be used by teachers, so that they can analyse and reflect on their own teaching. This solution is very open and adaptable, to make sure that it fits into different types of disciplines. HAMS is designed in a way that provides students with a way to understand scope and depth, and it also enables them to critically analyse knowledge. By HAMS giving students these skills, they can use them accordingly to develop themselves towards future professions. This tool is also made to work with both practical and theoretical teaching, by holding its focus on the planning and intervention stage

(García-González et al., 2017). As this method surrounds planning and intervention, which are important aspects of preparing a design, it would be possible to adapt to a design-focused classroom.

Another example is deep learning. Warburton (2003) speaks on understanding critical awareness, limitations, and scopes, as being the key concepts to receive the desirable outcomes within ESD. His suggestion is to develop an interdisciplinary, integrated framework, which will require students to engage in diverse levels of synthetic and comparative thinking. Warburton (2003) then believes that a well-developed capacity for deep learning is the answer. Deep learning evolves around extracting understanding and meaning from experiences and course materials. Deep learning might also be an important and relevant topic in ESD, as it's becoming important to think interdisciplinarily, and holistically (Warburton, 2003). Warburton's (2003) paper looks into the influence of deep learning and proposes ways for it to contribute to how sustainable educators can make students use deep learning, and encourage them. His proposal is said to help maximise benefits that sustainable courses can have, while also fostering interdisciplinary, creative approaches (Warburton, 2003).

3 Research Approach

This chapter will describe the methodological choices, procedures and mindset that underlie this project. The methods will illuminate different aspects of teaching within sustainability in HE. The research follows a qualitative approach, with desk research, eleven semi-structured interviews, followed by two affinity workshops, and various design methods, which are used as methodological tools to answer the research question. Furthermore, the choice of methodology will be highlighted with an overall design-view on the conduction of methods. The qualitative interviews and workshops supplemented with the selection and recruitment of informants, and the implementation of data collection and transcription.

3.1 Qualitative Design Methods

Qualitative methods are a research method used in the collection and analysis of qualitative data. This is data that is usually available in the form of text, in contrast to quantitative data, which is expressed in the form of numbers or other quantifying terms. The purpose of these qualitative studies is to gain in-depth knowledge and a holistic understanding of specific contexts, and to develop concepts, categories and typologies. These studies also aim to formulate hypotheses and theories, and make theoretical generalisations. These aims are targeted at the two main user-groups, which are bachelor design-students, and lecturers under the Department of Design (ID) at NTNU. The qualitative methods that are used allows for there to be multiple theories and perspectives amongst participants, where all views can be acknowledged and used.

When using qualitative methods, one needs to separate interpretation and phenomena. A phenomenon is an appearance, what you notice, comes into view and is perceived by the senses (Dalland, 2017). Interpretation looks into the potential of interpreting a human action by exploring a deeper content of meaning than what may immediately seem self-evident. A phenomena approach emphasises that there is no actual truth, but that different phenomena can be interpreted on several levels. The meaning of an action must be understood in the light of the context of which what is studied is a part (Thagaard, 2018). With this view, researchers can learn to analyse their methods as texts in order to look beyond the here and now. These two directions are also intended to be able to complement each other (Kvale & Brinkmann, 2015). A qualitative researcher who looks at actions in their natural context will always be coloured to a certain extent by the researcher's theoretical point of view. The collaborative relationship between the author as a researcher and informant in this process shows that the study represents an epistemological point of view which implies that knowledge and understanding are created in social interaction (Postholm, 2010). A goal in this methodological approach is also to highlight the participant's perspective. The collaborative relationship between researcher and participant in its natural context shows that qualitative research represents an epistemological point of view based on the fact that knowledge and understanding are created in a social interaction. Such a theoretical standpoint will also be important for which units of analysis the study focuses on further in the work (Postholm, 2010).

In general, it can be said that qualitative research involves understanding the participants' perspective. This is especially important when designing, as design is driven by recognizing user goals. As this thesis aims to propose a design-perspective to its process, and propose a design solution proposal, qualitative methods are great tools to identify the user-groups’ goals (Cooper et al., 2014).

With a design-view on the research process, having a personal view shine through is seen as natural (Cooper et al., 2014). Theory at various levels will give direction to the research work, while the author's own experiences will influence the research focus (Postholm, 2010). Which methods one chooses to use in the research work depends on which social conditions one wants to develop knowledge about, as well as which theories and paradigms form the basis for the research work (Postholm, 2010). These methods will also aim to discover user-goals, instead of tasks and actions, as these goals will reflect the user-group's expectations to the solution proposal. By keeping such an aim, the end result is more likely to satisfy the user, and irrelevant aspects can be eliminated faster. By having these goals, it will become possible to define basic frameworks of what the solution proposal could be, what it should do and how it should meet the user's needs (Cooper et al., 2014).

For the methodological choices to meet the user's goals, they need to be put into context. Data gathered from interviews and workshops will help build knowledge on who the users are, what they are doing, and their goals. By using these methods to gather data on goal-directed interactions, the user's mental models for a potential solution will shine through. By taking a researcher's viewpoint on design, a systematic means of translating and synthesising the research can be made into design. The design-view still brings empathy into the process, while the research data will be provided with user information (Cooper et al., 2014).

Through literature reviews, desk research, interviews, workshops, and the extensive analysis of the two last mentioned methods, enough data will be produced to start narrowing down the process. Through these qualitative methods, several goals and needs are taking form. Before forming these goals and needs into specific solution proposals, personas and scenarios need to be developed. Personas and scenarios are a crucial part of user-centred design, as they provide the designer with a precise way of thinking and knowing how the users behave, think, and what they want to accomplish. Scenarios supplement these personas, as realistic, imaginatory stories where the persona will try to accomplish their goals. An idea portfolio will then be used to select a specific solution idea, and a service blueprint will be conducted to map out the necessary contents in a solution which fulfils all goals and needs. After a solution has taken form, a benchmarking session will be held, to identify what similar solutions exist today, and which advantages and pain-points can be collected from these. All in all, these methods create a clear image of who the users are and how a solution can fulfil their desires.

3.1.1 Design as a Method

Design is not simply a research methodology or framework, but rather an interpretive philosophy that has the potential to bring about real-world transformation. It is an approach that focuses on the human experience, empathising with individuals and their needs, and providing solutions to improve their lives. Design can be seen as both an attitude and a process, and it allows for traditional as well as experimental methods (Kimbell, 2011; Fallman, 2008). It is an approach that prioritises democratic participation and shaping behaviour, as well as form (Spaargaren, 2003).

Research through design enables researchers to address complex problems and create new knowledge through the application of design practice. The practice of design often involves intangible, iterative, reflective, and messy processes of synthesis or sensemaking. These processes allow for creative problem-solving, intuition, and the incorporation of personal experience into the research process (Blythe, 2014; Zimmerman et al., 2007). Abductive reasoning, also known as designerly ways of

knowing, allows for the creation of new insights or knowledge through processes of judging, prioritisation, and forging connections (Kolko, 2010).

Abductive analysis borrows much from inductive approaches such as grounded theory, but emphasises the need for the researcher to have the deepest and broadest theoretical base possible and to develop this base during the research process. By making use of inference, insight, and conjecture, abduction provides less certainty, but more innovation. This allows for concepts to be reconfigured or combined in new ways, and human instinct to be seen as a basis for truth (Timmermans & Tavory, 2012).

In a bid to follow such methodologies, combining concepts in new ways, working with real-world contexts, making use of a wide theoretical base, and developing this during the research process, the project will now turn to its methodological studies and develop the solution proposal.

3.2 Design Methodology

3.2.1 Desk Research

This thesis aims to propose a solution that could potentially be implemented into design-bachelor studies at the Norwegian University of Science and Technology's Gjøvik Campus. Therefore, students' and lecturers' goals and needs will be applied into the process though a certain methodology. But firstly, the business's goals need to be clarified first. To understand where the university stands on sustainability, and what the design-bachelor studies entails, a dive into the university's information base was conducted.

3.2.1.1 Norwegian University of Science and Technology

The Norwegian University of Science and Technology (NTNU) is a university located in Norway, with an internationally oriented outlook. The university has three campuses, which are located in Trondheim, Gjøvik and Ålesund. Trondheim is the school's headquarters. As seen in its name, NTNU is known for having a technical-natural sciences focus, but also involves humanities, social sciences, economics, medicine, health sciences, educational sciences, architecture, entrepreneurship, fine arts and artistic directions (NTNU, n.d.-f). This thesis focuses on the Gjøvik campus, specifically within the Department of Design (ID). The Gjøvik campus holds most of the artistic directed studies, such as bachelors within graphic design, web development and interaction design, which are the bachelors this thesis deals with (NTNU, n.d.-e).

For NTNU in general, the university has four thematic focus areas. These areas are the ocean, health, energy and sustainability. As NTNU explains on their webpage for the thematic focus area for sustainability, they "research what sustainable social development encompasses, in its broadest sense, within environmental, economic and social conditions" (NTNU, n.d.-d). This program works together with core partners from various research groups, which focus on the environment. The program focuses on topics such as modelling and analysing, technologies, consumer behaviour, and the like (NTNU, n.d.-d). NTNU has also taken a pledge to help fulfil the United Nations' (UN's) Sustainable Development Goals (SDG). NTNU therefore include the goals in various activities, as the goals require a multidisciplinary approach to work, as well as they help forge partnerships with industry and the public sector. All faculty and students are therefore asked to consider the SDGs wherever they can (NTNU, n.d.-a).

3.2.1.2 Design Bachelor studies at NTNU

As mentioned, NTNU in Gjøvik has three bachelors within their department for design. Firsty, there is the Bachelor in Interaction Design. As it also goes under the name UX design (user experience), its focus lies on the user, and learning how they interact with digital solutions. The students in this degree need to learn how to design in an inclusive, intuitive, useful, and user friendly way, while considering ethics and social issues. This study is suitable for those who have an interest in people, design and technology and like the combination of theoretical tasks and practical work. Throughout the course, the students encounter subjects that combine different working and learning methods, as well as projects that require them to combine knowledge and skills across subjects (NTNU, n.d.-i).

The Bachelor in Graphic Design indulges its students into two worlds within design, which exists in both the physical and digital realm. NTNU aims to educate students to become graphic designers with a wide competence-base, who are able to balance design and practical skills, as well as thinking conceptually and analytically. Through a curriculum on communication, aesthetics, craftsmanship and quality of use, the students can become wholesome designers (NTNU, n.d.-c).

The Bachelor in Web Development is said to be the bachelor for those who enjoy programming, designing solutions and to meet users. This bachelor is the intersection of these subjects, and the bachelor aims to create user-centred web developers. The students will get a look into developing and prototyping, as well as advancing their level within web solutions each year (NTNU, n.d.-b).

3.2.2 Informant/Participant Sampling

Qualitative research opens up several ways of selecting informants. The main rule is, however, that the sample in qualitative interview studies must be selected on the basis of characteristics or qualifications that can provide reflected statements about the topic in question (Tjora, 2021). And as a designer, one must capture the entire range of possible end-users to cover all user behaviours. To make sure that the informants for interviews, and participants in workshops, fit the topic and possible end-user groups, the method of selective sampling was used. This method is suitable for qualitative research, and can provide detailed and in-depth data on the phenomenon that is being investigated (Leedy et al., 2021). With this in mind, one can recruit informants and participants that are thought to give the desired information (Tjora, 2021). The criteria to qualify as a participant is highly determined and subjectively decided by the researcher, and author of this paper. Each method and criteria to be sampled as an informant and participant is listed under each user-group below.

Current Students:

The first informant/user-group consists of current students. Current students were sampled for both interviews and workshops. The criteria for this focus-group sampling included them being enrolled in HE level 1-3, at NTNU Gjøvik, under ID. In other words, this signifies they are enrolled in a bachelor level study, on the topics of design, such as Graphic Design, Interaction Design or Web Development.

The recruitment process for interviews consisted of posting information about the thesis and interview on a common sharing-platform that all, and only, bachelor students can access, and receive notifications from. The overarching subject managers, for each bachelor, posted the information on the front page of these sites. The recruitment process for workshops consisted of posting information about the thesis and workshop

on the sharing-platform for the course IDG2200 Design and Prototyping for Digital Products, and adding it to the course's time schedule. This course is available for 2nd year interaction design students and 3rd year graphic design students.

The information was written by the author, and consisted of the introduction, and how the activity would be conducted. Participation was voluntary.

Former Students

The second student user-group consists of former students. This group was only brought in as informants in interviews, and not participants in workshops, as idea-generation is more reliant on current student statuses. The criteria for this group-sampling included them being previously enrolled in HE level 1-3, at NTNU Gjøvik, under ID. They must have finished their bachelor education at NTNU, within the last 2 years, so that their school-experience and curriculum is relatively close to that of the current students. With a bigger year-gap, the curriculum and experience will differ more. By comparing the curriculum of the current, running bachelor studies, versus previous years, curriculums up to two years back are close to identical to current curriculums.

The recruitment process consisted of contacting former students through the platform Messenger, which is a chat-service connected to Facebook. The former students received a message with the same contents as the post for current students. Participation was voluntary.

Lecturers:

For this project, valid information is needed on the topic of the lecturers' work, and their thoughts and understandings around sustainability. By targeting lecturers with at least 5 years' experience, having physical education or pedagogy, and being hired under ID, there will be good prerequisites to ensure that the informants/participants had certain knowledge, working methods and experiences that provide valid data for the research question (Dalland, 2017). The lecturers were also selected from HE level 1-5 study specialists as the lecturers will have relatively similar curriculum goals to work from and similar ways of grading assessment.

The recruitment process consisted of contacting lecturers through the NTNU's email service, called Outlook, which is an email-service brought by Microsoft. The lecturers received a message with the same contents as the students'. Participation was voluntary.

3.2.3 Semi-Structured Interviews

Kvale & Brinkmann (2015) define a semi-structured interview as "a planned and flexible conversation whose purpose is to obtain descriptions of the interviewee's life with a view to interpreting the meaning of the phenomena being described". In-depth interviews often have open questions that give the opportunity to go in depth where the informant has a lot to say. In other words, the informant is considered an active participant and source of knowledge (Foley, 2012). This approach gives the informant greater control over the interview situation and the conversation moves more in the direction of a conversation where there is room for both parties to legitimately raise questions (Kvale & Brinkmann, 2015). Interviews also contribute to developing an understanding of how people experience and reflect on their situation (Thagaard, 2018). As a designer, to be able to craft an appropriate solution, an understanding of capabilities and limitations need to be made. The best way for a designer to begin this process, is by talking to the end-users/stakeholders, who are responsible for managing and using the future, not-yet

produced, solution (Cooper et al., 2014). The researcher should also produce descriptions and narratives that can be interpreted and reflected in accordance with their research interest (Kvale & Brinkmann, 2015). This is done by categorising the various interview questions so that it was ensured that the various areas were covered, while at the same time there was room to follow up answers with new questions.

All interviews were transcribed from audio tapes. The transcription was carried out shortly after the interviews. The interviews were taped (audio only) with an audio-recording application, and deleted right after being transcribed. They were written onto two documents. The dialects of the informants varied to a great extent. To ensure anonymity, all transcription was done in Bokmål. In order to include meaningful elements beyond the words, pauses, small interruptions and hesitations were marked. According to Kvale & Brinkmann (2015), this is the best way to ensure precise transfer from speech to written language (Kvale & Brinkmann, 2015). These transcripts will later be analysed by identifying common opinions, biases, and patterns in the data through an SDI analysis.

To gather a wide range of insight for the project, there were in-depth interviews conducted on current- and former students, as well as lecturers. Two current students attended an interview, where one of them was a graphic design student, and the other a web development student. Six former students attended as well, where there was a mix of three graphic design students, two interaction design students and one web development student. Three lecturers attended as well, where all teach a variety of classes, spanning between the graphic-, interaction- and web-design courses. The in-depth interviews aimed to create a deeper understanding of their work/school schedules, what their courses contain, and identifying their knowledge around sustainability, in what the lecturers teach and what the students learn. This was included in the interviews to be able to map out where there might be weak links, if there is a lack of knowledge on teaching sustainability, lack of content in the course plans, motivation, etc. This was also done so that the data collected, and the proposals being developed based on this data, was coherent with their knowledge, and understanding on the topic.

3.2.3.2 Interview Guides

The design of the interview guides was based on the problem, theory, and the author’s experience as a former design-bachelor student (Kvale & Brinkmann, 2015). The content of the interview guides reflect the problem and the theoretical basis of the study. The questions were carefully prepared to reflect the theory so that the answers could be discussed against relevant theory. The interview guide served as a script that structured the interview process, while there was some flexibility during the interviews so that it was possible to ask follow-up questions (retrospective questioning) (Østbye, 2013). Relating to a structure can help to ensure that topics are not forgotten and that one avoids collecting too much redundant data (Ryen, 2002). For this study, the semi-structured interview can be linked to what Roulston (2010) calls a new positivist belief that the interview is concerned with using dialogue to uncover the essence of the interviewee's experiences, and to provide the researcher with valid, reliable data (Roulston, 2010).
The in-depth interviews were conducted with Teams and Zoom. A total of 11 in-depth interviews were conducted with some of the relevant stakeholders for the project, 2 students currently studying a design-bachelor, 6 former design-bachelor students and 3 teachers from that same study.

Two guides were developed, with one primarily for the current and previous students:

Interview Guide – Students (current and former)
What is your educational background?
Do you have other skills and/or experience related to design?
What is your understanding of what web design is? / What are you doing now?
What expectations do/did you have for the bachelor's degree? / How do you think the bachelor's program was?
How much time do you spend at school in a week?
How big does/did the amount of study (feel so far)? Explain.
How do/did you prefer to work?
Have you come across reflection work/diary writing in studies before, in the form of reflection on the study, subject or your own work? What about journaling?
What is/was your opinion and your relationship with optional study assignments?
What is/was your opinion and your relationship with compulsory study assignments?
What do you know about sustainability?
What do you know about sustainability in design? (Do you know more now than when you started your studies?)
Do you want to learn more about sustainability in design?
Had you felt ready for working life by now, and could you implement sustainability in what you are going to make?
What are/were your expectations regarding learning about sustainability in this study?/Has a lot of sustainability/sustainability focus been implemented in your workplace?

Table 3.1: Current/Former Students Interview Guide

A second guide was developed for the lecturers:

Interview Guide – Lecturers
What is your educational and teaching background?
Do you have other skills and/or experience related to design?
What do you teach, within design bachelor's studies?
What tasks does your role entail in the design bachelor's degree?
Where would you say there is room to implement more in your curriculum?
In which cases have you come across reflection work/diary writing in studies before, in the form of reflection on the study, subjects or your own work?
What is your opinion and your relationship with optional study assignments?
What is your opinion and your relationship with compulsory study assignments?
What knowledge do you have about sustainability within what you teach?

Table 3.2: Lecturer Interview Guide

3.2.3.3 SDI Interview Analysis

For the analysis of interviews, Tjora's step-by-step deductive inductive method (SDI analysis) was used. Inductive methods make specific data general, and deductive methods make general data specific, which means that this method tackles both. This method brings a framework and control to the process, as well as it is characterised by systematics and structure. In the SDI analysis, one works upwards from empiricism to theory with an inductive approach. At the same time, one works downwards by elucidating the empirical evidence from a more theoretical to a more empirical level with a deductive approach (Tjora, 2021).

What particularly characterises the SDI analysis and which made it relevant for this project, was that it provided the opportunity to bring theory and perspectives into the analysis work itself, and by not being atheoretical. The research review, and the author's preconceptions, have laid some guidelines for how the data has been read, understood and interpreted by empirical evidence. This interaction between theory and empiricism in the form of an abductive approach gave a wanted procedure. In an abductive approach, one starts from empirical evidence as induction, but different theories and perspectives come into play during the analysis process. The specifically abductive is shown in the SDI analysis in the form of developing code groups, concepts, models and theory (Tjora, 2021).

The SDI analysis fits well with the use of computer programs that process qualitative data material (Tjora, 2021), by making the analysis systematic. For this analysis, Nvivo was used. This is an analysis-program adapted to the processing of qualitative data. The program brings the opportunity to handle the experience of the data in a clear way. The analysis work was started from the principle of carrying out an empirical first-phase. This is how the potential that lies in the empirical evidence is taken care of. Such empirical coding means that one can get close to the empirical data in the coding process, and can also use terms from the empirical data in the form of native terms (Tjora, 2021).

In order to be able to answer the problem as best as possible, a precise and well-arranged analysis process was necessary. 3 sets of transcribed user-group interviews were imported into Nvivo. Amongst these 3 sets of transcribed interviews were 2 current student interviews, 6 former students interviews, and 3 lecturer interviews. After reading through the interviews in their entirety, the work on creating empirical nodes began. In Nvivo, it is possible to mark paragraphs, words, phrases and dialogues that deal with the same topic. To not miss out on the empirical data, every node was based on and formulated directly from what emerges in the empirical work itself. As Tjora mentioned in his book on qualitative research methods: "you should code what the informant says directly, not what they are talking about" (Tjora, 2021).

The codes also received content from empirical evidence, and none of the codes deviated from this way of thinking. This work is about generating codes inductively. This means that premature conclusions can be avoided (Tjora, 2021). By continuously using the deductive coding test (Tjora, 2021), it was made sure that empirical coding was followed. That the code test is deductive means that it asks questions "from the more theoretical (the code) to the less theoretical (the empirical segment)" (Tjora, 2021). All collected words and statements are henceforth called nodes, and the theoretical grouping of these are called codes. After coding all sets of interviews, these were the results:

Sets	Nodes	Codes
Current students	47	6
Former students	149	7
Lecturers	50	5

Table 3.3: Number of Nodes and Groups

The nodes that were created were "pointers (references) to the exact location of the text you coded in the file" (Jackson & Bazeley, 2019). This means that Nvivo 'tags' the transcribed interviews together with the nodes that are created. Together with the transcripts, this makes up the code set. These are representations of the author's experience, in the form of a code-structured experience (Tjora, 2021).

3.2.2.4 Grouping the Nodes to Codes

The next step in the analysis work was to make an inductive code grouping. This was done by grouping the nodes in the code sets, thematically, by finding nodes with a mutual thematic connection. The code groups, together with the research question, will help form the starting point for what will be the themes. Several nodes were discarded in this round, because they did not have a good enough relevance between the node and the research question. These were placed into their own folder called "Residual Group for Irrelevant Nodes". The nodes that were removed revolved around biases, understanding what their study entailed, and other statements that did not relate to the themes. These were the code groups after the first round of thematic grouping:

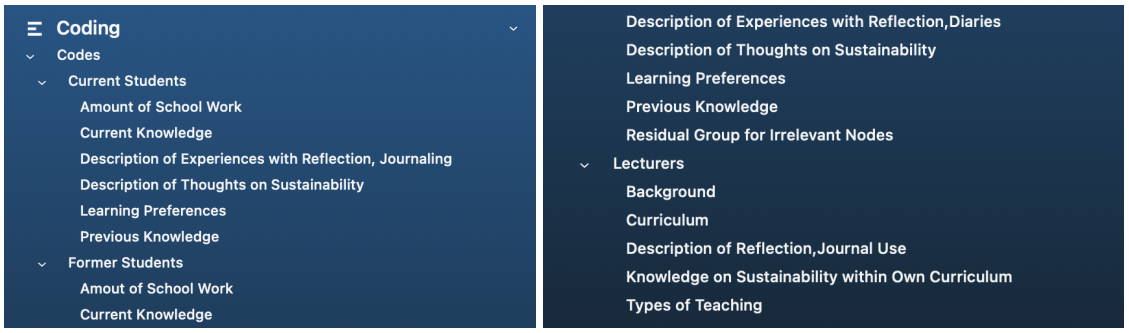


Figure 3.1: Code-groups in Nvivo

In the work to arrive at these themes, the abductive approach shows itself. In order to reach the goal of this work, it had to be alternated between what information came from the research reviews, and how the author related to the empirical material. This way of developing themes can be called a form of qualified guessing (Tjora, 2021). Such a procedure can contribute to raising the quality of the analysis because one avoids ending up with themes that are not closely related to the empirical evidence. This process helped provide a form of quality assurance. The analysis results of what was found within the codes is found under Results below.

3.2.4 Co-Creative Affinity Map Workshops

Co-creative workshops are a great tool to get feedback from the user groups the solutions are going to be made for. The co-creative workshops help involve the groups of people the author is designing for, and bring them into the design process. By using this

method, they get to be in the middle of the process, and feel more involved, rather than by watching and giving feedback from the sidelines. By creating together, you also design better by getting a full look at all the facets of your solution (Gray et al., 2010).

Affinity mapping was the co-creative method used in this segment. This method gives an insight into where the participants' thinking is focused and how to make sense of it. The affinity map method is recommended to use when one wants to find categories within a cluster of data and ideas. This method is therefore fitting for this thesis, as the goal is to see which ideas on the thesis topic are most common within the user-groups (Gray et al., 2010). Workshop was therefore the logical next step in the process. Two workshops were held, one physical with bachelor-design students and one digital with lecturers.

3.2.4.2 Affinity Map Conduction

Affinity map workshops help view the real-world thoughts and issues to the forefront, which is crucial in UX research. It brings an important insight into necessities that should be involved in the solution proposal. The workshop followed the suggested set-up proposed by Dave Gray, Sunni Brown, and James Macanufo (2010) in their book *Gamestorming*. This book looks into several design-related *games*, which can help develop, narrow down and conceptualise ones ideas. To use the terminology of Gray et al. (2010), the object of play, or in other words, the conduction of the affinity mapping, includes methods related to brainstorming. This workshop-type allows for up to 20 participants to attend, and the maximum of needed time lies at 1.5 hours (Gray et al., 2010). These workshops were predetermined to last for up to 1 hour each, as the amount of participants were 7 for the student-workshop, and 6 in the lecturer-workshop. The workshop was conducted with tools as an aid, which were post-it notes and pens that the participants could use to write their ideas on.

The students' workshop was held physically at the Mustad Campus of NTNU Gjøvik. 7 students participated. 2 students were 3. year graphic design bachelor students, and 5 were 2. year interaction design bachelor students. Due to the student workshop being held physically, the tasks were completed by using physical post-it notes and pens. The lecturers' workshop was held digitally over the Teams platform. 7 lecturers from ID participated, whereas 1 belonged to the Trondheim campus, and 6 belonged to the Gjøvik campus. Due to the workshop being held digitally, the tasks were completed using Miro, an online collaborative whiteboard-platform that enables distributed teams to work effectively together (Perminova, 2023). Miro contains a digital post-it note tool, which made it possible to mirror the digital workshop with the physical workshop's tasks.

The participants need to be provided with enough data to create valuable data points, but, neither enough to be led in a direction of thought (Gray et al., 2010). As the first step of the workshop, the participants were given information about the research topic, the research question, and some pointers on what sustainability can include. The information the participants were given was vague, with intention, so that the participants would not be led in any direction regarding their answers.

To help visualise the topic, a digital display was prepared, with a question that the participants were to respond to, in addition to a visual of a scenario to accompany it. The question was open and made the participants be able to produce at least 20 post-its/pieces of information to sort when answering it (Gray et al., 2010). The workshop started off with an explanation of the scenario and the question that they would be answering. This question was developed out of the research question, and read

as follows: *How can students become more capable of reflection around sustainability?* This was accompanied by a text that read:

> *This project aims towards producing solution proposals that explore how more sustainability can be implemented in the studies of design bachelor-students, in a way that works for both students and lecturers.*

This text and question was accompanied by an illustration, so that both sides of the question could be visualised. Because, the participants needed to produce answers that either looked into a student or lecturer side, or both combined. The image reads (from the left) Mina (student), Mina needs to reflect, and Per (lecturer), Per needs to understand. This signifies how the goal of the project is to have students know and reflect more on sustainability, and lecturers understanding sustainability, and what the students might need to reflect on. The student workshop had their scenario and question displayed on a computer screen. As for the lecturers, this was displayed on top of their Miro-board, over an area devoted to placing their brainstorm post-its in the next task.

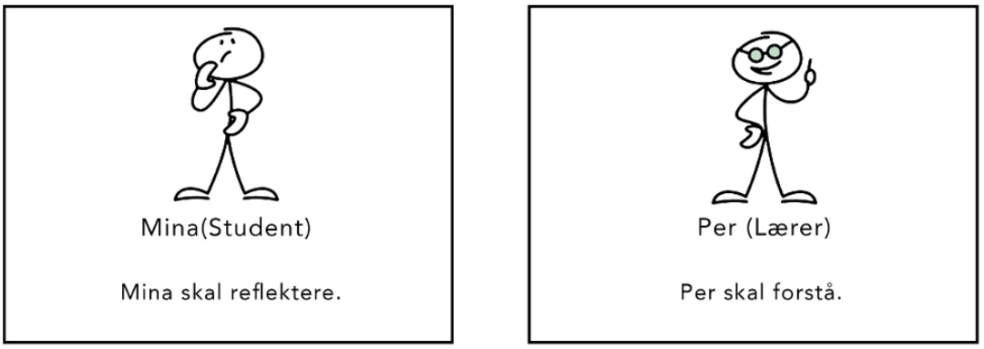


Figure 3.2: Scenario illustration from workshops

Brainstorming was used to answer the scenario above, which is an efficient method to get a large number of ideas on the table. The brainstorm was of the "sky-is-the-limit" type, which means that they could write everything and anything that came to mind. They were asked to write elaborately on the post-it notes, so the ideas could be understood by other participants in the workshop, and by the author after the workshop was finished (Gray et al., 2010). The participants got 15 minutes to write down their thoughts and ideas in silence, individually, and they created a high quantity of notes in both of the workshops. The students were given random blocks of notes to write on physically, while the lecturers were assigned a colour of a post-it each, and completed the sky-is-the-limit brainstorm by placing the notes in a devoted area in Miro. 37 notes were created in the student workshop, and 46 in the lecturer workshop. Gray et al. (2010) refers to these post-its as nodes, or notes, as they will be referred to going forward.

After this brainstorm, the participants read and explained each note they created. By doing this, all participants became more aware of the contents of the notes in front of them, as there is no time set aside for them to read the notes personally (Gray et al., 2010). From this point forward, the two workshops were conducted in different ways. Due to unforeseen circumstances, a fire-alarm went off in the building where most of the lecturer participants were located during their workshop. Therefore, the workshop's duration was 30 minutes instead of 60 minutes, which resulted in no more tasks being

completed together beyond this point in the workshop. The remaining tasks were therefore done over email by the lecturers.

Figure 3.3: Meaningful space during Student Workshop

After creating such a high quantity of data, it raises the question as to how one can collect meaning from it. This was done by using an affinity diagram, which is a technique that helps discover patterns embedded in the way of thinking amongst the participants. This includes clustering and/or sorting the information into language-based relationships (Gray et al., 2010), while also making a meaningful space. A meaningful space is an area where the participants can place their notes and have a clear view of them (Gray et al., 2010). In the student workshop, the participants were asked to discuss the contents of the cards together and put them into three categories. Their meaningful space was a glass wall in the room where the workshop was held. The limit for categories was set to three, so that they had guidelines to follow, and to not create an unnecessary amount of categories. The categories were formed based on the relationships they decided on together. They were allowed to add one more category, after the first try was completed, as one group became exceptionally large. The cards that they felt did not belong with a category, were placed in the parking lot. Also, repeated ideas were kept, as this shows how many participants are thinking of the same ideas. The participants were asked to categorise by what they saw as natural, and not overthink, as they should focus on grouping based on affinities, and not a higher category (Gray et al., 2010). The students were not allowed to name the categories at this stage, so that they would only focus on patterns when categorising, to get a sense of where the participants focused their thinking.

The next step had the students give names to the categories, by brainstorming vocally. They were asked to not think for too long, go for what seemed natural, and agree on the first category everyone thought was fitting. If there were disagreements, both names could be included. And, if they could not make up their mind, the most agreed upon category-name was chosen (Gray et al., 2010). As for the lecturer workshop, the categorization and naming was done by the facilitator (author), as these

tasks were not possible to do without the participants discussing it together in real time. More on this is explained in the Results-section.

Figure 3.4: Students' Categories of Voted-on Notes

To generate more concrete data from the workshops, and as the pool of ideas were still large at this stage, two additional tasks were added; dot voting and forced ranking. Dot voting is a great method to use when there still are too many ideas and concepts to gather information from. This method helps converge towards a solution, and to choose amongst concepts through individual prioritisation (Gray et al., 2010). In both workshops, the participants have a set of notes to vote on from their brainstorm during affinity mapping. In this method, the participants were asked to vote for their top 3 favourite ideas by making a dot on a note. They were asked to consider what they think would work best in-practice, and what they saw as most important as well. These guidelines provided a look into their opinion of impact and feasibility on the content of the notes. By giving the participants 3 votes each, their votes will become more meaningful, and thought-out (Gray et al., 2010). These votes were across all categories. This task was done in silence, individually, in the physical, student workshop. As for the lectures, the dot voting and forced ranking tasks were presented via emails, where one task was described at a time. The dot votes were added to the Miro board within two weeks after the workshop was originally held.

After everyone had cast their votes, the notes with dot/s were moved to a separate area, so that they could be looked at alone. This was done both physically with students, by moving the notes underneath the remaining ones, and digitally with lecturers, by creating a new area where they were placed randomly. These single-outed notes could now become the topics for further discussion and making decisions. The notes were explored in more depth, as the participants were asked to place them in a ranking order, based on prioritisation. By forcing the participants to rank the notes, difficult decisions have to be made (Gray et al., 2010). This task was included so that the list of voted items would get a clear, prioritised order. The scale went from least to most important/usable, which mirrors the values of impact and feasibility.

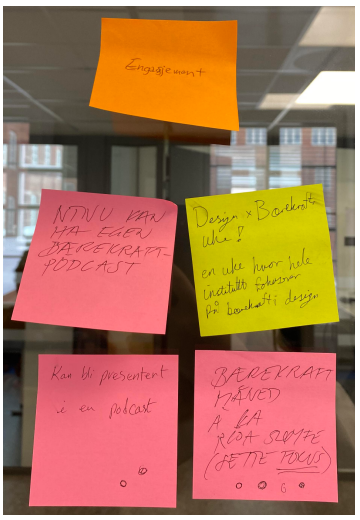


Figure 3.5: Illustration of Categorised, Named and Voted-on Notes in Student Workshop

In the student workshop, the discussions around the placement of notes on the scale went smoothly, and the facilitator (author) asked a couple of questions to lead them in the right direction. Some discussions started to go towards what they would personally like, and what seemed fun, so the facilitator asked them to consider what they thought would work in practice. They all saw the same patterns, and agreed immediately to the categorization, naming, and forced scale. The discussions during each task were insightful and included many well-thought out ideas. The lecturers got instructions over email, and it was explained that each participant got their own, assigned blank area to put their forced ranking in. 5 scales were created. These scales were then analysed and made into one singular scale, which will be elaborated on in the results section.

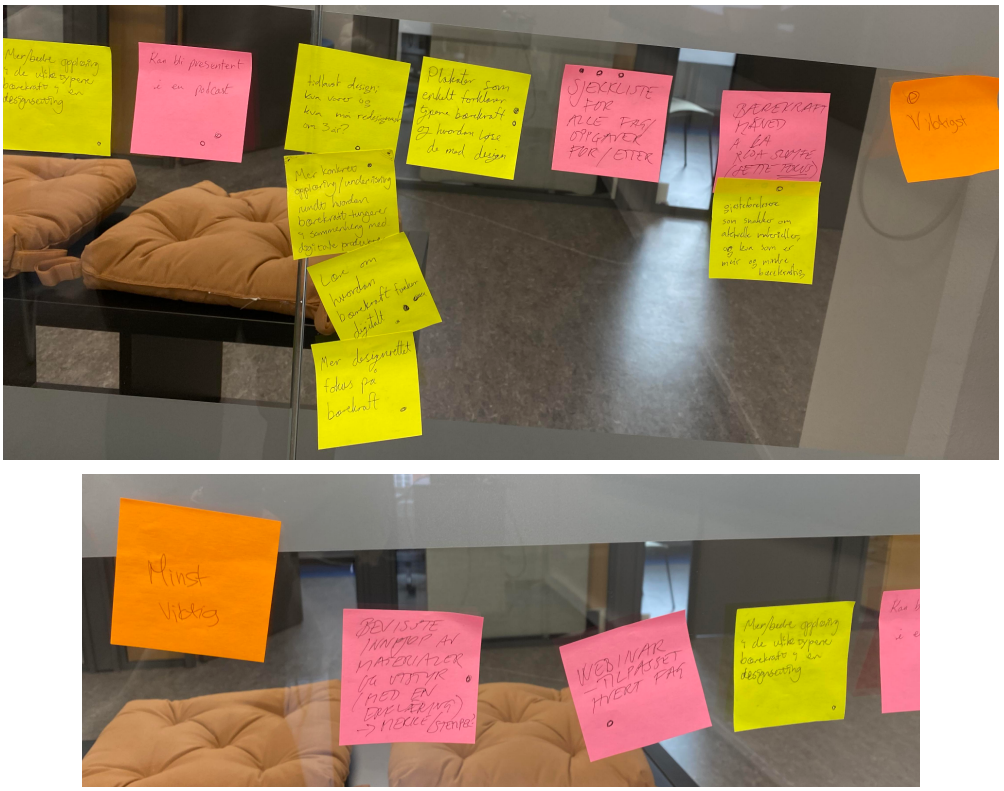


Figure 3.6: Illustration of Forced Ranking in Student Workshop

The facilitator did the grouping and naming for the lecturers, so that the notes would be ready and easy to comprehend for the lecturers, when doing the last two tasks over email. The grouping was done as close to how the students did it, by forming the relationships on what felt natural right away. The same went for naming, by giving the groups names based on the first ideas that came to mind. The grouping and naming was not an important step, considering these themes were not needed to develop answers, but it was a crucial step for the participants to become more familiar with the notes. The previous step, which was reading and explaining the cards out loud, will therefore be seen as comprehensive enough to develop understanding for the lecturers. As the next steps were voting and prioritising the cards on a scale, it is seen as easier for the participants to keep track of the cards, if they are categorised in themes that are recognizable by them.

3.2.4.3 Thematic Analysis

The workshops are a tool to get a deep understanding of the end-user. And to learn about the end-user in the most efficient way, the workshops will be analysed in a thematic manner. A thematic analysis helps make sense of notes, discoveries and the observations made, by organising the gathered information into themes. How one should find these themes in an affinity workshop, depends on the goals the researcher has. In this case, the goals revolve around getting a better understanding of what the two user groups, students and lecturers, would prefer and what they see as most efficient, considering learning and teaching on the topic of sustainability. To find the answers to these goals, there has to be a deeper look into the data from the last three main-tasks conducted in the workshops, which were: 1. categorising and naming, 2. voting and 3. prioritisation scale.

3.2.5 Personas & Scenarios

In solution-based proposals, there needs to be models who represent phenomena and useful abstractions within what is researched. These models need to emphasise features that reflect relationships, and significant, de-emphasized details. As all processes with design, including this thesis, revolve around users, there needs to be representations of the relationships between these groups, what they want, environments, in a context of a proposed solution (Stickdorn et al., 2018). These user-models are called personas.

A persona is a fictional representation of an end-user group. They are generalised characters that embrace the needs, goals and behaviour patterns of the user groups. Personas will be used in this research as it is easier to approach a fictitious representative of a target group, with a name, picture and other relevant information, than undefined groups of people. A detailed persona is used, among other things, to tailor content, manage solution development and as a basis for user-group communication. To make these personas effective parts of the design process, there needs to be an applied, precise rigour during the process of finding patterns within behaviour, which translates into the most accurate representations of archetypes (Stickdorn et al., 2018).

For this thesis, the personas were developed on the basis of knowledge gathered from interviews and behavioural observations in workshops, in addition to knowledge on their education's contents and data research. As Stickdorn et al. (2018) mention in their book, *This is Service Design Doing*, on personas based on research; "almost every aspect of a well designed persona can be traced back to sets of user statements or behaviours" (Stickdorn et al., 2018). Therefore, statements from interviews, and

observed behaviours from workshops will be the main data suppliers for the development of personas in this thesis. These personas will be used to get concrete representations of the possible user-groups for the undefined solution.

When using personas in a design process, supplying them with scenarios brings an additional depth to the character. A persona-based scenario tells a story that describes the persona's activities or tasks (Cooper et al., 2014). Just like personas, scenarios bring life to the requirements of a design. It helps to visualise situations where the solution can be used and how a user journey could potentially take place. They help to think further than technology and business goals, to what an ideal experience for a persona would be like (Cooper et al., 2014). Additionally, scenarios also bring life to the personas themselves. The scenario contents are derived from interview research, analysis, and personas. The personas will be walked through a future interaction with the solution, yet to be developed. For this exercise, context scenarios are used. These types of scenarios are adapted to fit solutions where they have not been designed yet, and the personas' needs are put first. From their perspectives, activities, perceptions and desires will be the story-line of the scenarios. These scenarios will give information on the ideal user experience, before defining the solution. After a solution has been developed, they will be tested with scenarios called "validation scenarios". Such scenarios are not known for going into detail, but rather test the solution in various situations to check its functionality (Cooper et al., 2014). As the context scenarios look for potential situations the solution could appear in and the goals/needs the solution would have to solve, the validation scenarios check if the solution proposal could complete these same needs/goals. The validation scenarios will check if the solution is possible to use, and could identify new needs. The scenarios are all supposed to answer the research question as well, which is about how students can be provided with tools that will help them address sustainability related issues in their education.

3.2.6 Idea Portfolio

Based on all the collected data and interpretations of the data, some important needs, wishes and important aspects will come to light. These ideas can be made into proposals that can be put into an idea portfolio. By using this method, the ideas and solution proposals can be placed and arranged on a grid, within two variables. This method helps balance between the chosen variables and consider both needs and the researcher's analytical mindset. This method works well when having to make an informed decision, and helps make the decision based on a strategic view (Stickdorn et al., 2018).

The portfolio was made in Miro, the same application used for the digital workshops held with lecturers. The ideas used in the portfolio were derived from voted-on ideas in workshops, and the most critical points in interviews. By using this data to create ideas, the user's goals and needs are their driving factors.

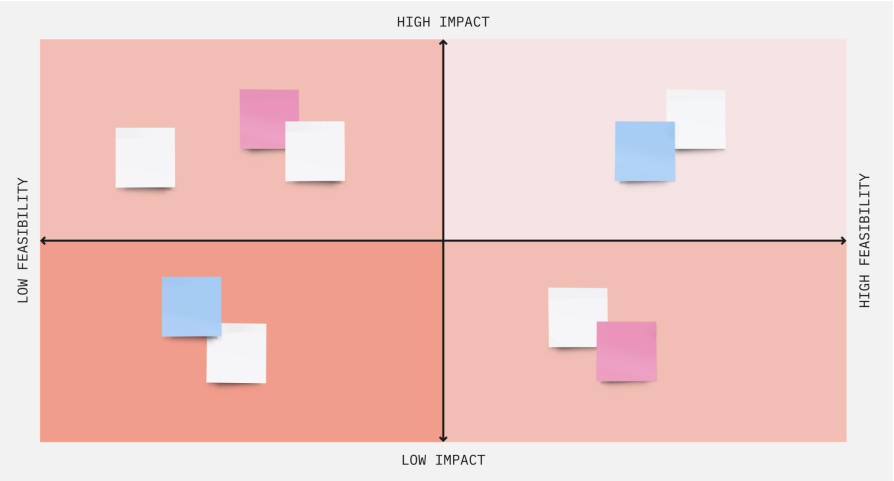


Figure 3.7: Idea portfolio before filled in

The criteria for the portfolio grid will be "feasibility" on the x-axis and "impact" on the y-axis. Feasibility revolves around how conveniently the idea/proposal can be done, and impact assess the potential reward. For this research, feasibility will focus on what realistically could be implemented into design bachelor studies at NTNU Gjøvik, while the impact will be measured after how much it could meet the needs and requirements set by lecturers and students, both axes based on gathered end-user information (Stickdorn et al., 2018). The ideas will be assessed one at a time, and given a score from 0 to 10 within each criteria. These scores will decide where the ideas are placed in the portfolio (Stickdorn et al., 2018).

3.2.7 Service Blueprint

At a certain point, the details and contents of the idea need to be generated and defined. Paint points, needs and goals are defined in personas and scenarios, which are then based on analysed data from interviews and workshops. These goals and points are therefore reflective of the needs of the user groups, and what needs to be included in the solution proposal. A service blueprint can help expand on these goals and pain-points, as it visualises all parts of a solution. The blueprint will help by highlighting parts of a solution that often gets overlooked, such as the organisational processes. Service blueprints show the layers and actions below the usually visible actions of a solution, by connecting the user-experience with frontstage and backstage processes (Hvidsten et al., 2021; Stickdorn et al., 2018). By showcasing the connections and dependencies between the processes, it is a great tool to help identify opportunities and pain points (Stickdorn et al., 2018). By adding in the identified goals, needs and pain points into the blueprint, possible details within the solution proposal that will answer these points will appear.

The service blueprint used in this thesis is led by a Journey Phase, where the stages the solution entails are set in a chronological order at the top. The goals, user actions, front stage actions, back stage actions, and supporting systems are listed under each step in the journey. The user actions contain actions that users perform while interacting with a service to reach their goal. The user actions in this service blueprint is mostly focused on the student, with some possibilities for the lecturer to participate. These actions will be highlighted in the explanations of each journey-step. The front stage actions can be performed by lecturers, planners or technology, and assist the user actions. The focus has been on lecturer actions in this blueprint, which are actions they

need to fulfil for the user actions to happen. The backstage actions are actions that the user doesn’t see, but that are required to support their experience. These actions are needed for the lecturers to complete the front-stage actions. The supporting systems consist of anything that must exist to support the actions and experiences above.

3.2.8 Benchmarking

Benchmarking is the act of comparing products, working methods or the like, based on given criteria or standard values, derived to achieve improvements. In this case, benchmarking will be used to look at similar, existing solutions to the future solution proposed in this thesis, to find out what other, similar solutions do, pain points, possibilities, etc. Benchmarking is a common term for all non-conformance analysis’ methods that try to compare one's own solution with the solution of competitors or other reference points. In benchmarking, one can focus on competitors in the same industry, functions in solutions that one envisioned to be well-developed, and methods, for example how others do something. The process of going through existing solutions with similar ideas leads to discussion, comparison, and gaining insight on these solutions (Tague, 2005).

To quote Nielsen: “Users spend most of their time on other solutions. This means that users prefer your solution to work the same way as all the other solutions they already know.” (Nielsen, 2000). Therefore, being inspired by other solutions helps make solutions that won’t confuse the end-users to a large extent. To put it simply, one does not need to copy competitors, but one does not need to reinvent the wheel either.

4 Results

4.1 SDI Interview Analyses

4.1.1 Student Interview Analysis Results

The data collected from interviews will be reviewed as a whole, as the former and current students' study experiences and knowledge based on taught material is close to being identical. Their statements are interpreted as showing to a large extent something they themselves think about as important. The emerged themes within the nodes, called codes from the analysis, will be interpreted in this section. The themes that emerged have been called 'Amount of School Work', 'Current Knowledge', 'Previous Knowledge', 'Description of Experiences with Reflection/Journals', 'Description of Thoughts on Sustainability', and 'Learning Preferences'. These groups are existing for both Current and Former students' Nvivo analysis. The former students have an additional group, 'Residual Group for Irrelevant Notes', as they brought forward more information on their current working lives and situations, which does not hold any necessary information, that could potentially answer the research question. Therefore, they have been placed in this group, which works as a 'parking lot' for less relevant notes. Each of these themes contains quotes from the interviews. Where it is necessary to nuance the interpretations, it has also supplemented what appears in the research review with other relevant literature.

4.1.1.1 Amount of School Work

What characterises this topic is the students' expressions around school work, their preferences and amount of time they spend on school. In the interview guide, there were a few questions devoted to this topic. The questions read as follows: 'How much time do/did you spend on school in a week?', and 'How big does/did the amount of study feel so far? Explain.'. The topic is about how much and why the informants believe they could have more school, or why they feel they already have enough. The informants agree on several points, that the amount feels right as it is now, but some could have handled more. They generally call for a more even spread of workload throughout the semester, while some prefer having full control of their time spent on school work. This topic is described in more detail using a total of two subsections.

1) Specific time spent

Everyone spends less than 37.5 hours on school per week, in general. As the students expressed, both former and current, they spend around 20-30 hours on school per week, with a higher average around the end of the semester. All in all, the amount varies based on what time in the semester it is. The beginning of the semesters are usually slow, and the pace picks itself up towards the end, which is when they are more busy. As a former student expressed; "the amount varied from start to end of semester". So at the end of each semester, they feel like it goes above that amount. This is in correlation with their courses, which usually have one, large scale compulsory delivery at the end of the semester. More on this will be presented further down. Some are good at planning their school days, but most do a lot at the end.

2) Preferences/Thoughts

Most of the former students express that the amount of study felt balanced, and they had no interest in having a lot more to do, as it allowed them to have jobs on the side, plan their days, and investigate each task and delivery deeply. They said that "all in all it was nice",and that the "amount felt good as it was below average". But, some struggled to spread out the work, as they expressed "it was what you make it yourself", that it was "hard to control", "not a steady workload", and that they "could have spread out work more". Then on the other side of the spectrum, the well-planned former students that managed to spread out their work expressed that they "could have handled more school", in the form of block courses. These former students also experienced a shift in study points, where courses went from 10 to 7.5 points, which indicates that these courses also had to adjust the degree of difficulty. But, none of the courses adjusted for this, and it resulted in some courses taking up more time and being more difficult than the students could handle:

> **Former Student 3:** *"When we studied, I remember that they changed the study layout, where it went from 3 subjects with 10 points to 4 with 7.5 points. And then I remember that we experienced that they (subject managers) were unable to regulate the amount properly in the subject. It felt like 4 subjects with 10 marks instead of 7.5. Then I remember that semester was a bit much workload, but apart from that the workload was perfectly fine, maybe a little bit since we only needed to work 20 hours a week on average."*
>
> Extracted from former student interview 3.

The current students supplement the former students who preferred the amount of school work that exists now, as they expressed that "the study amount is fine" and that the "study amount is right, not too much, but can't be more".

4.1.1.2 Current Knowledge

The topic of current knowledge revolves around what the former students are currently doing, as this reflects their knowledge on the topics to come, and the current students' comments on what they have learned about design and sustainability in their ongoing studies. In the interview guide, there was a question devoted to this topic. The question read as follows: 'What are you doing now?'. This topic is described in detail using a total of two subsections.

1) Current design-related situation

The former students are all currently in the midst of either learning or working on design-related domains. Four of the former students are writing their master thesis in Human-Computer Design, Industrial Design or Media UX, and have therefore built upon their design-knowledge base, which was developed during their bachelor studies at NTNU Gjøvik, by continuing their degree. The remaining former students are actively working within the design domain, either as consultants or UX designers. This information is included in the analysis, as their current situations might have an impact on the knowledge they bring in upcoming topics.

One current student mentioned they were writing their thesis on a sustainability related topic, which can also affect their knowledge base on the interview topic on sustainability, and how they henceforth answer the questions.

2) Residual Knowledge on Sustainability (current students)

The current students could not provide information on design-related current work and/or additional studies, as they were doing neither, but instead provided information and comments on what they have learned through their studies so far. They bring forward more information on what they have learned in upcoming topics, in the form of thought and opinions. These were categorised by themselves, as they are in the form of knowledge statements. The current students expressed that they had learned "web coding can be sustainable", that "web design is formats for mobile and laptop", it's "related to sustainable knowledge on servers, electricity, file size, etc.". As these expressions were answers to what they knew on design and sustainability, based on what was taught in their studies, this displays a lack of knowledge on the topic of sustainability. These answers display the need for more sustainability focused teaching.

4.1.1.3 Previous Knowledge

What characterises this topic is the students' previous knowledge, in the sense of what former students have studied in the past, and all of the students' previous design-related jobs/studies/experiences. In the interview guide, there were a few questions devoted to this topic. The questions read as follows: 'What is your educational background', and 'Do you have other skills and/or experiences related to design?'. This topic is important for the same reasons as the previous one, which is because their previous knowledge and experiences with design and their education form and affect their answers in the interviews. Looking for similarities in their previous knowledge base, will make their statements in the interviews being based on more of the same information base. This topic is not divided into subgroups, as the information all goes under the same theme.

Amongst the former students, 3 have a bachelor degree in graphic design, 2 have a bachelor in interaction design and 1 student took a bachelor in web development. None of the students have previously taken any design related studies, and none have experience with design before starting their studies. After starting their studies, the former students took on part-time jobs while studying, which were either summer jobs as consultants and developers, or performing smaller freelance jobs for family members.

As for the current students, both students are in their last year of study. They have no previous design experience, but had some knowledge on sustainability from high school studies.

4.1.1.4 Description of Experiences with Reflection/Journals

What characterises this topic is the students' experience with reflective work and journaling in their bachelor studies, and their preferences within this topic. In the interview guide, there were a few questions devoted to this topic. The questions read as follows: 'Have you come across reflection work/diary writing in studies before, in the form of reflection on the study, subject or your own work?', and 'What about journaling?'. This topic revolves around the reflective work and journaling they have encountered, as well as their opinion on what they had encountered. Former students were asked to focus their answers based on their previous bachelor study only. This topic is described in more detail using a total of two subsections.

1) Reflective Work

Most of the students started their answers by not remembering any specific reflection involved in their deliveries and overall schooling. After giving it some thought, some answers arose, such as reference groups, and reflection on group assignments. As for

reference groups, the students expressed: we "reflected about courses in reference groups", "I've heard of reference groups, but I don't know much about it" and we "reflected about courses in reference groups". One student who took part in a reference group said that "reference groups did not have much reflection", which is true, as reference groups revolve around giving feedback to a course-lecturer, and not reflecting with them. The reflection will usually take part amongst the students, to figure out what information/requests to bring to the lecturer.

Another form of reflection some students could think of, was giving feedback on courses when they were completed (end of semester). They would either receive "mails on reflection for courses when semester was over", "reflected on tasks after delivery and sent it to teacher", or "they had reflections around class and courses".

Some students have encountered reflection as part of a delivery, and it has usually revolved around group work and how it was working with other individuals. The students mentioned:

> **Former Student 2:** *"We had a subject where we wrote reflective things in relation to group work and how it went. Nothing else I can remember. A big note at the end of the project. How it went etc."*
>
> Extracted from former student interview 3.

> **Current Student 1:** *"We have had that as an exam form several times, to write a reflection note. Or it is usually two-part, where one part is in a way the group work, and the solution we arrived at, and the other is a reflection note, about how it has been and how we have contributed, etc. About the project itself."*
>
> Extracted from current student interview 1.

> **Current Student 2:** *"(...) we write a report and must reflect on what we have learned and what we could do better, but not so much of that. We may have had some exams, maybe two, I think, which consisted of writing a report and yes, that is part of the assessment then, the reflection part."*
>
> Extracted from current student interview 2.

These quotes show that the reflection students encounter in their studies evolved around working in groups, what they contributed with, and the like. It is apparent that there has been little to no reflection related to theory, both physically at school and in reports/deliveries. If there has been any reflection related to theory, either written or physical, it has not been done apparent enough for the students to take notice of it. According to Dyment & O'Connell (2011), reflection is an important practice for students to engage in, as it grows their learning experience, and helps them make sense of theory (Dyment & O'Connell, 2011). The skill of reflection is, as seen in these interview statements, highly undervalued at NTNU.

2) Journaling

All of the students have encountered journaling/diary writing, either when working during a semester, where they write what they have done each day, or in the form of a process diary, to keep track of sketches and each step towards an end result in a design related delivery.

Considering the journaling during a semester with practical deployment work, the students that encountered this mentioned that they "did not write weekly even when

supposed to, and it was compulsory". They "did not find it motivating, but understood why they did it" and "did not reflect much, only wrote what you did, no one checked during". Some expressed it "felt weird to write all day and put things on hold during deployment". All statements related to journaling during deployment holds a tone of irritation, and expressions of not being motivated to write. Lecturers did not check up on the journal-writing during the deployment, even if it was compulsory, which resulted in some students not writing entries during the deployment, and faked these entries when delivering the journal at the end of the semester.

Most students had come across process diaries, as this is a common part of reports in design projects/deliveries at NTNU. In this topic, diaries will be seen as the same as journals, as the concept for both include frequent entries. The main difference is that a diary is about what you have done, similar to a log, and a journal includes more thoughts, ideas and reflections. As the students express there being no reflection, and only a focus on writing about what you have done, these will be called diaries. The reflection, on the other hand, would happen in the report when they had finished their process, and the diary helped them remember their choices. When referencing to the effects a process diary had;

> **Former Student 1:** *"… Then we were able to reflect on the process and become aware of the choices we made."*
>
> Extracted from former student interview 1.

No one expressed that they liked the diaries during, but after, they thought it was a good reference tool when writing their last task, which was usually based on those diaries:

> **Former Student 4:** *"I liked having a process. I remember we learned a lot that we should save everything from the process as it were. But I think it was quite unusual at the start because there are ugly sketches. So I liked that we had it at the end, actually, because it helps to remember how you arrived at your solution then."*
>
> Extracted from former student interview 4.

To summarise, there is no push to reflect on theory and thoughts in process diaries and journals during deployment work, but the students will be able to reflect, if they wish, on their own choices, in deliveries afterwards.

4.1.1.5 Description of Thoughts on Sustainability

What characterises this topic is the students' knowledge, thoughts and statements about sustainability, both as a concept or related to design. In the interview guide, there were questions devoted to this topic. The questions read as follows: 'What do you know about sustainability?', 'What do you know about sustainability in design?', 'Do you know more now than when you started your studies?', 'Do you want to learn more about sustainability in design?', 'Did you feel ready for working life, and that you could implement sustainability in what you will create?' and 'Has a lot of sustainability/ sustainability focus been implemented in your workplace?'. The topic is about how much knowledge and why they have knowledge on sustainability and design. They also express their feelings on NTNU's use of the UN Sustainability Goals, as well as the former students' knowledge on sustainability at their current work-station. The informants agree on several points, that they don't feel ready for working life, and that they would like to

learn more. They generally call for more knowledge, and a more widened theory-base. This topic is described in more detail using a total of 5 subsections.

1) Previous Knowledge

When asked about what they know of sustainability in general, everyone thinks of food, recycling, thinking of the future, fast fashion, etc. As some students mention: "first thoughts is nature and taking care of it", "recycling and reuse", "sustainability is thinking of the future", "it is viable, friendliness, climate, etc.", and "it is fast fashion, food and meat related". Summed up, their first thoughts on the topic are related to the climate, and the ways the public pushes on them in their everyday lives. No one mentioned sustainability in other relations, as in social innovation, etc., or for design/web relation. They were not told to ignore what we previously talked about.

2) Quality of Knowledge

When asked about their knowledge on sustainability in relation to design, everyone reacted with being unsure at first. Some needed time to think, or some nodded to what the question might entail. The only hints given was to think of the three pillars of sustainability. Most answers related to web coding, in correlation to file sizes, image sizes, colours, typography, and all in all how to save space considering files and servers.

> **Current Student 2:** *"(...) to minimise file use, not to have any images, not to have any videos in your design at all (...). To save resources. There is also a lot you can do if you absolutely must have pictures, with those pictures, such as considering which format, which size of the pictures, things like that. (...). There is a lot you can do then, which includes sustainability. Same with typography, maybe don't use external fonts. Yes, and even colours and, it is proven that anabolic screens, so dark colours are best, to save energy. (...). Make your solution more efficient, and also save energy, in the form of electricity."*
>
> Extracted from current student interview 2.

Otherwise, the answers were about working on a task connected to a sustainable mission, such as an application for a sustainable organisation, or a website for one of the UNs sustainability goals. These answers mirror the fact that they have sustainability related topics/businesses to design for, but that they do not learn how to include sustainability in these deliveries (except from web coding related theory, as shown in the quote above).

Everyone said they knew more now about sustainability than before they started their education, but that they didn't think that was through their studies. As some student mentioned: "I can do more than before the study, but that is not the merit of the study, it is the merit of the summer job. Own learning, more than anything else", "very little learned from school, mostly learned from personal learning" and "only learned about sustainability externally". They feel like what they learned, they could have thought of themselves, and that everything else they know, they learned in their everyday lives. The students that mentioned this, were very adamant to highlight it.

3) Preparation Level

Everyone was eager to learn more, and showed interest in learning new aspects. Some more than others, but most were very eager, as they have noticed the big focus on this in society and work. It was mentioned by a former student that "there is a big focus on sustainability at work, so I would like to know a lot more". This indicates the need to prepare the students for working-life with more knowledge on sustainability. Other students express that they "would like to learn more to prepare for working life", "...because designers can have an impact", and "as it is wise to have knowledge, for the world and for yourself". The last students' quote hints to being aware of having sustainability knowledge can help one get a job.

Nobody expressed that they feel/felt ready for work life, considering implementing sustainability in aspects of their future working life. Those who only wanted to learn some more, changed their answer to wanting to learn a lot more, based on this question, which took all participants a bit by surprise. The common responses were similar to this:

> **Current Student 1:** *"No, no way. I had not felt ready... I am at a loss. How am I supposed to do that? That is an overwhelming task. Yeah, okay maybe we should have more on sustainability then."*
>
> Extracted from current student interview 1.

There has also further been confirmed that there is a lack of theory and knowledge on sustainability in design, as students mention that they "can't remember learning anything theoretical during bachelor", "can't remember focus on it in physical and tactile prototyping", "not learning anything concrete", "not learned anything other than universal design", " only remember mention of storage and redundancy", and so on. This indicates that there is not enough being taught, and/or that the topic is not given enough attention, so the students prioritise remembering it.

4) UN's Goals

All who have had UNs goals in their studies, felt that it was thrown onto their tasks. They do not feel like they truly learn about what the goals consist of, and how to implement them in their tasks. They are just asked to implement them, but it makes them feel like it is just something the teachers have to implement, with no true interest in doing so.

> **Current Student 2:** *"Regarding the UN's sustainability goals, it feels very rushed. It is up to us to find the connection between what we do and the goals. So it can be difficult, and not everyone feels relevant to design and coding like that straight away. That is the goal of climate action, in any case, there are things we can do. But considering the others, I haven't seen the link. There is no theory and nothing about how these can be angled into what we do."*
>
> Extracted from current student interview 2.

5) Sustainability at Work

For those who have experienced working-life as a designer or consultant, some sustainability is implemented everywhere. It can range from the workplace (food, sorting, etc.), and/or writing sustainability reports after each project. Some organisations write these reports about themselves, some deliver them to their clients after a completed project. Based on this statement:

> **Former Student 4:** *"All companies now focus a lot on sustainability, and they want to appear sustainable to all their customers. (…) It has been implemented through what the customer wants, and that the company would seem sustainable, in itself (...). …like a sustainability report, to appear more and more sustainable every year."*
>
> Extracted from former student interview 4.

…it seems businesses tend to want to seem sustainable to the customer. And some see a heightened interest from customers, to have sustainability in high-focus in projects for them. These statements on the importance of sustainability at work as designers, underline the need for this thesis topic, which entails implementing more sustainability in studies, so that the future workforce employees can implement it in future projects.

4.1.1.6 Learning Preferences

On the topic of groups or individual work, the students expressed; "I prefer groups because of creativity, but nice with some individual work", "I prefer groups with design studies", "I like group work with a hybrid of individual and group activities", "I liked groups if you could work with people you work well with". So almost every student prefers groups, but only if they have a hand in putting them together, as most students have such different work-morals. As mentioned in the quotes, they all like working alone too, but that is either as a part of group work (dividing the work), or when it comes to personal tasks, such as writing essays. But even then, people tend to like feedback from others, as they get lost in their own work and don't spot mistakes. One student finds groups challenging, and would therefore prefer working individually at all times, but they are used to working in groups and can therefore still make it work.

The students were also asked about their preferences within optional assignments. This varies greatly, and the share is around 60/40, where the majority of the students don't do these assignments. Amongst the 40, most of them tend to only do very few tasks, and only the ones that they feel would really benefit them, or is about something they are struggling to learn in a course. Only one student said they do them all, and only put it aside when they are extremely pressed for time. For the students that did not do them, it was either because they needed "pressure and motivation", or just because they had no interest in them, but "liked that they were available".

For compulsory assignments, it was not asked if they were completed or not, as all compulsory tasks need to be done to pass a course. So the students were asked what kind of compulsory assignment they were the most fond of. Everyone prefers one or two big tasks in a course. Even if it makes their work load differ a lot, they prefer it that way, because of reasons mentioned earlier. Only a few specific courses have been mentioned where small, frequent tasks are preferred, which was Service Design, and when learning basic HTML and CSS, such as the Web Coding course. These courses contained "a forced process with smaller tasks that keeps you on track". They mentioned that these are very much connected to the course goals. The methods used in these courses felt efficient and motivating for these students. But all in all, bigger, fewer tasks is the preferred method, as even the forced processes with smaller tasks lead up to one big delivery at the end of the semester.

4.1.2 Lecturer Interview Analysis Results

The themes that emerged have been called ‘Background’, ‘Curriculum’, ‘Description of Reflection/Journal Use’, ‘Knowledge on Sustainability Within Own Curriculum’, and ‘Types of Teaching’. These groups can draw some similarities to the groups for students, as their interview guide questions were somewhat similar/based off of eachother (table 3.2). This also helps the author be able to draw conclusions for lecturers and students on the same themes in the coherent analysis below.

4.1.2.1 Background

What characterises this topic is the lecturers’ background, related to studies, work and experience in general. In the interview guide, there were a few questions devoted to this topic. The questions read as follows: ‘What is your educational and teaching background?’, and ‘Do you have other skills and/or experience related to design?. The informants answer similarly on several points, such as having many years of experience within the field, and being highly active within their department.

Two of the lecturers teach and work under the ID, while the last lecturer delivers one course under the department, but belongs to another. The common factor is that they all hold obligatory classes for bachelor students under the same department, which is available at NTNU Gjøvik. All of the lecturers have an extensive educational background and they are all well-adjusted into the lecturers positions through many years of experience in academia. The previous educational backgrounds vary from “bachelor in design, master in design and digital media” to “Phds taken in Czech Republic”. Lecturer 1 mentioned having taken courses and certificates within topics like print, typography and pedagogy, to specialise their knowledge. Lecturer 2 has previously been a program leader for BIXD, while lecturer 1 currently holds that position for BMED. The courses they teach vary, from physical to tactical related topics within design.

4.1.2.2 Curriculum

This topic displays what the lecturers mention that they have in their curriculum, which here mostly revolves around sustainability. This topic will therefore mirror what the lecturers think the students know, if they have paid attention at a normal level. It is actually proven that a student’s attention span lays at around 10 to 15 minutes (Beech, 2021), while lectures at NTNU usually lasts for 45 minutes or longer, with 10-15 minute long breaks. A student’s attention span can also vary because of factors such as mood, motivation and personal feel of relevance to what is being taught (Beech, 2021).

Considering that the students pay attention at a normal level, the lectures were as mentioned asked questions on their curriculum. There were a few questions devoted to this topic in the interview guide, which was: ‘What do you teach, within design bachelor's studies?’, ‘What tasks does your role entail in the design bachelor's degree?’, and ‘Where would you say there is room to implement more in your curriculum?’. All lecturers presume that they implement sustainability in their teachings, and explain how they actively do it in today’s lectures.

As lecturer 2 explains, all lecturers were “asked by leaders to include sustainability, and they do their best to do it correctly”. Two of the lecturers express that they teach sustainability at a large amount, and that they “start with a few of the UN goals, on materials, etc., in the first half of the semester”, and “tries to start soft and use frameworks, such as UN’s goals”, as well as “interpreting sustainability themselves, and trying to include it considering study level”. Lecturer 1 explains that they “teach several perspectives of physical production of physical products”, but that there is “room to

implement more in the digital aspects of design". Lecturer 1 is therefore the only informant that answers the question somewhat correctly, by informing that there are possibilities to include more topics within sustainability in their courses. A good note on how sustainability can be included, would be to "conceptualise the topic where appropriate, and make students aware when being taught about sustainability".

Answers to the last question were somewhat avoided, as they answered with what they already do (as seen in quotes above), instead of answering if there is room for more topics in their curriculum. This can be due to misunderstandings, or an opinion that what they already do works so well that nothing new/more needs to be included. Lecturer 1 was the only informant who reflected to some extent on space in the curriculum. All lecturers also answered with a focus on sustainability, without being asked specifically to do so. No sustainability had been mentioned yet by the interviewer (author), and it was explained before the interview that sustainability would be included in the last half of the interview. The answers have brought important information, but it is necessary to mention that the question was not answered directly.

4.1.2.3 Description of Reflection/Journal Use

What characterises this topic is the lecturers' use of reflection and/or journaling in the courses they teach. In the interview guide, there was a question devoted to this topic. The questions read as follows: 'In which cases have you come across reflection work/diary writing in studies before, in the form of reflection on the study, subjects or your own work?'. The topic is about how much they include reflection in tasks and/or in correlation with a course, and why they use it. The informants have all come across reflection, either by using it themselves or hearing co-workers' experiences. They generally mention that it is beneficial.

The reflections are usually involved in the grading process, as it is included in final reports for bigger projects. Lecturer 1 "use it to make people responsible in groups, and to familiarise them with goals", which is a statement that fits the ones students mentioned, and "would like to use it more, and plans on including it in their Information Architecture course". Lecturer 2 also use it:

> **Lecturer 2:** "*We have used a series of reflection notes that end up in a larger reflection note. The students must go through this design framework in my subject, and they must then reflect. (...) There, the students will reflect a bit on both what they have done in that phase of the project, which may be about insight, and how they have used the theoretical terms in that phase, which includes sustainability. So they will probably write a little along the way, but at least at the very end, about sustainability."*
>
> Extracted from lecturer interview 2.

This lecturer then includes sustainability reflection as part of grading, as it is included in the final report of a project delivery.

4.1.2.4 Knowledge on Sustainability Within Own Curriculum

This topic focuses on the lecturers' saying around knowledge on sustainability in correlation with their courses. In the interview guide, there was one question devoted to this topic: 'What knowledge do you have about sustainability within what you teach?'. The topic is about what they are currently focusing on and trying to improve within sustainability in their courses.

Lecturer 2 mentioned that they "added some sustainability in BIXD study goals when they were program leaders, as change can happen by pushing the topic on everyone's curriculum. Lecturer 1 also works on this level, as their "goal as a program leader is to find defined facts for plans (that course lecturers can use), which is a work in progress". Questions arise, such as "how can small changes in typography make a change", and how difficult it is to understand sustainability as a course lecturer. Sustainability is a large term, and as well as "students needing structure and direction", lecturers need this as well. They "work on the UN goals, but it is challenging as they are broad". These quotes highlight the need for better lecturer education and clearer answers as to how they can implement sustainability in an effective way. They too, as well as students, need to learn more on the topic of sustainability to be able to deliver a well functioning curriculum, with this included.

4.1.2.5 Types of Teaching

What characterises this topic is the lecturers' methods of teaching, thoughts and experiences with giving out optional tasks, as well as their preferences within compulsory assignments. In the interview guide, there were a few questions devoted to this topic. The questions read as follows: 'What type of teaching/assessment forms do you have?', 'What is your opinion and your relationship with optional study assignments?', and 'What is your opinion and your relationship with compulsory study assignments?'. The topic is about what methods of teaching and assignments they use, how much they include optional tasks, their thoughts and experiences around students doing them, as well as their preference for compulsory assignments. The lecturers all use various types of teaching methods, and they all prefer the same type of compulsory assignment. As for optional tasks, all lecturers feel the majority of students do not complete them. This topic is described in more detail using a total of three subsections.

1) Teaching methods

The lecturers from the interviews all vary their ways of teaching, and bring variation into the students' study-life. (teori, hvordan variasjon hjelper). They perform lectures, seminars, guidance sessions, workshops and excursions, and deliveries in the forms of projects, reports, exams, etc., depending on the course.

2) Optional tasks

All of the lecturers felt the same about optional tasks, which was that "optional tasks are only done by a few students, and mostly only when it feels relevant and motivational for the student". Lecturer 3 mentioned that "optional tasks are mostly not done as mandatory deliveries are their first priority". A small number of students do all the work that is given to them, but the majority prioritise compulsory assignments.

3) Compulsory assignments

The lecturers have tried many ways of teaching and types of deliveries, and they have all landed on one big task, with delivery date at the end of the semester, to be most efficient. As Lecturer 1 mentions, "one big task gives the students freedom". And, that it is "hard to adapt to other subjects' deliveries, which might overlap and students then tend to struggle to do smaller tasks". Based on their previous trials and feedback from students, one big delivery/project is then chosen over many smaller ones.

These interpretations will be based on the step-by-step deductive inductive method. The themes will be interpreted in the order they were mentioned in the SDI analysis, and a comparison of student and lecturer statements will be drawn.
The first conclusion that can be drawn based on the SDI analysis, is that all of the students spend less than average hours per week on school. Some don't want more, but they are mainly speaking on deliveries and assessments. If more classes were set up, they would have time to attend. When it comes to deliveries, both lecturers and students prefer one large task over many smaller ones. From the lecturer's perspective, this is because it's a bigger chance of deliveries crashing with other subjects', and students have expressed to them that they prefer it that way. Students confirmed this in their interviews, by saying the bigger, less frequent tasks make it possible to work on the side, etc.

4.1.3 Interpretation of Findings

All of the interviewed students have either finished a bachelor or are in their last year of study. So design and HE is not new to any of them. When asked about their knowledge level within sustainability, there should therefore have been a higher quantity of theory-based statements mentioned. The students only knew of some web coding related topics, otherwise their knowledge was based on personal experience, and not school. Otherwise, students don't remember much of what is learned. But, lecturers expressed that they teach a good amount on sustainability. These answers do not correlate, which signifies that there is not enough attention given to the topic, so the students don't (prioritise) remember it. If the topic is given more clear, concrete attention, it might have been remembered more in correlation with how much the lecturers claim to teach. Universal design is for instance a large part of graphic- and interaction design, but it is never/rarely mentioned that universal design is a type of sustainability. Designing for more/all people, with focus on high quality, is good for the environment, society and economy in the long run. If sustainability was mentioned frequently with this topic, more would have mentioned it in the interviews.

One lecturer did mention a wish for adding more sustainability in their courses, but found it difficult to know how, and find time to understand and include it on their own time and knowledge base. More mentioned this last part, of finding it difficult to plan and understand the UN goals enough to include them more. This has resulted in the students feeling the goals are added as a last-thought, and not in correlation with theory and instructions. Both lecturers and students have therefore expressed frustration around the UN goals, but also identify that it is helpful to have a framework to follow.

When it comes to assessments and deliveries, most students don't do optional tasks, and lecturers confirmed this by saying few do the optional study assignments they hand out. Otherwise, as mentioned, both parties like the compulsory, large assessments which are less frequent. Most students also preferred to work in groups, if they have a hand in putting them together. Both in groups, and sometimes depending on the assignment, they selectively prefer to work individually. This could be in groups when conducting smaller tasks within a large delivery, or if the assignment is purely writing something. Groups work best when it connects to creative work, as there needs to be ideation and feedback in these processes.

The only reflection of importance that was mentioned by students, were reflections on group dynamics and how work was divided. Lecturers also confirmed using this type of reflection. Otherwise the student could not recollect reflecting in connection to deliveries (only after, or reference groups). A lecturer mentioned having theory-based

reflection as a compulsory point in one of their courses, where the reflection has to include sustainability related topics. No student mentioned this, even though they have taken the course. This might be because they don't remember, it not being apparent enough, or it being included in the course within the previous year (2022-2023).

Some have encountered journals while deployed, but all expressed annoyance around it, and that they did not write entries as frequently as they should have. If they did, it broke their workflow. Otherwise, all had encountered process diaries, and liked using these for later reports, to help with recollection. But, no reflection was expected in the diary, nor was the diary checked during. So the students have encountered frequent entries into a log in their schooling, but no reflection and theory in correlation with these. All students expressed a wish to learn more, and not feeling ready to work, while including sustainability in all possible aspects. Therefore, a need for this thesis and its topic is discovered. As the need has been identified, all interpreted data from the SDI analysis will be seen as valid, and will be used in upcoming interpretations and conclusions.

4.2 Workshops

4.2.1 Thematic Analysis Results

This section aims to derive meaning from workshops through thematic analysing. Further elaboration on findings is explained in the categories below, which are based on the three main tasks in the workshops.

1) Categorising and Naming

A large amount of notes were gathered in the workshops, filled with ideas. The grouping and naming of the notes helped organise and make sense of the qualitative data that was collected. At that stage, it was possible to see themes within the data, which were defined by the participants themselves, who are also the end users. The students, who grouped their own cards into 4 themes, named them:

1. Engagement
2. Implementing
3. Lectures/Teaching
4. Deliveries
5. (Parking Lot)

The contents of these categories were decided by the students in a forced process, by grouping based on the first patterns they saw. The contents of the categories are explained based on the vocal expressions and themes that emerged during the workshop.

Engagement
NTNU can have their own sustainability podcast
Could be presented in a podcast (2 votes)
Design x sustainability week! One week where the entire institute focus on sustainability in design
Sustainability month á la Pink Ribbon (aim the focus)

Table 4.1: Student Workshop 'Engagement' Notes

These suggestions reflect around the possible solutions that entail something "outside of the box". These answers help engage students in new ways that the students in the workshop have not experienced in a school-setting before. Therefore, all participants expressed extra excitement around this category, by mentioning that these suggestions seemed more new and unique than the suggestions revolving around what they are familiar with.

Implementing
More/better teaching in the different types of sustainability in a design-setting
Invest in the campus-area with room for expanding
Better recycling at school
Timeless design; what lasts and what must be redesigned after 3 years?
Sustainability website where you can check your project
Learn more about materials for example packaging
More concrete examples on how sustainability-goals have effected design so we have something to build on
Show the effects sustainable design can have/have had
Posters which easily explains the types of sustainability and how to solve it with design
More design-aimed focus on sustainability
Conscious purchases of materials and tools (with a declaration) -> sticker/stamp?
Tips on how to work sustainability in f.ex. the workshop (climate)

Table 4.2: Student Workshop 'Implementing' Notes

This category includes suggestions on the topic of implementing sustainability into different aspects of their learning. As suggested, this could be done by adding to the curriculum, getting concrete examples as to how to add sustainability in deliveries, posters with information, and all in all topics they would like to learn more about. The students want clearer guidelines and concrete examples as to how they can implement sustainability in school.

Lectures/Teachings
A lecture during the semester, not connected to a course. Obligatory
Classes already from the first year of study, like a basis class on and around design
Intro class in all courses with a Kahoot in the end
Classes which explain the types of sustainability-measures in each course
Learn about how sustainability works digitally
Add more digital classes so that people don't have to travel far
Webinar - customised to each course

Generally more opportunities for adaptation in classes/teaching
Classes that specifically is aimed towards sustainability in design
Learn about relevant issues within sustainability
More concrete teaching around how sustainability works in correlation to digital design
Sustainability analysis as its own course -> be able to evaluate ourselves
Guest-lecturers who speak on relevant materials, and what is more and less sustainable
Alternative teaching-methods to books
Could be smart to have a couple of classes which focuses on sustainability only, in correlation to study
Workshops on the topic

Table 4.3: Student Workshop ‘Lectures/Teachings’ Notes

This category revolved around suggestions about the students’ ideas on classes and lectures. A common theme here is having sustainability related classes, where that is the only topic that is being tackled. Also, a call for learning about sustainability related to digital aspects and design is apparent. Guest-lecturers and workshops are also included here, which could be a part of their classes. The highest quantity of notes were in this category, which could signify this being where the students focus most of their thoughts and wishes.

Deliveries
Ex-Phil (integrated part) task?
Have a delivery where we solve a sustainability issue
Have clear requirements on reflection around sustainability in deliveries
Students have to be more engaged in working sustainably through setting demands in projects/deliveries
Check-list for all courses/deliveries before/after

Table 4.4: Student Workshop ‘Engagement’ Notes

The suggestions in this category vary some compared to the other categories. Though, three of the notes express a common wish for more clear demands in deliveries, for example in the form of a check-list or requirements. The remaining two notes are more adapted towards having purely sustainability-related deliveries. This category adds to the lecture topic, as the contents can intersect and correlate, as well as the fact that these categories started out as one in the workshop. Because of its size, the students asked for permission to split them, which resulted in ‘Lectures/Teachings’ and ‘Deliveries’.

Parking Lot
Own initiative to explore/research and learn about different solutions

Table 4.5: Student Workshop 'Parking Lot’ Notes

The parkinglot note did not fit into the other categories, and revolved around students learning and exploring the topic of sustainability in their own time. This is a step they can take based on their own interest, and is not related to what could be included in a solution.

As for the lecturers, where the groups and themes were developed by the author, 3 groups were made. The names are:

1. Building Knowledge
2. Lectures/Teaching Strategies
3. Assignment Related
4. (Parking Lot)

The notes and suggestions made by the lecturers had a more spread-out topic selection. And, as the author was the categorizer, and the categories did not come naturally from the workshop lecturer-participants, these categories need to be looked at with a less of a critical eye. The categories become biassed, and based on the opinion of one person. The next steps, dot voting and forced ranking, will therefore lay the premise for the results, and here, the notes in themselves will be explained and analysed (not the categories). The categories that the author created were first made based on first-seen patterns, and then adapted and named based on the results from the students workshop, so that the categories could somewhat be compared thematically. But, as the themes are not naturally identical, and the lecturers have more nuanced notes, some notes landed in the middle of categories. Those suggestions will be mentioned in between the categories they belong to.

Building Knowledge
Invited talks of experts showing how change can have an effect in specific domains
Bring in external lecturers, etc.
Students need a lot of things to be able to reflect: facts, other people's opinions, tools for reflection
Finding ways of focusing on different types of sustainability (often people/students think merely recycling - at least before obtaining more knowledge)
Lecturers: Obtain more knowledge about sustainability in a broader perspective
More knowledge amongst lecturers = better ability to teach the topic
Ethics: Who should change society?
Reading list (given by us educators)
Introduce some kind of "sustainability licence" that the students could work during the year to achieve (in the end of semester)
Read up on the sustainable goals
Be a part of "Nature and Youth"/"Future in our hands", etc.
Create awareness around the legal framework for sustainability in society
Creative awareness around responsibility at an individual and community-level
Create awareness around interest-conflicts for sustainable needs

Whip: What will happen if we are not sustainable?
Carrot: What will benefit from us being sustainable?
Is sustainability profitable?
How can we change society?

Table 4.6: Lecturer Workshop 'Building Knowledge' Notes

Many of the teachers made notes that belonged together, and that were quick expressions on the theme/related to the scenario. They mentioned that they wanted to get all their opinions and thoughts on the notes as well, even if the notes did not directly answer the scenario question they were supposed to answer. Most of these answers were placed in this category, which revolved around how to build more knowledge and questions that could be asked in situations where knowledge is built. Here, the topic of lecturers building their knowledge is brought up in several notes, and also ideas for more learning, such as external lecturers, talks, reading lists, awareness ideas, etc. The most common theme here is lecturers building their knowledge base, which correlates with the students' thoughts on learning more as well.

In between
Toolkits for visualising supply chains impact on environment. Visualisation of design choices and impact
To articulate opinions is sometimes difficult, so students need tools and a vocabulary. Also, it is important to consider when reflection should be done 'in private space' and 'in groups'. Important to not only give room for politically correct views

Table 4.7: Lecturer Workshop 'in between' Notes

The suggestions/notes that landed in between the theme of knowledge and lectures revolved around tools and the like, that students could use in class, and as a learning strategy.

Lectures/Teaching Strategies
Awareness about in issue with examples, in specific courses
Act as we teach
Students: Open discussions related to given issues/possible issues/conflicts, is it a "trend"?
Identify which sustainability goals are most important: Prioritise them?
Identify 5 concrete actions that can make a difference
Teach sustainable theory and historical reasons for why it's relevant
Probably important to not only reflect over individual cases or themes or projects, but also see them in connection to each other over the course of the entire education, and beyond
Another thing which is probably relevant is the ability to reflect over one's own perspective in relation to that of others. What does respect for different views mean?
Sustainable Design is a very complex issue with trade-offs that have to be presented and discussed. Workshops in which those trade-offs are somehow experienced

For lecturers it is important to be aware of their influence. They are both role models and evaluators. So there should be room for them to share their own views, but they should also be able to objectively approach different views. They should be aware of generational differences
Discussions and reflections about different kinds of sustainability (environmental, social, economic)
Maybe we should coordinate how we teach sustainability between us to cover more ground and have a cohesive strategy?
Co-design workshops with students to create guidelines for sustainable design in specific domains (graphic, web, interaction design) or even specific use cases (wearable technology, AI, games, etc.)
I would like to do more of what I am already doing in my two courses (see pics)

Table 4.8: Lecturer Workshop 'Lectures/Teaching Strategies' Notes

Figure 4.1: Lecturer Workshop Pictures with Note

This category includes suggestions on sustainability topics that relate to teaching methods, classrooms and lectures. mentioned here is focusing more awareness on the topic on sustainability in class, which would help students notice the topic more, and methods such as workshops identifying actions, include historical aspects, discussions, individual and group activities, and the like. An important mention is also the note on lecturers coordinating what and how they all teach sustainability, and therefore cover more ground. The images above belong to a suggestion from a lecturer who would like to continue as they are doing currently, and supplied with images that describe how it is done.

In between
Students: Reflection note on how project relates to sustainability
Focus on impact on society, people, companies
Reflections becomes most interesting when they are related to dilemmas, so students could be presented dilemmas, both related to their everyday private life, related to their future profession, but also related to more general societal dilemmas

Table 4.9: Lecturer Workshop 'in between' Notes

These notes relate to both classroom strategies and assignments, and therefore landed in the middle. These topics are focused on what could be done in both categories, and also brings ideas as to what needs to be taught. Here an idea on dilemmas is presented, which brings forward an important note on not only teaching the positive side of sustainability, but bringing forward all aspects by giving students dilemmas.

Assignment Related
Students: Doing assignments with sustainability as a component
Employees: research projects related to sustainability
Working with personas can be a good way to help students see what kind of views they identify with
Check-in/check-out, different topics related to sustainability, each day working on a project = making the students more aware? (inspired by Experts in Teams (EiT))
Portfolio of examples of sustainable design that teachers could use in their courses
Some kind of "Sustainability agent" observing the students working, asking (critical) questions regarding e.g. the sustainability goals - making the students reflect upon these issues as part of a "normal" working day - not as a separate thing - (inspired by Experts in Teams (EiT))
"Sustainability critical friend" following you throughout e.g. a project making inquiries about why you do certain things, how, etc.
Evoke emotions/reactions/actions by conducting "worst case" or critical design workshops with the students early on to "rock the boat" and make them reflect, discuss and debate

Table 4.10: Lecturer Workshop 'Assignment Related' Notes

The notes in this category relate to deliveries in themselves, or aspects within them. Here, it is suggested to add sustainability into some deliveries, as a component, portfolio components, personas, etc., as well as bringing in aspects from EiT, a NTNU master-level course, which includes agents that help you, and daily/frequent check-ins when working with a task. Their notes vary in content, but they all revolve around working with deliveries to some extent.

Parking Lot
We should also be more radical in our approach to finding sustainable solutions together with our students. Maybe by finding a way to become a more sustainable department?

Table 4.11: Lecturer Workshop 'Parking Lot' Notes

This note relates to personal work, which is similar to the parkinglot note in the student workshop. This note mentioned that the department in itself, and the personal choices made at the work/school place, should be more sustainable. This is an important aspect to consider, but as this thesis focuses on more curriculum/active teaching sessions, this falls to the side of the topic.

2) Dot Voting

In the next stages of the workshops, the participants will analyse the notes, by casting votes. Here, both in the student and lecturer workshops, the participants are the analysts, and the facilitator is the observer. In other words, the author is not conducting this task for the lecturers, and this task was done in the same way for both workshops, except that lecturers completed the task remotely and the students physically. Even though the students were together, and could practically voice their thoughts and discuss the task, they were asked to be silent and complete the task alone, which all participants respected and completed as asked. This makes the conduction of the task close to identical, with only the digital and physical presence being different.

Since the facilitator was present for the student workshop, the participants could be observed and their behaviour could be analysed, in addition to their answers. As the notes were displayed on a wall, the students could clearly comprehend all the cards at once, and cast their votes. To recollect, they had 3 votes each. The students wanted to find notes that truly reflected their biggest wishes, and answers that they personally relate to. For example, if a note said "podcast on SD topics", the participants would only vote on that note if they believed they would actually listen to it. Their realistic thought process was therefore heightened at this stage, which was vocally confirmed by participants, who mentioned they were uncertain on which notes to vote on. They realised some notes they liked previously, were not something they would like in a real life setting.

As for the lecturers, it was not possible to observe and get feedback on their thought-process during this task, as they got instruction in an email, and completed the task on their own. No feedback and/or thoughts were communicated over email, even though they were given the option to. The voting seemed to otherwise go well, and all previous participants in the live workshop completed this task over email/Miro in the following week after the original workshop. No faults appeared from having to do the task remotely. It is important to mention that the notes that were voted on, were the notes that would describe a solution-idea the best. So, quantity is not seen as a sign of agreement here.

Students:

One vote
More concrete teaching around how sustainability works in correlation to digital products
Webinar - customised to each course
More design-aimed focus on sustainability
Conscious purchases of materials and tools (with a declaration) -> sticker/stamp?
Timeless design; what lasts and what must be redesigned after 3 years?
More/better teaching in the different types of sustainability in a design-setting
Guest-lecturers who speak on relevant materials, and what is more and less sustainable

Two votes
Posters which easily explains the types of sustainability and how to solve it with design
Could be presented in a podcast

Three votes
Check-list for all courses/ deliveries before/after
Learn about how sustainability works digitally

Four votes
Sustainability month á la Pink Ribbon (aim the focus)

Table 4.12: Students' votes on notes

The voted-on notes can be seen in the category explanations above as well. 12 notes were voted on in total. Their answers were spread out, and 7 out of 12 notes got one vote, which signifies the participants not being completely on the same wavelength, as to what they would like/prefer. But some notes got 2-4 votes, which signifies more agreements. The votes, when looked at all together, show an interest in new ways of learning (podcasts, webinars, sustainability month, etc.), wanting clear guidelines (posters, check-lists) and more concrete theory (with a digital focus). The checklist, learning about digital sustainability and sustainability month were the notes with the most votes, and therefore the ideas/suggestions that most participants liked and agreed on.

Lecturers:

One vote
Invited talks of experts showing how changes can have an effect in specific domains
I would like to do more of what I am already doing in my two courses (see pics)
Another thing which is probably relevant is the ability to reflect over one's own perspective in relation to that of others. What does respect for different views mean?
Probably important to not only reflect over individual cases or themes or projects, but also see them in connection to each other over the course of the entire education, and beyond

Two votes
More knowledge amongst lecturers = better ability to teach the topic
Maybe we should coordinate how we teach sustainability between us to cover more ground and have a cohesive strategy?
Identify 5 concrete actions that can make a difference
Reflections becomes most interesting when they are related to dilemmas, so students could be presented dilemmas, both related to their everyday private life, related to their future profession, but also related to more general societal dilemmas
Some kind of "Sustainability-agent" observing the students working; asking (critical)
Questions regarding, e.g. the sustainability goals - making the students reflect upon these issues as part of a "normal" working day - not as a separate thing… (inspired by Experts in Teams)

Four votes
Co-design workshops with students to create guidelines for sustainable design in specific domains (graphic, web, interaction design) or even specific use cases (wearable technology, AI, games, etc.)

Table 4.13: Lecturers' votes on notes

10 notes were voted on. The lecturers show a bit more agreement than the students, as there were less notes with one vote. The lecturers voted on notes that revolved around reflections (group/individual, views, dilemmas), lecturers' knowledge, EiT inspired notes (agents, reflection tactics), coordinating what they teach and co-creative workshops. The last one includes several topics mentioned in other notes, such as creative learning,

focusing on domains and use cases. This note also got 4 votes, and was the only note above 2 votes. This signifies a clear top position as a favourite suggestion amongst the participants.

3) Forced Ranking

To make the participants make a forced ranking, they had to be presented with two necessities: a set of notes and specific criteria for the ranking. This type of ranking makes the participants have to judge the notes closely, and the criteria should therefore be clear and precise. Therefore, the criteria was "Rank the notes after importance, and which ideas would work realistically". The amount of notes the students (12) and lecturers (10) had to rank, is said to be ideal, as it allows for the participants to not be overwhelmed, as well as being able to judge relatively (Gray et al., 2010).

As for the students in their workshop, they were able to create a singular dimension of a ranking since it was completed together in unison. The previously dot-voted notes were placed on a line in a random order. Underneath, post-it notes with "least important/usable" to the left, and "most important/usable" were placed at the right. Through discussion, the students placed the cards in the linear prioritisation scale. As the facilitator, the author observed the discussions, as well as the answers. The discussions were kept civil here as well, as the participants agreed on most things. The discussions were also insightful, as the participants changed mindsets and thoughts as the discussions went on.

As for the lecturers, they were asked to complete the task the same way as the students, and encouraged to discuss their choices amongst themselves at work if they saw the opportunity. As no feedback has been given on that note, the analysis will move forward with the idea of there being no discussions behind their choices. Their forced rankings are therefore solely based on their own view of what is most and least important/usable, as there has been no influence on their thoughts through discussions with fellow participants. Each lecturer got their own assigned area to put their scale. After all participants finished the task, an average was drawn.

Students:

Figure 4.2: Digitised Forced Ranking in Student Workshop

As the students had their workshop physically, there was no possibility to remove the dots from the notes and have them forget which notes they favoured earlier. But, as they were asked to now consider more practical questions and importance, over favouritism, they expressed that they forgot about the voting, and only focused on the contents of the notes. The voting started off with the podcast suggestion, and webinar, to the right, as it was the most talked-about and intriguing notes. But, as their discussions went on, and they brought the other notes into the discussion, the students figured out that these favourites had to be moved further back. When it came to what they would actually attend, do and/or see as beneficial, the checklist, sustainability month, and more focus on theory. The note on being more sustainable with materials at school ended up on the

farest left, as they realised, even though important, that it did not relate to them, and their education towards sustainable designers. The overall winner, to the farthest right, was a sustainability month, where the idea was inspired by Pink-ribbon/October, which is a month of the year with an extra focus and emphasis on breast cancer. So, the students felt a month with a sustainable focus could include most of their wishes, such as guest lecturers, theory, webinars and the like. These aspects could be available in addition to class, while lectures and classes could have their own focus, with check-lists, discussions, and other activities related to sustainability in that specific course, their deliveries.

Lecturers:

Figure 4.3: Forced Ranking in Lecturer Workshop before Finding Trends

As for the lecturers, as they had to complete the forced rankings alone, there were 5 rankings made in total. 6 lecturers took part in the original workshop, and all who participated have done the previous remaining task over email (dot voting), but one of the lecturer-participants did not complete the forced ranking. Therefore, there were 5 rankings to consider when looking at the results. As a reminder, the furthest left of figure 4.3 is least important/usable, and the furthest right is most important/usable. To give the notes a value, the notes were given a random number from 1-10. The contents of the notes were put into a spreadsheet randomly, and numbers were added after, which can be seen in table 4.14.

	Statements
1	Invited talks of experts showing how changes can have an effect in specific domains
2	More knowledge amongst lecturers = better ability to teach the topic
3	Maybe we should coordinate how we teach sustainability between us to cover more ground and have a cohesive strategy?
4	I would like to do more of what I am already doing in my two courses (see pics)
5	Another thing which is probably relevant is the ability to reflect over one's own perspective in relation to that of others.
6	Co-design workshop with students to create guidelines for SD in specific domains or even specific use case
7	Not only reflect over themes, projects, etc., but see connections to each other over the course of education, and beyond
8	Identify 5 concrete actions that can make a difference
9	Reflections becomes most interesting when they are related to dilemmas, so students could be presented dilemmas
	both related to their everyday private life, related to their future profession, but also related to more general societal dilemmas
10	"Sustainability-agent" observing the students working; asking (critical), questions regarding sustainability
	- making the students reflect upon these issues as part of a "normal" working day - not as a separate thing

Table 4.14: Lecturer Workshop Voted-Notes in Table

The aim is to create one, common ranking from the five personal scales. But, it is particularly difficult to draw an average from text content, when the notes that are ranked have no previous value. Because for this task, the dot votes were no longer considered, and also, the dot votes did not give the notes a clear ranking, as many got the same amount of votes. The assigned numbers to each note that was ranked, is also randomised, which brings them no true value. In order to find a common ranking, the author searched for trends. The notes were put into a spreadsheet as their assigned number, and put into columns and rows based on their ranking, and which lecturer the ranking belonged to (table 4.16). When all numbers were filled in, the trends became apparent.

	10	9	8	7	6	5	4	3	2	1
Lecturer 1	9	3	7	2	6	10	1	5	8	4
Lecturer 2	4	2	3	1	5	8	6	7	10	9
Lecturer 3	4	2	3	1	5	7	6	9	10	8
Lecturer 4	4	7	2	3	1	5	10	9	8	6
Lecturer 5	4	5	2	3	7	10	1	6	9	8
Trend	4	2	3	1	5	7	6	9	10	8

Table 4.15: Lecturer Workshop: Finding Trends

The students, in their workshop, all had their personal favourites in their voting, but listened to others opinion, and made together a scale which considered everyone’s opinions. This means that some opinions might have been put to the side, and each placement is based on the most popular opinions. The lecturer’s workshop does not reflect the same thought process in their personal votes, but by looking at trends in the data, one can assume what the scale might have looked like if made together physically. The trend consists of how many have placed the same note on the same place on the scale. As seen in figure 4.15, for example, 4 participants put the 4th note from figure 4.14 in 10th place (absolute least important), which means that this is a trend. Where there are two notes with two of the same placements, the trending note was decided by

where the remaining notes with the same number were placed. For example, there were two eighth-notes in 2nd place, as well as two ten-notes. To choose the right note here, the author looked for where the remaining eight and ten notes were. The tens were placed further down, and two eighths were placed in 1st place. Therefore, 10 became 2nd place and 8 became 1st place. The final scale can now be said to reflect how the lecturers might have created their scale, as the notes reflect popular opinions within the placements in the personal scales/rankings.

Table 4.16 illustrates the results. Reflection, sustainable agent, workshops and concrete actions are placed at the top half, while knowledge building amongst lecturers, coordinating content and some ideas on reflection is on the bottom half. All in all, the trends show that the lecturers think of dilemma reflection, leading by concrete examples, and being inspired by EiT (with agents who observe work), is seen as most important and as solutions that could work in practice.

	Statements
1	Identify 5 concrete actions that can make a difference
2	"Sustainability-agent" observing the students working; asking (critical), questions regarding sustainability
	- making the students reflect upon these issues as part of a "normal" working day - not as a separate thing
3	Reflections becomes most interesting when they are related to dilemmas, so students could be presented dilemmas
	both related to their everyday private life, related to their future profession, but also related to more general societal dilemmas
4	Co-design workshop with students to create guidelines for SD in specific domains or even specific use case
5	Not only reflect over themes, projects, etc., but see connections to each other over the course of education, and beyond
6	Another thing which is probably relevant is the ability to reflect over one's own perspective in relation to that of others.
7	Invited talks of experts showing how changes can have an effect in specific domains
8	Maybe we should coordinate how we teach sustainability between us to cover more ground and have a cohesive strategy?
9	More knowledge amongst lecturers = better ability to teach the topic
10	I would like to do more of what I am already doing in my two courses (see pics)

Table 4.16: Forced Ranking in Lecturer Workshop Trend

4.2.2 Interpretation of Findings

The statements below are interpretations based on the analysis and results above, with a comparison between students' and lecturers' suggestions in the workshops. These common interpretations are drawn based on the most mentioned topics, voted-on cards and forced ranking, as these activities reflect the participants' wishes, goals, and needs to the largest extent.

Deliveries and classes tend to follow the same frameworks, which was also discovered in the interviews, by both students and lecturers expressing the same thought. This makes new, more creative solutions, such as podcasts, sustainability months/weeks, new ways of conducting workshops in class, be what awakened the most excitement and engagement in both workshops.

Many suggestions by the students entails adding more sustainability to curriculum and in most aspects of their learning. Where both workshops and interviews have now identified a lack and need for this. The interviews with lecturers did not enlighten on this

topic, but the workshops brought forward the lack of teaching on the topic, as lecturers said they needed to learn more on sustainability as well. So the base of this issue lies in lecturer education and creation of curriculums, which is an issue this thesis can enlighten, but not propose a solution for. This is because it goes beyond the confinements of a classroom, and does not include the students.

The students want clear guidelines, and the lecturers are working towards giving it to them, but there is a lack of time and knowledge to do so. It seems like the lecturers also crave guidelines and knowledge, equally as much as the students. A common theme is having a check-list and requirements in deliveries. Lecturers mention EiT in some of their notes, and to do something inspired by this, such as agents, which was one of the lecturer's top notes in their ranking.

Also, there is a lot of focus on bettering the environment, and the only correct answers evolve around this. But, it is an important note to include that both sides of sustainability have to be discussed. While looking for possibilities and options revolving around sustainability, there needs to be discussions about the negative side of sustainability. For example where it is not possible to make changes and what could possibly worsen the situation. All sustainability focused discussions are a step in the right direction, while a focus on possibilities is preferred. Dilemmas is a great suggestion for bringing all sides of sustainability into a classroom, which was suggested by lecturers.

The most trendy notes amongst the lecturers are quite the opposite from what the students chose in their rankings, but all voted-on notes are quite similar in topic. Notes on topics like guest lecturers, workshops, knowledge, concrete guidelines, etc. are voted on in each workshop, but they are placed differently on the scales. This reflects the different views and opinions lecturers and students have on education. As the goal of the thesis is to find a common ground between the user groups' statements/goals, this type of data is appreciated on the same level as data that is deemed similar. The data from the workshops indicates that the solution proposal needs to cover a wide range of goals and needs, instead of a few specific ones.

4.3 Personas & Context Scenarios

4.3.1 Students

Since the solution is thought to be available for all bachelor-design students, a persona representing each study year has been developed. Each of these personas are studying a different bachelor study, to also bring in the variety within each study-program. Therefore, 3 student personas have been developed to represent the various types of students at bachelor level under ID. All are based on the previously collected data from analyses in interviews and workshops.

Persona 1 – 1st Year BMED Student

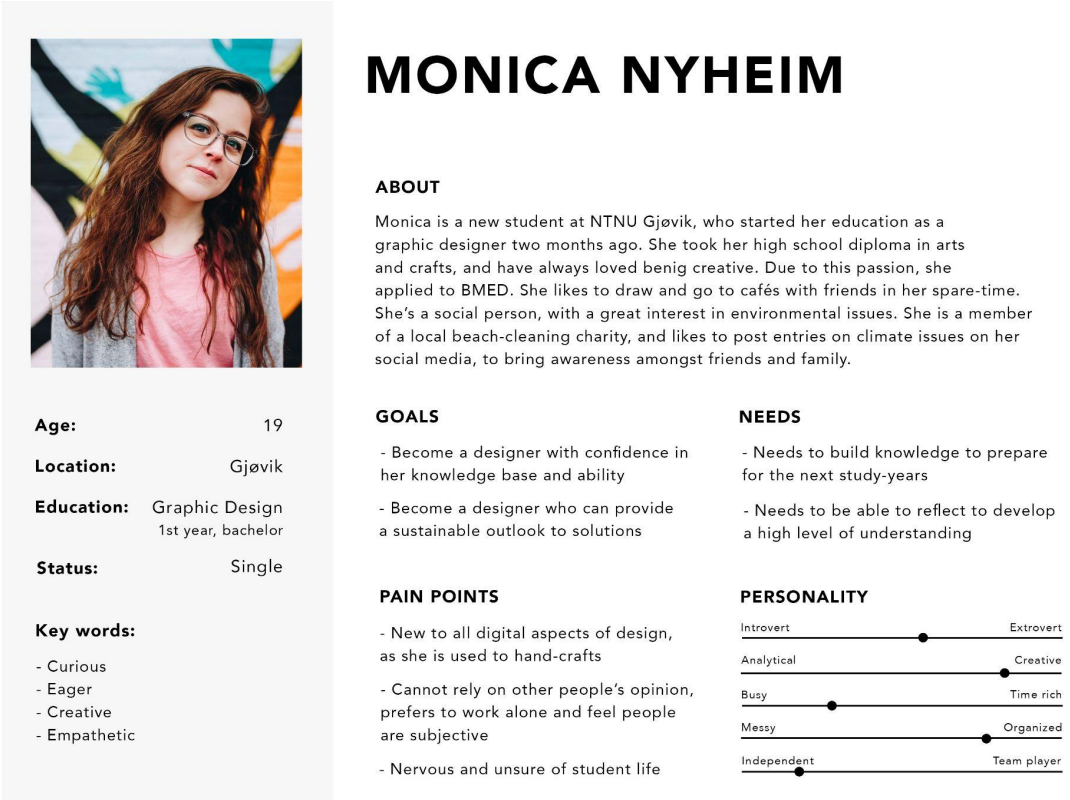


Figure 4.4: Persona 1, student

The first student persona represents a first year graphic design student. Her name is Monica, and she has some previous knowledge from arts and craft from high school. She is outgoing, creative, and an overall motivated and organised person. As a first year student, she is curious and eager. Her goals and needs reflect the ones of other first years, which are to build confidence, knowledge and ability to reflect, so she can widen and build upon the knowledge through the remaining years of her studies. As a personal note, to represent the students with an interest for sustainability, Monica wants to develop a sustainable outlook within what she learns, as its an interest of hers, but also because she believes its important in her future in the business.

Scenario 1

What is the goal?

Monica is a few months into her studies, and is well into her courses the first semester. These courses revolve around basics in design and graphics. She has learned the basics of many aspects, but has not learned about the basics of social, economic and environmental sustainability in design. Monica would like to learn more basics on these topics, in addition to all other basic information.

How to achieve the goal?

A hypothetical solution would potentially step in at this stage of Monica's learning, as she has started to learn and build her knowledge base. This solution would provide Monica with the basic information she needs, and correlate it with what she is currently learning. The solution would be of an easy level, which does not claim more of the first year

student than all other aspects of her studies at this stage. The solution provides her with basic information and reflection tactics that fit into her courses, tasks and current deliveries.

What is the result?
Monica can now include sustainability in her tasks and reflect on them on the same level as the other basic information she has been taught.

Persona 2 – 2nd Year BIXD Student

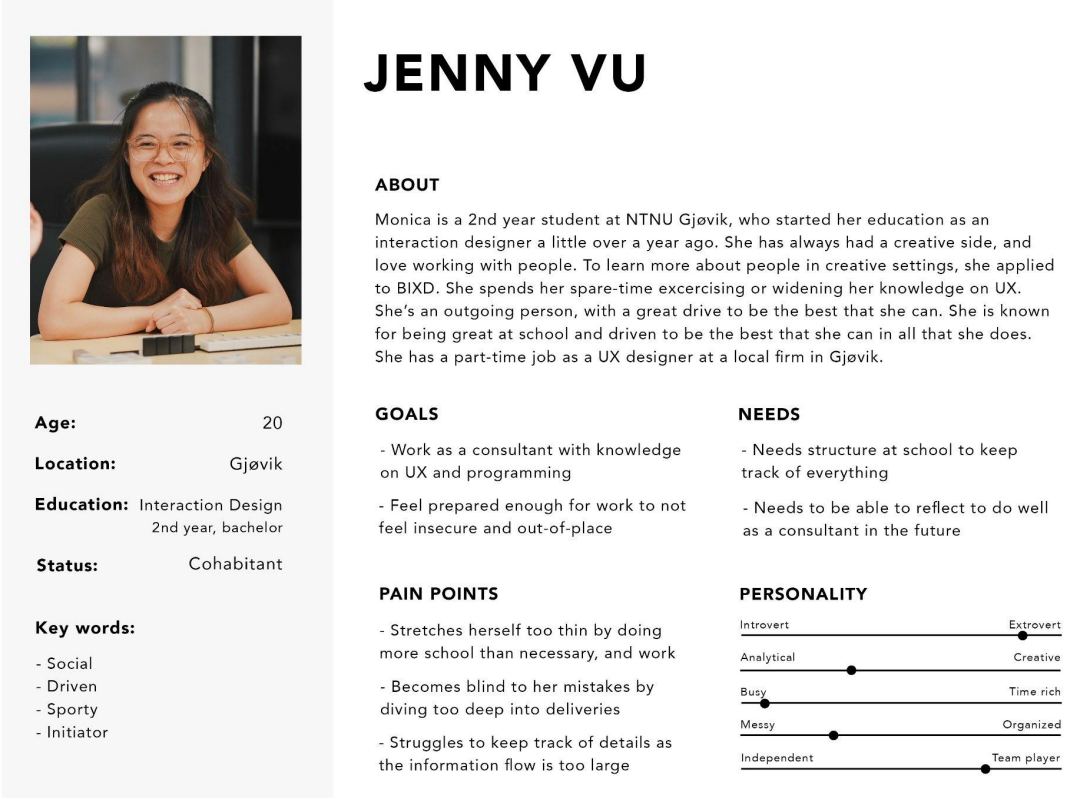


Figure 4.5: Persona 2, student

Jenny Wu is a 2nd year student at NTNU Gjøvik, soon to be half way into her interaction design bachelor. She lives with her boyfriend in the town centre of Gjøvik. Jenny is a social and sporty person, who spends her spare time exercising and hanging out with friends. She is also very driven, and spends a lot of her time on school. She doesn't like to feel unsure and ignorant during class and in deliveries, and therefore reads and prepares well for anything she does. As she also has a part-time job as a designer, she needs to stay organised, but this is not her strong suit, as she usually overbooks and takes on too much. As many other 2nd years, Jenny is starting to think of her future as a designer, and her goals at school revolve around feeling prepared and ready for work. She feels like she needs to know all aspects of design to be able to contribute in a future working environment, and being able to reflect on topics is a must.

Scenario 2

What is the goal?

Jenny does not know how to reflect well, and feels like she needs this skill to feel more prepared for her future work life. To get there, she feels like she needs a more wholesome knowledge base, where she is not insecure and feels out-of-place.

How to achieve the goal?

Jenny knows it is impossible to know it all, but feels like there are important topics her studies does not touch upon enough, which might be important in design businesses. Jenny is presented with the hypothetical solution, and notices that it evolved around topics she is not confident in. She therefore takes the opportunity to build on her knowledge, and indulge in a new, exciting aspect of design. The solution and its topic feels relevant for her future, which motivates her to take part.

What is the result?

Monica can now reflect on sustainability within her knowledge base as a 2nd year, and feels all the more prepared for work in the future.

Persona 3 – 3rd Year BWU

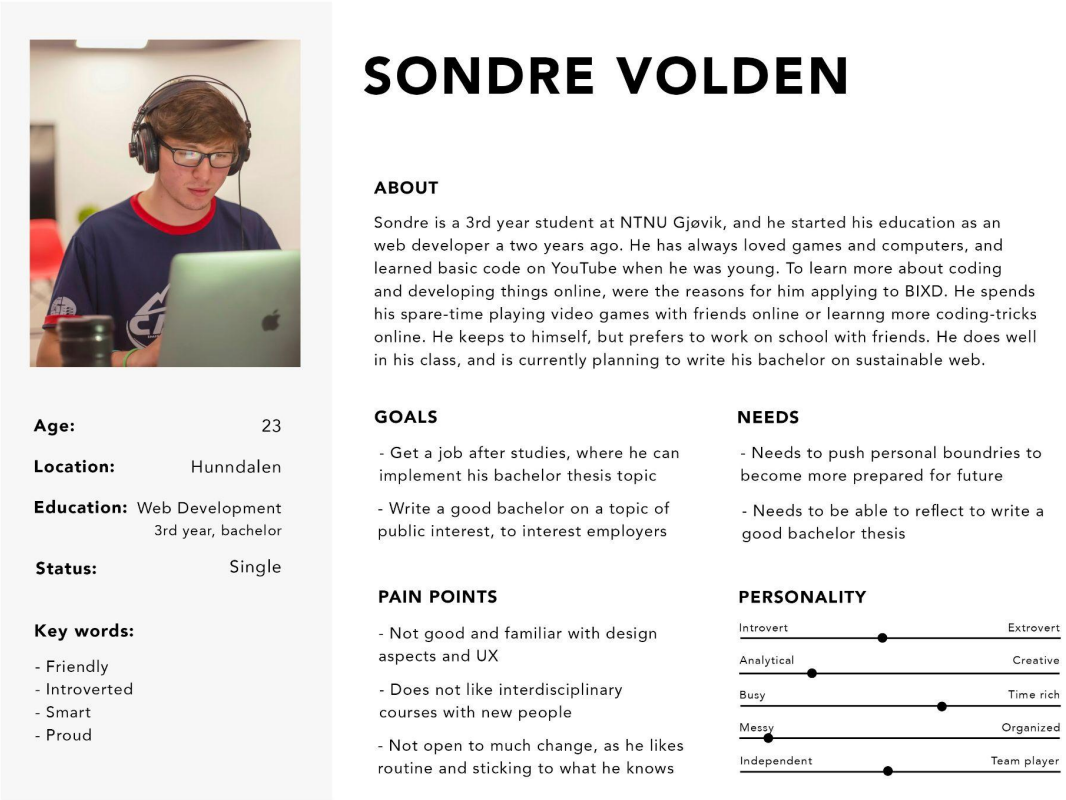


Figure 4.6: Persona 3, student

Sondre is a 3rd year student, currently in his fifth semester. Sondre is quite used to the student-life, and very confident in the knowledge-base he has developed. A lot of his knowledge comes from self-learning, but it was always a supplement to what was taught in school. He is a bit introverted, and likes to work on tasks by himself. He could work with friends, but feels uncertain about working with unknown people. He knows that this

quality would make him a bad employee in the future, so he would like to work on his boundaries, but not in deliveries, as he cares for his grades greatly. As he has a lot of knowledge on coding and web, his knowledge on design is not high. He has not focused as much in those classes. Now that he is preparing to write his bachelor's thesis, and focusing it on sustainability, he sees a need to learn more on the topic, in his own domain, and design, to be able to reflect and bring dimension to the topic in his thesis.

Scenario 3

What is the goal?

Sondre prepares for his bachelor thesis, and what comes after, work. He wants to write about sustainability, as it's a relevant topic in the domain, and it could make his thesis stand out to employers. Sondre needs to build upon his current knowledge on the topic, by bringing in other views and dilemmas, to make his understanding and thesis more dimensional.

How to achieve the goal?

Sondre needs to reflect with others who have some knowledge as well. He uses the hypothetical solution to discuss topics and widen his horizon on the topic with other design students, either from his own class or the other design bachelor studies. From these conversations, he learns more than basics, and moves towards dilemmas, realism, and work-focused reflections. His mind opens up to new views and questions, which makes him more capable to reflect.

What is the result?

The solution brings him new perspectives on sustainability, and makes him more confident on writing his thesis on the topic.

5.1.1.2 Lecturer

As for the lecturers, they expressed under the interviews that they tend to teach under more than one bachelor's degree, and the study-year level varies. Therefore, a lecturer persona per year and bachelor is not necessary. Instead, the lecturer persona should reflect on the complex nature of the role as a lecturer, where they can be program-leaders, and teach courses simultaneously. In the interviews, it was expressed that the lecturers who had a program-leader role, had more of an impact on what was taught. Therefore, there will be one lecturer persona, where the persona represents a program-leader, with a normal lecturer role, with a few courses to teach.

Persona 4 – Program Leader and Lecturer

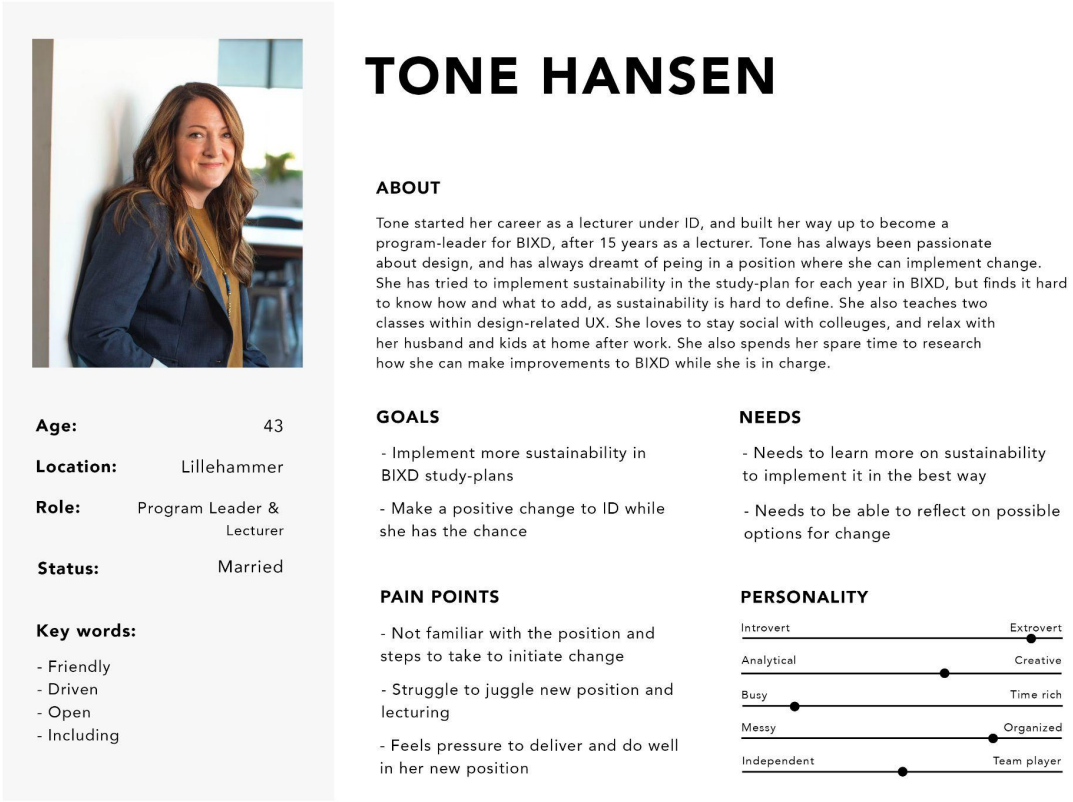


Figure 4.7: Persona 4, lecturer

Tone is a family-focused woman, with a social, outgoing personality, and a great ability to be open and inclusive. Tone has been a lecturer under the Department of Design for years, and teaches two design-related courses each semester. She also recently became the program-leader for the Bachelor of Interaction Design, which gives her more opportunities to inflict change. Tone's goals revolve around making change for the better within her program, and one of these goals involve implementing more sustainability. Her pain-points are that she is not familiar with the position, and change will not happen as fast as it should. She also lacks knowledge on sustainability, and does not know how to implement it in an effective way. She could need advice and help, as well as solutions that would be easy to adapt.

Scenario 4

What is the goal?

Tone has learned over the years that the topic of sustainability becomes more and more important, but she struggles to know how to implement it into the bachelor study she is the leader of.

How to achieve the goal?

Tone uses the hypothetical solution as a way of teaching students to reflect and learn sustainability. The solution is easy for her to adapt, and she can change, add and remove from it, as sustainability, studies and the world changes. The solution brings the possibility to be used by the other design-bachelor studies, and have the studies learn and reflect together, as well as apart. The solution could open up for lecturers learning

and reflecting alongside students, so both can evolve and not demand lecturers to build their knowledge base first.

What is the result?
Tone can now deliver a versatile, inclusive solution that helps both her and her students to become more aware on the topic of sustainability.

4.4 Idea generation

When making a solution, and preparing the proposals to include in a selection process, one has to firstly talk to those who are directly affected by the solutions, to get an insight into what is important to them, and their needs and challenges. The insights gained from such conversations makes it easier to empathise with them, and distinguish what is important from so-called nice-to-haves.

To make a solution proposal, the pool of information and data needs to be made into ideas. The workshops that have been conducted, have actually developed such ideas already, as the question and scenario they answered led the notes to become solution proposals. The voting and forced ranking has therefore already given a glimpse into what the students and lecturers need, and want. After looking into the notes with votes from the workshops, and supplementing/adapting the notes based on data from interviews, these are the solution ideas that appeared:

- **Check-lists** for Courses and Deliveries
- **Sustainability Month** with a lecturers and more
- **Posters** with information on how to include sustainability
- **Adapted Learning** by adding more sustainable aimed theory/activities
- **Podcast** on the topic of sustainability and design, under ID
- **Webinars** on the topic of sustainability and design, under ID
- **Guest lecturers** to visit in specific courses
- **Lecturer-Education** to build their knowledge before teaching
- **Coordinated sustainability theory** between lecturers for less repetition
- **Co-design Workshops** with guidelines to follow
- **Reflection** tasks with dilemmas
- **5 Actions** towards change in each course
- **Sustainability Agents** as helpers and observers (EiT inspired)

4.4.1 Idea Portfolio

The ideas are listed in a random order, and displayed as short, descriptive sentences. The ideas are displayed in the first and fourth column, with impact score in second and fifth, and feasibility in third and sixth. Colours were added to their content area to differentiate the information. Ideas are yellow, impact scores are green and feasibility scores are blue.

Figure 4.8: Idea Portfolio Idea-Voting

1) **Check-lists** for Courses and Deliveries:

The check-list idea was proposed by students, and entails having clear goals and information that students can check-off when included/added to their deliveries. This could also work for courses, where they can check-off points on lists when completed/they feel they have learned enough on a sustainability-topic. This idea got a 6 on an impact score, and a 8 on feasibility. It can be effective to have a list to follow, and to get clearer borders, but the impact would be higher if the list was more of a guideline. A check-list does not open for reflection and understanding on the topic, but rather help a student get the process of learning along. The impact is therefore only a bit higher than average, as the list might tell them important aspects, but doesn't teach them about them. It could be easy to implement though, hence 8 in feasibility, as the only stopper could be lecturers struggling to create the lists.

2) **Sustainability Month** with a lecturers and more:

The sustainability month was the most voted idea during the student workshop. This idea carries a lot of potential, as it's an open idea. There was an idea to invite in guest lecturers, and there is potential for many other ideas to be included, such as workshops, webinars, theory in classes, etc. Since the opportunities are endless, the impact is set at a 10 in score. This idea can have a great impact if made in an adaptable way. There is room for lecturers to take part themselves, hence building upon the lecturer-education issue, and giving the lecturers the ability to adapt their own month, instead of following

a template that does not work for all (such as UN goals). The feasibility is therefore at an 8, since it can be adapted by each lecturer, supervisor, organisers, and the like. 2 points were deducted as planning common-activities, such as guest lecturers, webinars, workshops, etc., entail bookings, and potential crashes in time-schedules.

3) **Posters** with information on how to include sustainability:
The posters meet some of the same issues as the check-lists. Posters with information on sustainability is a helpful artefact to have visually, and is like a check-list without the checks. But, these posters would have to be extremely general, and include large amounts of text to cover all bachelors and all years of study, including each course. For a more general aspect, this is a well-functioning idea for motivation and remembrance, but it is not an answer to the issue. Therefore, the impact is low at 3. Making the posters and hanging them are easier tasks on the other hand, so feasibility is at a 10.

4) **Adapted Learning** by adding more sustainable aimed theory/activities:
Adapted learning is an idea of great importance, as it is proven to be a need in HE. The lack of ability to reflect on sustainability stems in not having enough knowledge. Both students and lecturers have expressed a lack of knowledge, and so adding more to curriculum and courses seems like a natural and logical solution. So the impact, if possible to do, is at 9 for this thesis. But, changes to curriculum is a difficult task, as most courses have enough theory to go through already. Figuring out what can be removed, replaced and added, is a long and difficult process, in addition to figuring out which aspects of sustainability can be included. These points place this idea at 4 in feasibility.

5) **Podcast** on the topic of sustainability and design, under ID:
The podcast idea was a clear favourite at the beginning of the student workshop. Podcasts are exciting, and a new way of thinking within learning. They give the ability to listen and learn when the student would like, and provide a conversation based platform with a more natural language. But, there is a downside to this as well. As podcasts are adaptable and follow a talk-as-we-go template, there is a lot of room for speaking off topic and expressing statements that are wrong. It is also easy to lose focus and not pay attention to details when listening to a podcast, as one can listen at any time, while active or sitting still. Therefore, the impact is at an average, which is 5. The anchors would also need to be well educated on the topic and be confident in all theories expressed. Setting up a full podcast production, and having people commit to a frequent, long lasting commitment, would make it less feasible. But, NTNU has podcasts now, for other studies and topics, and following their ways might help the process. Therefore, the feasibility score lands at a 6.

6) **Webinars** on the topic of sustainability and design, under ID:
Webinars open for digital and physical attendance, as well as deciding for them to be compulsory or not. They can be with guest lecturers or lecturers in specific courses. They could keep a focus on sustainability and contain creative activities. The impact score is therefore at a 6, just above the average impact one can expect from a class. But, this idea does not go beyond the confinements of a normal, digital lecture, with a focus on sustainability. Online classes tend to have the students lose more focus than in physical ones, which makes them less effective and engaging. Therefore, the feasibility ends up at a 6 as well, as it adds and deducts to student attendance.

7) **Guest lecturers** to visit in specific courses:
Guest lecturers are the next idea, which has been mentioned as an integrated part of previous ideas. The concept in itself is a great idea, as it breaks the regular class paradigm by bringing in a new lecturer, new way of teaching and a change in dynamics, for a day or two. It can awaken the urge to learn and engage the students in new ways, as well as the information being remembered at a higher rate than usual, as change stands out within recognition. Therefore, the impact is set as 7. There is great potential here, and the few guest-lectures can make an impact, but are not large in numbers, and will not have a great impact. And as mentioned earlier, these types of ideas require planning and time-scheduele adjustments, which makes it hard to plan to some extent, but it is also something universities do from time to time, and have templates on how to do so. So the feasibility lies at a 7.

8) **Lecturer-Education** to build their knowledge before teaching:
As much as the students need to learn more and build their knowledge base, so do the lecturers. It might be even more important, as they need to teach students, and be able to answer dilemmas and questions students might have. Therefore, if lecturers got a better educational background within sustainability, the impact would lie at 9. They would be able to make great differences. But, changing lecturer education is beyond the scope of this thesis and the author's premises, which makes it unrealistic to view as a solution to the research question. Also, changing curriculum and educational routes in HE is a long and tiring process, which puts the feasibility at 2 for this idea.

9) **Coordinated sustainability theory** between lecturers for less repetition:
For teaching to be effective at a high functioning level, lecturers should communicate and plan what they teach together. This would be for the purpose of students not experiencing repetition, and therefore learning more broadly. But as this correlates with the curriculum as it is now, the issue is lack of information/theory, not repetition. The impact is therefore set at a 3. It would have some effect, but none that brings a large impact. On the other hand, it would be quite easy to initiate, as lecturers would need to set up a meeting, present what they teach on the subject, and adjust. The feasibility is therefore at an 8 for this idea.

10) **Co-design Workshops** with guidelines to follow:
Workshops are a great tool to engage creative learning and a change in the normal set-up of a classroom. It can engage movement, discussions, problem solving, creative tasks and the like. Topics taught in workshops can therefore easier be remembered, and could create a larger interest on the topics. Therefore, this idea got a 7 in score for impact. There is still a potential to do more, which deducts three points from the top. It would not need guests and other facilitators than lecturers, but it is an option if needed. It can be held in already-planned classes, in a pre-booked classroom, or added to the course time-schedule as needed. They are easy to plan, and can follow whatever plan the lecturer would like, which lands this idea at a 7 in feasibility.

11) **Reflection** tasks with dilemmas:
Reflections could be set up in the same way as workshops, but would be less engaging and exciting for the participants. Reflections are purely based on topic, dilemmas and facilitation, which can vary greatly. If not followed and steared, they might not contain much learning. Therefore, the impact is at a 6. Same goes for the feasibility, which also

lands at a 6, as it is easy to add to a class, but harder than a workshop to engage students to participate.

12) **5 Actions** towards change in each course:
This idea is similar to the check-list and posters, only with 5 specific actions. As this covers the same positive points as the posters and list ideas, the negatives will be reviewed. Setting a constraint at 5 actions will not suit all courses and be difficult for some to fill. A possible solution should be more adaptable, which puts the impact at a 4. This idea can be restricting and limiting. But, defining some actions on the topics of a course might not be difficult for a lecturer to produce, wish puts the feasibility higher, at a 7.

13) **Sustainability Agents** as helpers and observers (EiT inspired):
EiT is, as mentioned, a master-level course (or a set of courses to choose from), where the students attend one weekly, compulsory class, where they have a lecture and group work afterwards. The group has to work on an assigned task for a semester, and write weekly in a diary, and express issues, and positives from working together that day. During this group work, students with a higher education, assigned as agents, jump into the sessions to help, if needed. This idea looks into having these kinds of agents, only for sustainability. Some questions need to be answered for this suggestion, such as who these agents could be, and how they would work. Adding a diary would not be realistic, as all students have expressed they do not like to format. These agents also need teaching and courses in observing and helping. The impact is therefore at 6, since there would be too many possibilities for failure and low quality observations. It would also be hard to educate agents and implement them efficiently, which puts the feasibility at a 5.

After giving all the ideas scores on the two criteria of impact and feasibility, they were put into the grid on the x and y axes. The ideas were shortened into one or two word descriptions, for the sake of space. The chosen words are highlighted in bold in figure 4.9. The grid has a red colour within its squares, to imply best to worst fields. The darkest red field signifies low impact and feasibility (low field), the pink fields signify high impact/low feasibility and low impact/high feasibility (mixed fields). The light pink field signifies high impact and high feasibility (high field). The lightest field is therefore seen as the best field to land in, as it reflects higher than average scores in both criteria. Most ideas ended up in that part of the grid, with some ideas falling into the mixed fields.

The idea with the highest placement is the sustainability month. Check-lists are also quite visibly well placed. The remaining ideas in the high field cluster together around the same scores, and don’t particularly stand out. This does not mean they can not be considered, or mixed into the final solution. This will be looked into when forming the proposal. When looking at the portfolio as a whole, the sustainability month comes out as the clear most impactful and feasible solution idea.

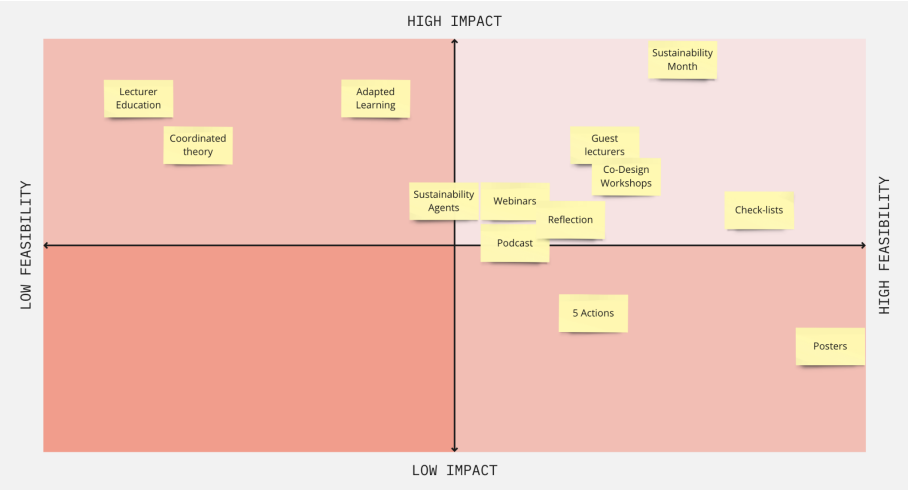


Figure 4.9: Completed Idea Portfolio

With the placements finished and the decisions explained, the sustainability month idea was chosen to continue with. This idea will be investigated further by looking at potential storyboards, service blueprints, and other various design methods, to test its relation and function with the end-users in realistic situations.

4.5 Service Blueprint

All of the goals and steps in the journey proposed in the blueprint, are based off of analysed data from interviews and workshop, which were summarised in the idea generation. Also, as mentioned while generating ideas, the sustainability month has the potential to include many of the other ideas, as the concept is quite open. The other highly voted-on ideas, within the idea portfolio, can therefore be considered to be included in the sustainability month. If they had a low impact, or low feasibility, these numbers might improve by being put into the sustainability month context. These ideas were therefore included in the user action stages, to test the possibility of including other ideas, and starting on an idea as to what the sustainability month can entail. To explain these actions and the involvement of other ideas in more depth, each step in the journey will be elaborated.

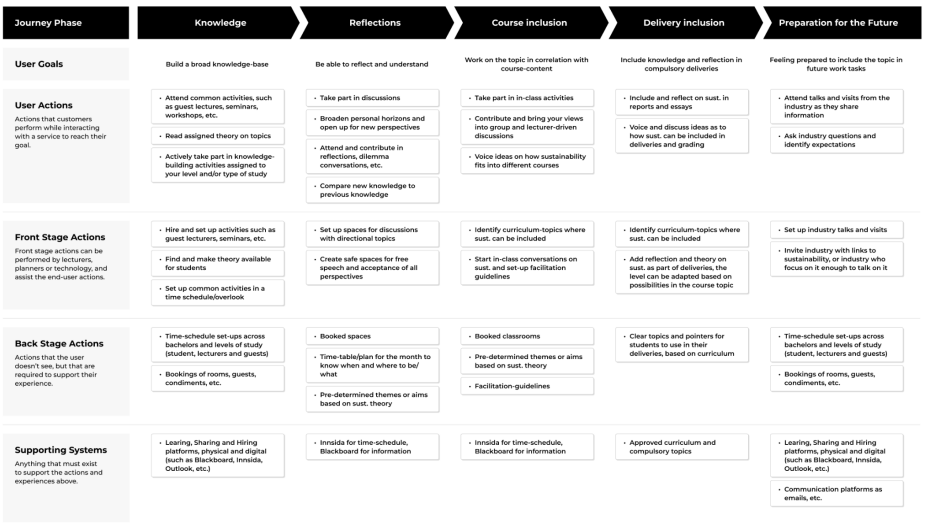
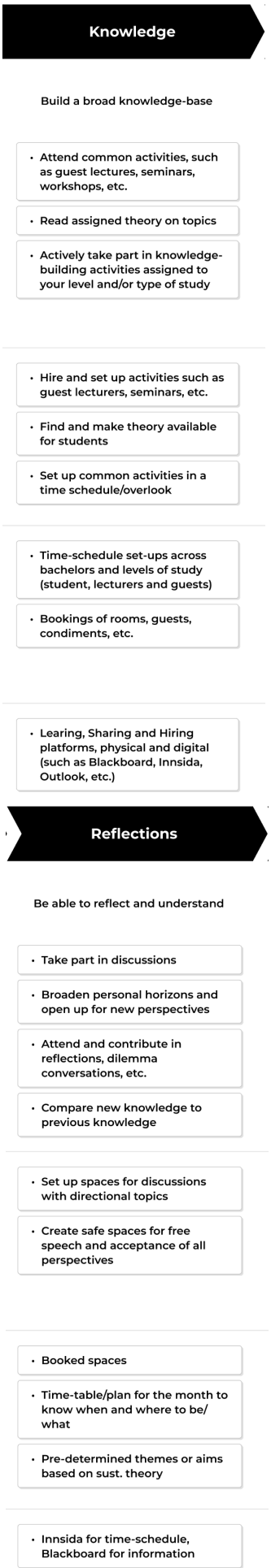


Figure 4.10: Service Blueprint



The first step of the journey and goal is building knowledge. As learned from interviews and workshops, both lecturers and students feel a lack of knowledge on the subject, and do not know how to move forward without it.

As examples for how knowledge can be built, other ideas for solutions, such as guest lecturers, seminars, workshops, and assigned theory, could help with this. By bringing in others with knowledge, and having both lecturers and students attend these activities, knowledge can be built together. Workshops, seminars, and the like, can also be more motivating and engaging, as it opens for new ways of learning, activities, and an overall break from the normal setup. These activities should be split into levels, for instance 3, based on year/level of study, as each year, across studies, follows the same principles. Basics are learnt the first year, more design with deeper knowledge the second year, and finessing all learnt material with a work-related focus in the third.

For such actions to take place, the lecturers or planners need to hire and set up a schedule. This needs to be fitted as well as possible into all possible attendees' time tables. Bookings of speakers, rooms, etc., also follows as a back stage action. All mentioned actions above need to use various digital services to be completed, such as learning, sharing and hiring platforms, to for example communicate information and hire guests.

Figure 4.11: Knowledge Section in Service Blueprint

After building knowledge, the students and lecturers will be more capable of reflecting. Reflection contributes to bringing in different perspectives on the same matter (Udir, n.d.), and will therefore widen one's views and thoughts on a matter. It's a great tool within learning, and is proven to not be done enough on the basis of theory at NTNU Gjøvik, as most reflections are about group work.

This step will bring reflection into teaching. The trick to having good reflections is attending, having an open mind, following topics or leading subjects, and contributing with intel and creating a safe space for all participants to share (Udir, n.d.). Lecturers need to help with this step, to make sure reflections, if held in groups, stay civil and on track. They need to be facilitators who steer and bring topics in for reflection/discussion. The lecturers can of course contribute to learning as well, and build their knowledge with students. As sustainability is a large topic with few "correct answers", being able to reflect and find solutions together, is crucial.

These actions need to have spaces, be set up, and have a predetermined list of aims. Such reflections can be set up in sharing platforms, in class, in deliveries, and the like.

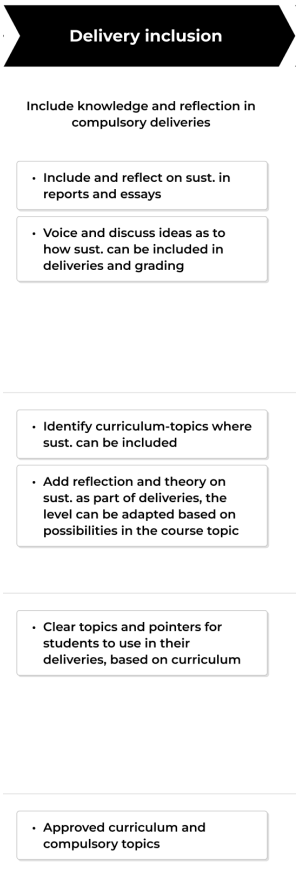
Figure 4.12: Reflections Section in Service Blueprint

During a month of sustainable focus, common activities (highlighted under knowledge) should not be the only aim. The common activities can also become quite wide in topic, and so a focus should also be aimed at other aspects of studies, such as course content and classroom activities. By including a month with a specific focus in these settings as well, the knowledge and reflections can be aimed towards more specific pointers. Reflections, as mentioned, can be held in classes, and be on topics related to the course at hand.

Lecturers should therefore find topics within their curriculum that could potentially be linked to sustainability, and facilitate activities around these topics. The lecturer does not have to know everything on these topics, but uses their knowledge from lectures, workshops, etc., and some research of their own, to find subjects for discussion. Dilemmas, aims, and possibilities can be reflected on, and does not necessarily need to have correct answers the lecturers need to know. Find pointers, bring them into the classroom, and learn **with** the students.

Such classroom-based inclusions need to be based on curriculum topics, have facilitation and be in a booked classroom/space, which are actions that need to be in place. These actions are again communicated through NTNU's platforms, such as Blackboard, Innsida, Outlook, Teams and the like. Each course director chooses the platform they and their students prefer to use.

Figure 4.13: Course Inclusion Section in Service Blueprint

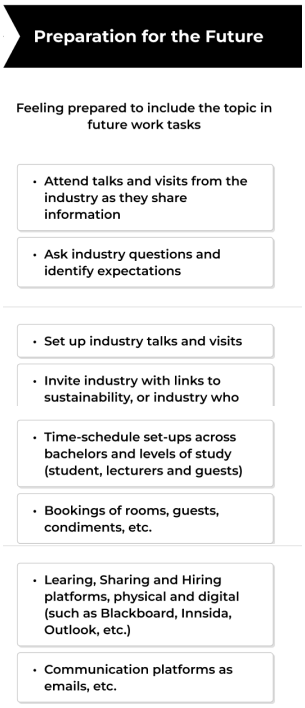


After building broad knowledge, narrowing it down in courses, and becoming able to reflect on the topic, possibilities open up to include sustainability in deliveries. Having the sustainability month be without some compulsory motivator, could possibly make some students not attend and contribute. By including some sustainable topics into deliveries, it will bring in an extra push. This push should not be strong, and contain too much theoretical content. The aim should be to reflect on sustainable possibilities and dilemmas within a delivery topic.

Where sustainability can be included can be discussed with lecturers in guidance lessons, in personal/group design reports, or reflected on together in classes. The aim is to have the ability to reflect on dilemmas and possibilities, and if possible, include them in a design. This needs adaptation to each specific task, and the lecturers can curate this based on their comfort level of knowledge and curriculum opportunities. If this is a small task to deliver during the month, or something to include in a later, big delivery at the end of a semester, is up to the lecturer as well, and how they prefer to curate their classes and deliveries.

For these actions to be possible, lecturers need to decide the pointers, and go through the loop of having it approved.

Figure 4.14: Delivery Inclusion Section in Service Blueprint



For the students with an extra interest, or specifically for second and third year students, industry, businesses and the like can be included into the sustainability month to talk about their sustainable choices. As learned from interviews, sustainability and reflection is a crucial part of most design-jobs, and students don't feel ready to start working. By inviting industry to have talks, career days, and the like, during the month, the industry can talk to, discuss, and answer questions students might have.

The aim is for industry to keep their focus on sustainability, but keeping the discussions open, as this is a great opportunity to prepare for working life in general.

These talks and days need to be planned, booked, and scheduled. And, similar to other journey steps, these events can be shared on NTNU platforms, and communicated physically as posters at school and in class, and digitally on all available platforms. These kinds of career days are frequently held at NTNU, and to have one aimed towards sustainability during a sustainability month would be possible to assume is doable.

Figure 4.15: Preparation for the Future Section in Service Blueprint

4.6 Validation Scenarios

Now that a solution idea is taking form, it will be tested in a variety of situations with validation scenarios.

Scenario 1 – 1st year student

What is the goal?

Monica would like to learn more basics on these topics of sustainability, in addition to all other basic information, as she is a new student with an interest in the environment.

How to achieve the goal?

Monica sees in her time schedule, and was informed by her lecturers, that there is a sustainability month starting this week. She looks at the plan for the month, and sees that some guest lecturers are coming to speak on various themes within sustainability. Underneath each event, it says that some of these lectures are recommended for her, a first year, and some for her study, graphic design. Monica decides to attend these lectures, and they provide her with knowledge and facts on basic sustainability within topics that fit her current courses, and the courses next semester. These activities provide her with basic information and reflection tactics that fit into her courses, tasks and current deliveries.

What is the result?

Monica can now include sustainability in her tasks and understand the topic enough to compare it to other basic information she has been taught.

Scenario 2 – 2nd year student

What is the goal?

Jenny does not know how to reflect well, and feels like she needs this skill to feel more prepared for her future work life. To get there, she feels like she needs a more wholesome knowledge base, where she is not insecure and feels out-of-place.

How to achieve the goal?
Jenny sees the plan and hears about the sustainability month in class. It makes her excited to know there are new things to learn ahead. In class, the lecturers bring up topics and dilemmas related to sustainability and the course contents, and open up for a discussion. Jenny did attend some seminars earlier in the week and learned some new things on sustainability, and voiced some ideas and thoughts she had around how this could be included in the course, as well as the negatives and dilemmas that might appear as well. Other students, and the lecturer, add to what Jenny said, and they are having a controlled, informed discussion on the subject. Jenny feels like her horizons have been widened on the topic, and more and more views and directions sustainability can evolve in appears. For each discussion and reflection in class, Jenny feels like her knowledge grows, and she would be prepared to have such discussions in a future workplace.

What is the result?
Monica can now reflect on sustainability within her knowledge base as a 2nd year, and feels all the more prepared to reflect on the topic in her work in the future.

Scenario 3 – 3rd year student
What is the goal?
Sondre prepares for his bachelor thesis. He wants to write about sustainability, as it's a relevant topic in the domain, and it could make his thesis stand out to employers. Sondre needs to build upon his current knowledge on the topic, by bringing in other views and dilemmas, to make his understanding and thesis more dimensional.

How to achieve the goal?
Sondre notices that there are things to join during the sustainability month, which suits his needs, and also his personal challenges. Sondre joins talks with fellow students, which he attends to discuss his bachelor topic, and also to push his boundaries with new people. Sondre also attends some talks with industry, and listens to what views they have on sustainability. There were many interesting inputs, and he could now understand more of what is expected of him. He also talks to some people from industry after, and discusses his thesis with them, to hear about its relevance in their eyes, and to get contacts in the domain.

What is the result?
The activities bring him new perspectives on sustainability, and makes him more confident on writing his thesis on the topic, while also feeling more prepared for his future.

Scenario 4 – Lecturer
What is the goal?
Tone has learned over the years that the topic of sustainability becomes more and more important, but she struggles to know how to implement it into the bachelor study she is the leader of.

How to achieve the goal?
Tone joins in on the idea of including a sustainability focus month into the study plans. She sees the month as being an adaptable, open solution, where her lecturers and the other study directions can work together, learn with students, and adapt their own course contents in correlation with common activities. It can be adapted as it goes along, but also change year from year, and follow the developing world. She also notices that the sustainability month has a reflection focus, where knowledge is built together, which could be more motivating for both lecturers and students. It won't demand too much of her lecturers considering reading up on the topics, and it's a new, creative approach which can break barriers in classrooms.

What is the result?
Tone can now deliver a versatile, inclusive solution that helps both her, her lecturers and her students to become more aware on the topic of sustainability.

As these scenarios' behaviour is driven by goals, important aspects the solution needs to include appears. These scenarios have highlighted the need for a clear and highly available time table, with information, times and topics. The month should therefore be branded and have a design theme, which makes it visible and seem important. It can not happen in the background, and be open to the possibility that students don't know about it. Students need to be informed, and it needs to be brought to their attention.

The course classes should have the opportunity and time set-up to correlate with common activities, such as guest lecturers, seminars, etc. They do not need to happen on the same day, but in an order so that topics from common activities can be discussed in class not long after. The first weeks can contain mostly common activities, while the remaining weeks can involve more class and delivery focused aims.

4.7 Benchmarking

After doing some research, it was discovered that some American universities have a month each year dedicated to sustainability, and that an organisation, focused on higher education, provides templates and tips to hold a sustainability month.

1) University of Buffalo
The University of Buffalo, in America, had their first sustainability month in March 2016, and holds it each year in March. Their month was highly inspired by the UN's Sustainability Goals, as all events were linked to a goal each. In the example below, a breakfast meet-up with a campus group named WiSE was linked to Goal 17: Partnerships for the Goals. They had guest lecturers and various speakers on themes connected to the goal and to the collaboration with WiSE. The university has provided the students with a full overview on their website, which figure … is collected from, with information, content, time, and place. University of Alabama has also gone with a registration set-up, where most events require registration. Some events, such as biking on campus, only provide information. Events hosted by the school, and by various campus groups, have registration, because classrooms need to be booked, and for some, food and drinks have to be provided (University at Buffalo, 2023).

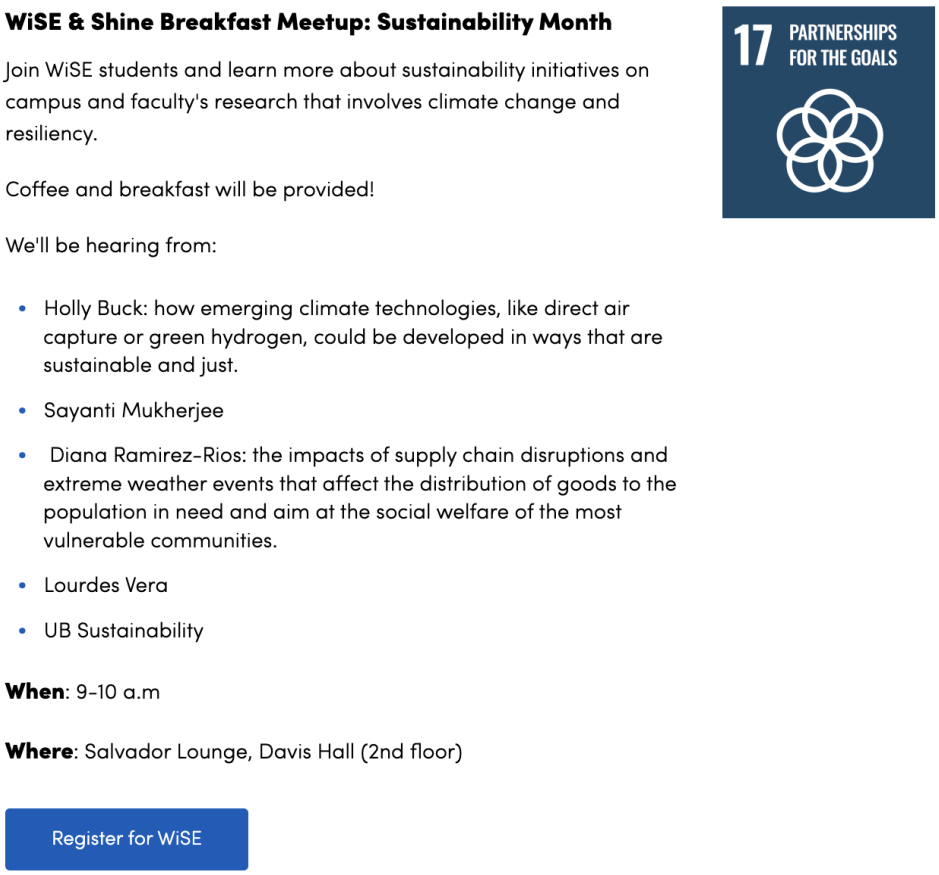


Figure 4.16: University of Buffalo Sustainability Month Event

There is some lack of information on this sustainability month, as the time-schedule/ overview was hidden far into the university's website, and there is no information on how much information is shared physically at school through media, vocal messages, etc. By looking at the overview itself, the information is well displayed, with clear instructions as to where, when and how to attend. Everything was in one place, and was therefore functional and easy to comprehend. If the registrations are linked to a personal time-schedule is unknown, but would be a great addition to the registration aspect. As for the contents of the sustainability month, there is a varied and high quantity of activities and events. The days are only categories by their dates, and not by content, which could make the content hard to comprehend. Both thematic and date categorization should be available, to help students find the events that suit them the best. Having all the events linked to UN SDGs is a wonderful method to use, if the school is devoted to, such as NTNU is, but it should also not set any constraints for content and types of events.

2) Lafayette

Lafayette is a university in Pennsylvania, America. They have a sustainability month each October, and started the tradition in 2017. The month focuses on highlighting ways students, faculty and staff can make changes for the better and be involved. The month contains events such as lunches, workshops, seminars, lectures, and the like, and in comparison to Buffalo, they are arranged by the school, groups at school, or people from the community. Their time schedule is built up as a grid with images and time and place underneath. Not much information is shared on the front page, but there is more

information linked through the images, which brings the user to a new site. Students do not have to sign up, but can use a punch Card to register their attendance. The punch card works as a reward program, where students collect the card, ask for a punch at the events they attend, fill it up at more events, and deliver it back to receive a prize at the end of the month (Lafayette, 2023).

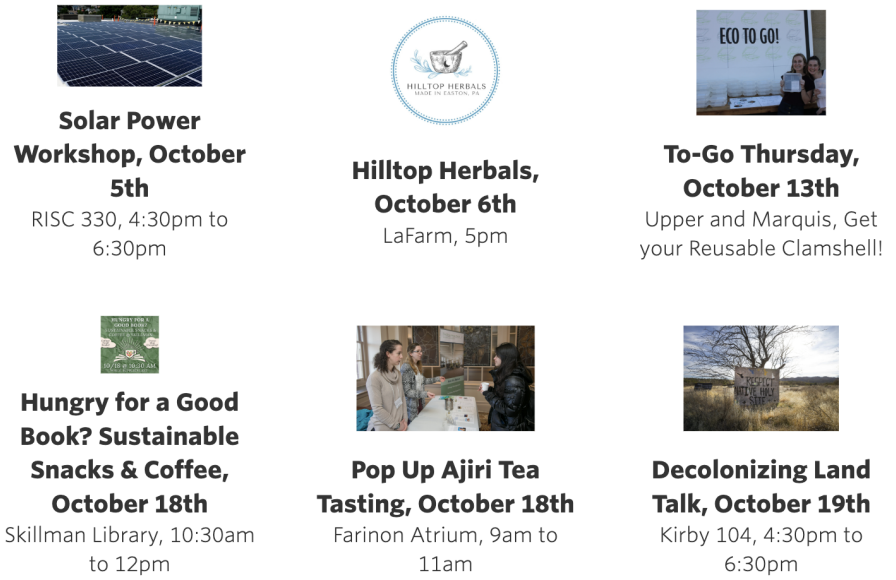


Figure 4.17: Lafayette Sustainability Month Events

The information on their website is vague and lacking. The month has not yet been held, and is 5 months away at the time this master thesis is written, which could be the answer as to why there is little information. Their events are ready and set-up, though, in a grid which is hard to understand. The grid has various amounts of columns, and the text information falls on various amounts of lines. The dates, times and places are also not highlighted enough to differentiate it from other information. Overall, it is hard to read and comprehend.

As for the punch card, this is a method that is not often used in university settings. The idea of having a reward (something to motivate the students), and also not having to register for each event (dropping by is possible), could put pressure off of students, and motivate them to attend as well. This aspect does not bring an academic motivation and push on the students, but it is a good idea for a sustainability month which is not connected to specific studies, such as design.

3) California State University

California State University, campus Long Beach, holds a sustainability month each October. Their focus is on virtual events, but they host several in-person events as well. The month is hosted by CSULB Sustainability, Sustain U, Sustainable Transportation, and other campus and community partners, instead of the school itself. They collaborate to offer free events to the students (California State University, 2021). Their time schedule and plan is displayed as in figure 4.18, with a descriptive image, some information on the event, and time and place separate from the other information. The events range from presentations, talks and activities such as hikes (California State University, 2021).

Clean Air, Cool Rides (on-campus event)

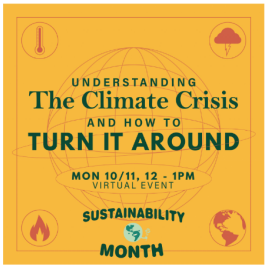
Brought to you by: **Sustainable Transportation**

Wednesday, October 6 | 11am - 1pm

Friendship walk (Outside North side of USU)

Did you know that in 2020, Southern California saw the worst ozone pollution levels and highest number of bad air quality days since the mid-1990s? And did you know that on average, transportation makes up 21% of a student's carbon footprint? Stop by this event to learn the many ways that you can help reduce air pollution, fight climate change, and make a positive difference!

No registration is required, just drop by!



Understanding the Climate Crisis & How to Turn it Around (virtual event)

Brought to you by: **CSULB Office of Sustainability**

Monday, October 11 | 12 - 1pm

Tune in for a presentation that will broaden your understanding of the climate crisis and empower you with knowledge about the available solutions for mitigating the impacts of a warming planet.

REGISTER

Figure 4.18: CalState Sustainability Month Events

The month does not seem to be a large production, as there are only 6 events and the information is hidden within one of the host's page on the school website. But as for the displays of information, each event has enough information to arouse an interest, and important information, such as time and place, is highlighted enough to notice. Some events need registration, which is marked well, and some only require showing up. The mix could help the amount of people showing up, as registering for something that does not need a register is an unnecessary step for the user. Having the various sustainable groups on campus be the hosts, and in general a part of the month, is a great idea to nourish the non-profit people school-events are usually driven by. Such non-profits usually like to take advantage of opportunities to spread their aim, which a sustainability month is a great platform for.

4) Association for the Advancement of Sustainability in Higher Education

The Association for the Advancement of Sustainability in Higher Education (AASHE) provides templates, advice and information on how to hold a sustainability month, in association with them. AASHE follows the international celebration, which is held in October (in similarity to Lafayette and CalState). AASHE suggests teach-ins, sustainability pledge drives, zero-energy concerts, waste audits, green sporting events, letter-writing campaigns, service projects, etc., as possible actions to take during this month (AASHE, n.d.-a). AASHE mentioned that this month is held in October because it is the start of the school year. AASHE has a collection of previous webinars during sustainability months, which can be used as inspiration for tactics and tools. They also suggest templates for schedules, and possible content. Their promotional toolkit, which is available for free online, provides images for social media, email chains, and many other tools to use when planning a sustainability month. Figure 4.19 displays one of the email templates AASHE provides, which is the first of many emails when contacting a potential speaker (AASHE, n.d.-b).

Steps to Host a Campus Sustainability Month Webinar - Email

**For event planning tips and ideas, see Campus Sustainability Month Tips.*

Step 1. Call for Webinar Speakers

Subject Line: Speak at [INSTITUTION NAME]'s Campus Sustainability Month Webinar

Dear [NAME],

This October is Campus Sustainability Month! To celebrate, [OFFICE/DEPARTMENT NAME] is putting together a list of events to take place throughout October. We wanted to reach out to you specifically to ask if you would be interested in speaking at a webinar to celebrate and inspire sustainability on our campus.

The purpose of this webinar is to celebrate sustainability at [INSTITUTION NAME] and inspire our students, staff and faculty to be change agents for sustainability. This webinar will take place on [DATE] at [TIME] over [PLATFORM (ex. Zoom)]. We would love it if you could speak for [LENGTH OF TIME] about [TOPIC] and answer audience questions.

If you would be interested in speaking at a webinar to celebrate Campus Sustainability Month, please let me know by [DATE]! I appreciate your time and look forward to working with you on this exciting event.

Sincerely,

[NAME]

Figure 4.19: Email Template by AASHE

Having tips and tricks all together in one place is a great idea and concept. This could potentially make the process of planning, contacting, posting, promoting, etc., easier for many planners. The issue lies with everyone having different needs and ways of doing things. What works for one university might not work for the next, considering the school's size, course selection, space, and more. Many of their suggestions for written templates are vague, which makes them easy to adapt, but also not as necessary as they seem. Their graphics, for example for instagram and other social platforms, are not possible to edit. The graphics have the logo, theme colours and content from AASHE, which will not be suitable for most universities, who have their own graphic profile to follow. All in all, the idea is great considering it could push and motivate universities to start a sustainability month. But, the contents of the toolkit and how little adaptable it is, make it hard to use. With more adaptability, for universities to make the toolkit content into their own, it could have been deemed more successful.

Figure 4.20: Instagram Graphic from AASHE Toolkit

4.8 Quality of Analysis

Hatch (2002) encourages combining different research designs, as this can help to provide several perspectives on the phenomenon being investigated (Hatch, 2002). In this thesis, including sustainability in bachelor design-studies is being illuminated by using literature study in the form of a systematic research review, step-by-step deductive-inductive analysis, in the analysis of the empirical material, and creative, design-based affinity workshops, as well as various design methods. But, one should discuss the extent to which valid and reliable assessments have been achieved in qualitative studies (Befring, 2007). An assessment of the analysis process, in the context of being able to draw credible conclusions, is particularly important (Befring, 2007). In this paper, it has been chosen to assess the quality of the project by discussing the two quality indicators reliability and validity. These criteria are about describing to which extent the analysis' carried out an overall perspective that can be said to contribute to knowledge (Tjora, 2021).

4.8.1 Reliability

Reliability is about how reliable a project can assert to be, and about assessing the extent to which you find an internal logic and coherence in the project. The SDI analysis, in combination with Nvivo, provides good opportunities to work systematically. The SDI analysis also gives the reader good insight into the various sub-processes up to the finished analysis. Combining the SDI analysis with Nvivo provided a good starting point for being able to process raw data, so that one does not lose anything that may be relevant during the process. The use of theory, description of the analysis process, from raw data to analysis data, to code structure and code groups, makes the process visible and transparent. It is believed that using the SDI analysis tools gave the project a good internal logic that can be communicated in an easy-to-understand-way for the reader. Workshops were also described in detail, through methods, analysis and findings. The process can also, therefore, be deemed visible and transparent to the reader.

There are reliability issues that follow the fact that the two workshops were done differently. Therefore, the lecturer workshop-results need to be looked at with a more critical view. This is because the facilitator completed the category and naming tasks alone, and the rest were done over email, without any possibilities for discussions amongst the lecturer participants. The lecturers were also not able to discuss amongst themselves, in comparison to the students who held all activities together. Therefore, personal opinion shines through to a larger extent than with the students. There was also a lecturer-participant who did not complete the last task (forced ranking), for reasons unknown. The complications of digital communication shines through here, as the lecturer did not respond to emails and give a reason for why they could not complete the task. The trends are therefore found amongst five answers instead of six, whereas all other tasks were completed by six participants. This results in the data not displaying all of the same views as the other tasks, by losing approximately 17% of the answer-base. Therefore, the final, trending scale does not mirror the same group of people as the previous tasks. But, 5 scales of opinions provide enough data to represent the lecturers and draw relevant data out of the answers.

4.8.2 Validity

Validity is about plausibility. It is about determining to what extent the approach that has been chosen can be said to be the best for creating a logical connection in the project as

a whole. Validity is therefore about determining what logical connection there can be said to be between the design of the project and "the questions that motivate the investigation in the first place" (Tjora, 2021). For this paper, it was chosen a social constructivist perspective as the superstructure for the project and a hermeneutic perspective as a backdrop for the analysis work itself. Here, language and text interpretation play a central role. The perspectives fit well with the choice of interviews, where one of the main purposes is the interpretation of opinions. Kvale & Brinkmann (2015) describes qualitative research as contextual where phenomena can only be understood in their context. The scientific theoretical approach that was chosen is therefore a decisive context for how the author understood the interviews.

The choices made during the analysis process were mainly made on the basis of the research questions. When it comes to how valid the project can be said to be, it has been an attempt at using these two criterias to argue that these choices show a good logical connection and a holistic way of thinking, which is ultimately intended to contribute to new knowledge.

4.8.3 Research-Ethical Assessments and Reflections

Throughout a research process, as a researcher, one must be aware of the scientific responsibility. The balance between looking after the informants and findings can sometimes be experienced as challenging. In order to raise awareness of the scientific responsibility in this thesis, some of the general research ethics guidelines drawn up by the national research ethics committees will be highlighted.

Throughout the research process, it is important that researchers have ethical reflections and assessments. The researcher must work from a fundamental respect for human dignity (De Nasjonale Forskningsetiske Komiteene, 2021). Findings must be presented in such a way that it gives as accurate a picture of the informant as possible (Kvale & Brinkmann, 2015). The informants have a right to sufficient information about the research field, the purpose of the research and who has access to the information (De Nasjonale Forskningsetiske Komiteene, 2021). Although the informants are anonymised in the thesis, some personal information will be collected during data collection in the form of study-direction, and/or what the lecturers work with. In such a process, consent must be obtained from those who participate. Requirements for consent are anchored in the Personal Data Act (National Research Ethics Committees, 2020). The requirement for consent is to prevent violations of personal integrity and protect the informants' freedom and self-determination. The consent is free, this means that it has been given without external pressure or pressure for freedom of action. The informant can themselves decide to withdraw without this causing any inconvenience. It is the researcher's responsibility to inform the research participants of this information (De Nasjonale Forskningsetiske Komiteene, 2021). All the informants gave their consent verbally, in addition to written consent prior to the interview. In this way, the informant's autonomy, integrity, freedom and right of determination, as well as the research ethics guidelines, was safeguarded (De Nasjonale Forskningsetiske Komiteene, 2021).

For this project, it was possible to collect data from students and lecturers in HE, because it is possible to obtain consent of students who are over 15 years old (Datatilsynet, 2022). The informants were informed that the information was confidential and this meant that the information should not be passed on in ways that would allow the informant to be identified. The information obtained also has a limited reuse. An in-depth interview for a specific research purpose cannot be used without further ado for other research.

Reuse of the information requires new consent from the research participant. Therefore, all recorded audio-tapes were deleted after use. This was communicated to the informants before the data collection began (De Nasjonale Forskningsetiske Komiteene, 2021). Early in the process, after the preliminary problem and interview guide had been determined, the project was reported to the Norwegian Center for Research Data (NSD). Since interviews were recorded, observed and obtained signatures in the information letter, the project was mandatory to report. The project was approved by NSD on the 19th of January 2023. The requirement for anonymity is satisfied in this project by the fact that the informants are given no names. In this way, the informants must be sure that the author keeps everything they say anonymous and that identification of the informants is not possible (Christoffersen & Johannessen, 2012). Transcripts were deleted at the end of the project in May 2023. As for the workshops, no additional information than study-directions for the students, and that they work for NTNU ID for the lecturers, is collected. There is no recording, audio-tapes, transcripts and the like, collected from the workshops that still exist. Only what the participants produced during the workshops and interviews itself, which is data that holds no personal information, is what is left.

4.8.4 Integrity

Protection of the integrity of test subjects and informants is a particularly important research ethical norm. This is an ethical norm that focuses on protection against various forms of risk by taking part in research, and the protection of participants' identities. Protection of anonymity and thus privacy is central to the protection of integrity. Furthermore, it will generally be more difficult to ensure the anonymity of informants in qualitative studies than when using collective quantitative methods. Whether it is an observation or an interview, individuals will appear in a direct and visible way. In personal conversations, the informant will tell in their own words about experienced events, which may be recognizable to others. However, this thesis is approved by the NSD, and all participants have signed a waiver to accept the chance of them being recognizable based on personal information shared by them in conversations/interviews, as well as their work-positions and study-directions. Otherwise, all personal information is not available in this thesis.

To ensure validity and quality, each transcription of interviews was done with utmost discretion, and all words except interjections (sound-words like ‘hmm’, etc.) were included. All methods have been carried out with validity and quality, and factual considerations have taken precedence over preconceived notions and assessments.

4.8.5 Ethical Challenges

Ethical challenges can arise despite having clear ethical guidelines to adhere to in advance. Therefore, one should be particularly conscious of considering all possible ethical dilemmas before starting a research project (Silverman, 2014). In an educational context, one will have a special ethical responsibility when the informants and participants are students and lecturers. This is a vulnerable group of informants which makes it particularly important to follow current ethical guidelines (Hatch, 2002)).

Halkier & Gjerpe (2010) describe four ethical considerations that one should be aware of when using interviews as a research method. These ethical considerations will also be applied to workshops, as it deals with the same sample of people. Firstly, the anonymity of the informants/participants must be respected. The naming issue was solved by grouping the informants together, and categorising them by numbers between

1-6. The interview groups were as follows; Current students 1-2, Former students 1-6, and Lecturers 1-3. The participants in the workshops were grouped as students 1-7, and lecturers 1-7. Secondly, the informants received information about what the project was about, and what information would be shared about the informants/participants in this thesis. This information was shared via an information letter and a declaration of consent, for the interviews, that all informants signed before participation. For the workshops, as they contained less to no personal information being shared (only study for students), the participants received information vocally before the workshops started. The informants during the interviews were informed about what the project entailed orally as well, and those who were interested in appearing for an interview were asked to read thoroughly through what they said they were willing to sign. The third point is not to make promises that cannot be complied with in practice. Therefore, no unrealistic statements and promises were communicated between the author/facilitator and informants/participants.

The last point is about following good behaviour as a facilitator. In connection with this fourth point, Befring's (2007) thoughts on power relations and ethics can be mentioned. Befring (2007) refers to the ethicist Løgstrup's statement that "ethics and morality are linked to the fact that we humans are always dependent on each other, and have power over each other". Because of this power relationship, one must follow basic ethical principles, and Befring believes that this particularly applies to researchers (Befring, 2007). As a former employee and student at NTNU, there may be a form of asymmetry in the facilitator role in the interviews and workshops with students and lecturers, at the same institution. There was no direct response to the author's role as facilitator from the informants/participants in either situations, and in the introduction to the methods, the facilitator role was explained, so that the informants/participants were aware that the author entered as a moderate participant in the discussions.

As the lecturer workshop and all the interviews were held digitally, some mentions of privacy and confidentiality has to be mentioned. As information is shared more and more online, potentials for data breaches appear. Online sessions could potentially be recorded by either a participant or a host, which makes the space potentially non-private. The online workshop and interviews were held on a platform that has a record-option, but it was not turned on by the host or any participants. As of this moment, in 2023, Microsoft, the owner of Teams, has not developed the application to be privacy-friendly beyond this. If a participant, or host, were to take recordings or screenshots from the computer they were using, the Teams application would not be able to notify the participants. As this is an aspect that is out of the author's control, this is a faulty possibility.

Another aspect is informants/participants not being comfortable with turning on their cameras. It is therefore important to create a safe space for all who participate, and make sure to mention they will not be recorded (only audio in interviews). By setting up the situations with clear and informative notes, the guidelines will be clear and the informants/participants will feel that their privacy is respected.

4.8.6 Biases

Biases are opinions that are based on reason, but that has the potential of being based on personal matters. Biases is henceforth a result or conclusion that systematically deviates from the real conditions explored in a study (Grønmo, 2020). In the Centre for Data Ethics and Innovation (2020), the term is defined as an outcome that is not only skewed, but shifted so that the outcome is unfair. For this thesis, biases are found to

separate irrelevant personal opinions from goals and needs. People's opinions are important in design, but some opinions that move beyond the thesis topic, should be identified, and kept in mind, while developing a solution. Identifying biases, in this case, can be seen as looking at findings with a more critical eye, to identify which goals and needs have to be considered with more care. The biases are collected and reviewed based on instances where the user groups have shared their opinions, which are interviews and workshops.

Student Biases:

The biases for students are collectively covering interviews and workshops. Firstly, most students expressed feeling the amount of school was enough, even though they worked less than expected. This opinion can be rooted in school feeling chill and without much pressure, and that there therefore is no interest in having more to do. The student's amount of school is not equal to most other studies. As these other students, design students probably have the capacity to do more. The opinion of not wanting more school could also be rooted in sometimes feeling like there is a lot to do, which is true at the end of semesters. But, that reasoning is also based on their own preference, and it is not the school's/course's fault that students don't pace their work more during a semester.

The students said that they prefer group-work most, because they can work with friends, and that makes the work more reliable and fun. Many expressed that randomised groups weren't something they preferred either. This could reflect that friends are the driving factor for liking group work. This is not a complete bias, as the students might actually work better together. They might want to pick groups themselves because they have knowledge on which friends have the same work ethic. The students' reasons for not wanting individual work were reliable as well.

Opinions on voluntary assignments are not based on educational reasoning, as the sole reason seems to be to not want to do them if not extremely necessary. The students are not pressed for time, so the matter lies on interest. There was no education-based reason behind their compulsory assignment preferences either. It was based on personal life, free time and work. But these are all good reasons, as school/lecturers should cater to these aspects to some extent.

What the students know about sustainability and design can be affected by their focus-level and interest, as well as interest/capability to pay attention in class. Students do indeed learn about sustainability, as seen when looking into plans and asking their educators, but the amount of knowledge varies. But, it might only be mentioned without being highlighted, and difficult to catch during class.

When it comes to none of the students feeling ready for work, considering implementing sustainability in all that they do, this can be a biassed answer considering they might be uncertain about work life in general. This question also puts pressure on them, as sustainability is not implemented in huge amounts in worklife. But, it is implemented to a large degree in some places, as seen in interviews with people that are working.

Lecturer Biases:

Some of the lecturers are quite well adjusted, and have found well-functioning ways of teaching and keeping the curriculum relevant. But, this aspect might also make them *set in their ways*. They prefer how they have already set up their courses, understandably so, as it currently works. Adding to/changing the curriculum might not be something they are very open to. As seen in the answers to: *where is there room in your curriculum?*, all participants avoided answering it directly, and instead answered what

they are doing now, and how well it works. These answers are therefore somewhat biassed, and obscured, but it also brings necessary data on their knowledge on sustainability within what they teach. Their knowledge does not reflect the knowledge of other lecturers within ID though. The lecturers in interviews chose to take part because of their interest in sustainability. The workshop, on the other hand, brought in a more varied group of lecturers, where some joined to bring opinions as to how they wanted to learn more, and some brought opinions on how they can spread their knowledge with others.

5 Solution Proposal

Based on all findings from the previous tasks, a complete solution proposal will be presented. DSM will include several aspects, based on needs and user-goals. All in all, DSM will be a motivating, inclusive and engaging month to learn and reflect on the subject of sustainability. DSM will work as a motivating carrot for the students, and not as a whip, telling them what they do wrong within sustainability. DSM is to hold its focus on possibilities, dilemmas and a future-focused headspace.

5.1 Design Sustainability Month (DSM)

1) When

The solution proposal is dedicating a month during the first semester each year to sustainability. The proposal is that the month will be held in October, as this is an international sustainability month in general, and because students are not yet fully indulged in their deliveries, exams, and thesis' at that stage in the semester. Students' schedules are seen to be more open in this period of time, with the average of 1-2 lectures per week during the entirety of October. As for first year students, they have gotten enough time to familiarise themselves with what they are studying and some basic information from course contents. Second years are in a normal study-period, with no deployment for interaction designers until the next semester. Some third years have started to work on their thesis, but otherwise it's a normal semester for them as well.

2) What

DSM will be separated into three main parts. The first, common activities, will be a handful of seminars, workshops, guest lecturers and the like. These activities can be attended outside of class by all design students, and can be spread out over the course of the entire month. These events will be optional, and can also be supplied by more fun, less content-based things, such as lunches, walks, etc., which can be planned by various campus-based, student-led non-profits. These common activities have a lot of potential by including all organisations, stakeholders and faculty on campus, as well as local organisations, to be included and bring an event to the table. All sustainability related events are welcome, but the focus and emphasis needs to lay on the more content-based activities, such as workshops, seminars and lectures. Each common activity should be marked with who the activity suits the most, considering topic and/or year, but should be held open for all participants, for those with an interest. The marking is then more of a pointer for lecturers to make recommendations to their students, and for students with less of an interest, and time, to prioritise what to attend.

The common activities are, as mentioned, open to adaptation and can include almost any kind of activity. But some parts need to be specific, such as having the

largest quantity of activities bring knowledge and information on sustainability, as that is the main goal. Another specific requirement is to have industry/future-work related activities. Specific days with visitations from industry is common at NTNU, and so one of the activities will be inspired by this. The students should get a look into how their future might look, in relation to how much sustainability, in relation to design, they should know at work. This also opens up for discussions, question asking, and building bridges with potential future employers.

In addition to these common activities, course coordinators will be expected to include an extra focus on sustainability in classes as well. If a course already has sustainability in its curriculum, they should aim to teach on those topics in the month of October. If the classes consist of feedback-sessions in October, with groups or individuals, they can discuss ways to make their projects more sustainable, and possible dilemmas and view-points that can be added into the following project-report. For regular lectures in courses that do not have enough or any sustainability to focus on for a class or two, discussions are a great method for inclusion. Lecturers have expressed a struggle to know what to include sustainability in their courses, and linking them to the UN goals. During DSM, there will be no expectation for the lecturers to have completely curriculum-based knowledge on sustainability, and to know the answers to all questions. It is expected for lecturers to have developed some pointers, and possible sustainability topics within what they teach, but only enough to start some discussions. Lecturers can make a slideshow, hold activities, group discussions, etc., based on dilemmas inspired by findings online, or any activity based on the lecturer's imagination. As the lecturers learn with the students, in common activities, there is also room to bring up topics from these activities, and start discussions in class as to how those topics could be included into the course. The opportunities are endless, and the aim is for lecturers to have an open mind and not be afraid of their lack of knowledge. Sustainability is a broad topic with many answers. Try to find them with your students. If in need, lecturers can collaborate and bounce ideas off each other.

The third man area is deliveries, that are either delivered at the end of the semester, or during the month of October (a decision each course coordinator has to take). They are expected to include at least one requirement within SD in design. What this one, or more, requirement/s are about, is up to each coordinator. It can be based on information given in common guest lectures, workshops, etc. (to boost attendance in common activities), or based on curriculum and topics brought up in discussions in class. Some reflection should be included in deliveries, to always remind the students of its importance, and push them to think. The delivery requirement, to have one or more pointers on sustainability, needs to be rooted in something the students have had the opportunity to learn, which is either topics/dilemmas talked about in class, or specific thoughts on sustainability the lecturer and student found together in feedback sessions. If deliveries are at the end of semester, sustainability in feedback sessions can of course be brought up at a later time, but the first pointers as to how students can include it in their deliveries, should be talked about in class during DSM in October. This is because the knowledge is fresh and the students will be in a more sustainable head-space.

Through deliveries, in class activities and common activities, the students are supposed to be able to reflect on the topic of sustainability. Some knowledge must be built first, but most knowledge on sustainability is built from self-reflection and critical thinking, since sustainability is such a complex subject which is hard to teach. By also developing these critical thinking and reflection skills on sustainability, and hearing from the industry in common activities, the students can feel more ready for their future and be prepared to include sustainability in tasks at a workplace.

3) How

For these activities to happen, there needs to be a great amount of planning behind them. Bookings, time schedules and plans need to be made. All stakeholders must therefore communicate, and work together, to make DSM work. The planning and DSM scheduling needs to be done with class schedules in mind, for all years and design-study directions.

Common activities, with knowledge sharing, should be scheduled at the most convenient times, within the normal school times from 9am to 4pm. More fun, bonding activities, held by non-profits, can take place after. For industry and guests, these times need to be booked and agreed upon. The booking, scheduling and plan should therefore be planned at least one semester in advance, to make sure people are available, and to have a set plan to share early with students and faculty. Some sort of plan, or first idea around a set-up, should be shared with students early in the semester, on the same terms as class content.

The in-class activities and pointers in deliveries is not something that needs much sharing apart from vocal messages and announcements on the course's digital page on Blackboard (NTNU's learning platform). But, the common activities need to be shared on a large scale to be known to all students. Lecturers can mention them in mails, in-class and on Blackboard, but there needs to be sharing in addition to these platforms. To have people take note of the events, posters and social posts can help. Placing posters, with QR codes to provide more information online, can help stakeholders take notice and keep track of the events, before and during DSM. Posts can also be made on NTNU and department of design websites and social media. All possibilities are welcome here. Inspiration can be drawn from Fadderuka, a buddy-program week made for new students, where an overview of the plan for the week is posted all over NTNU campuses.

To make DSM even more visible, it should have a graphic profile. This profile can be included in posters, social media posts, and other promotional media. Graphic profiles help to make something seem of high quality, by being coherent and modern. By having a graphic profile, DSM can be a recognisable trait for NTNU, on the same level as their buddy-week, which is a specific thematic week NTNU hosts each year, with bonding activities for students. An idea would be to set up a competition, where design students under ID could submit entries for possible graphic profiles. This could be a good start to tell students about these new events, and have them test their designer skills. Such competitions can be motivating for students, which again will make them take notice of DSM.

Such a large-scale happening needs to be planned by people who are assigned to do so. How NTNU handles such employment and role distribution is unknown, but one can imagine that there needs to be people in charge. This could be faculty members within ID that are passionate about the cause and would like to contribute. Some of these planners/initiators should have a significant knowledge base on sustainability, to be able to assist and give advice to lecturers that need guidance before and during DSM. As an example, there could be faculty in charge of bookings, coordination, and guidance. All in all, a specific team should be the drivers of DSM. But, as this could be an effort for the entire design department at Gjøvik, there should be held common meetings and workshops beforehand, where all faculty, and maybe students and the school's non-profits, can come together and pitch ideas for DSM content.

5.2 Solution Example

The solution proposal is supplemented by image examples, which will help visualise how graphics and information sharing could look. The graphic profile in the images below are completely imaginatory, and not a part of the official proposal. The profile is for visualisation purposes only. The content (names, event names, times, etc.) is imaginatory, while types of content, such as categories, placements, amount of information, etc., is imaged to resemble the real solution proposal.

As mentioned earlier, a thematic month filled with events and happenings, needs to have a strong graphic profile and high amount of content to share. DSM needs to be made visible to grasp student's attention and collect participants. So in addition to faculty informing their students vocally, and on course content pages, DSM needs to be made highly visible on school grounds and on the NTNU's social media.

Figure 5.1: Poster Idea for SDM

Posters, such as exemplified in figure 5.2 can be placed all over school, to mark DSM's beginning ahead of time. These types of posters should hold enough information to catch a student's attention and inform them of what is happening. The QR is thought to lead them to a web page with more information.

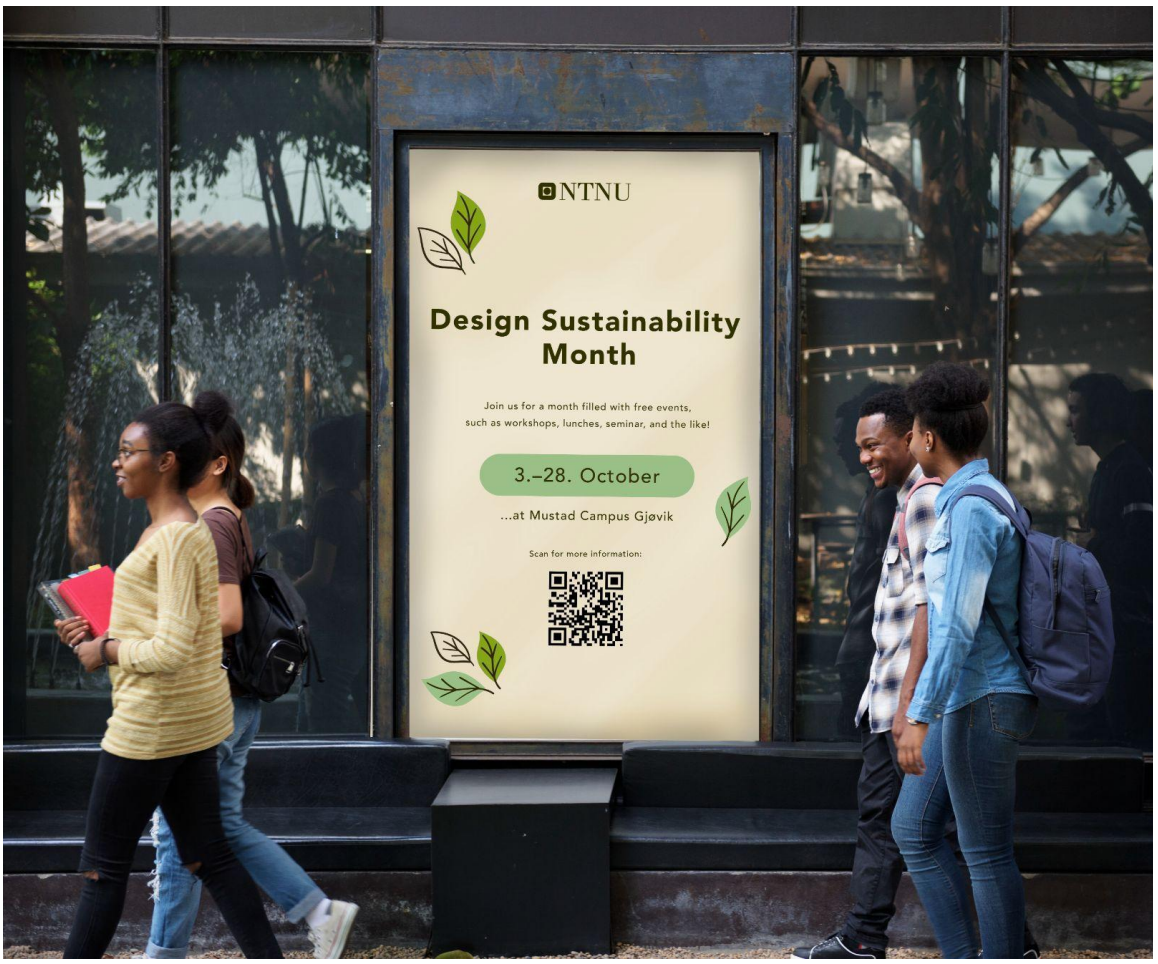


Figure 5.2: Mockup of Poster Idea at a Campus

As October is getting closer, more information should be shared, and time schedules are one of the more important contents to share. Posters with time tables, times and places can be hung around on school campuses (figure 5.4). Time, place and date should be highlighted, and separated from other information. A QR code should also be applied here, so students can scan it and receive more information on the event's webpage. This is also where registration happens.

Figure 5.3: Time Schedule Poster Idea

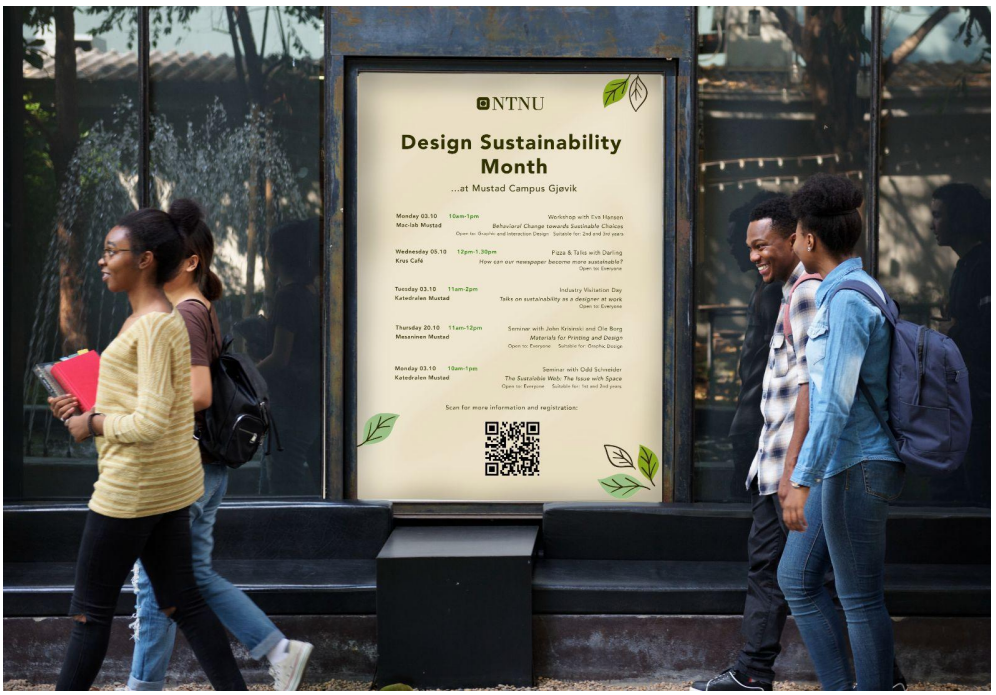


Figure 5.4: Mockup of Time Schedule Poster Idea at a Campus

When scanning the QR codes, students should be sent to a main page for DSM, where general information, contact information of people who can answer questions, and event information is displayed. More information can be added, when future planners see it as necessary.

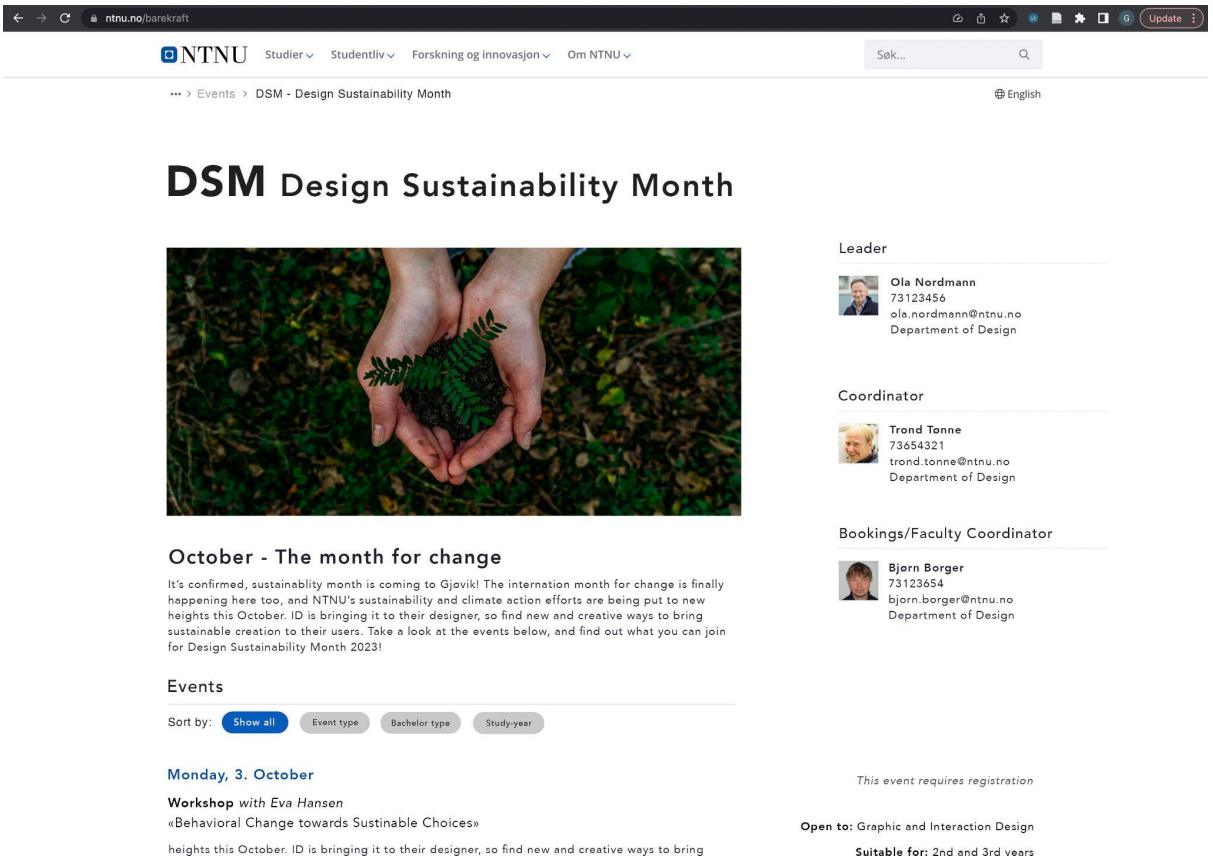


Figure 5.5: Web Page Idea

When scrolling down, the student should get an informative display of information on events. As a suggestion in benchmarking, the events can be categorised by showing all in chronological order, type of events, by bachelor types (according to suitable examples), and study year (according to suitable examples). The events are marked by who can attend, and who the event is mostly suitable for. This can be a recommendation based on which year you are currently studying at, or which bachelor. For example, a seminar on materials, with limited seats, should primarily be open to graphic- and interaction design students, as they use materials in class, and web development has none. If the seminar is on basic information as well, it could be marked as suitable for 1st and 2nd year students. Each event post should contain the name of host/guest, when, where, and basic information on the event's content. Next to location, an option to see it in NTNU's map service, MazeMap, could be linked next to it. A mark about if it needs registration or not, should be there, in addition to a registration button (if needed). There should be no room for misunderstandings overall in each post.

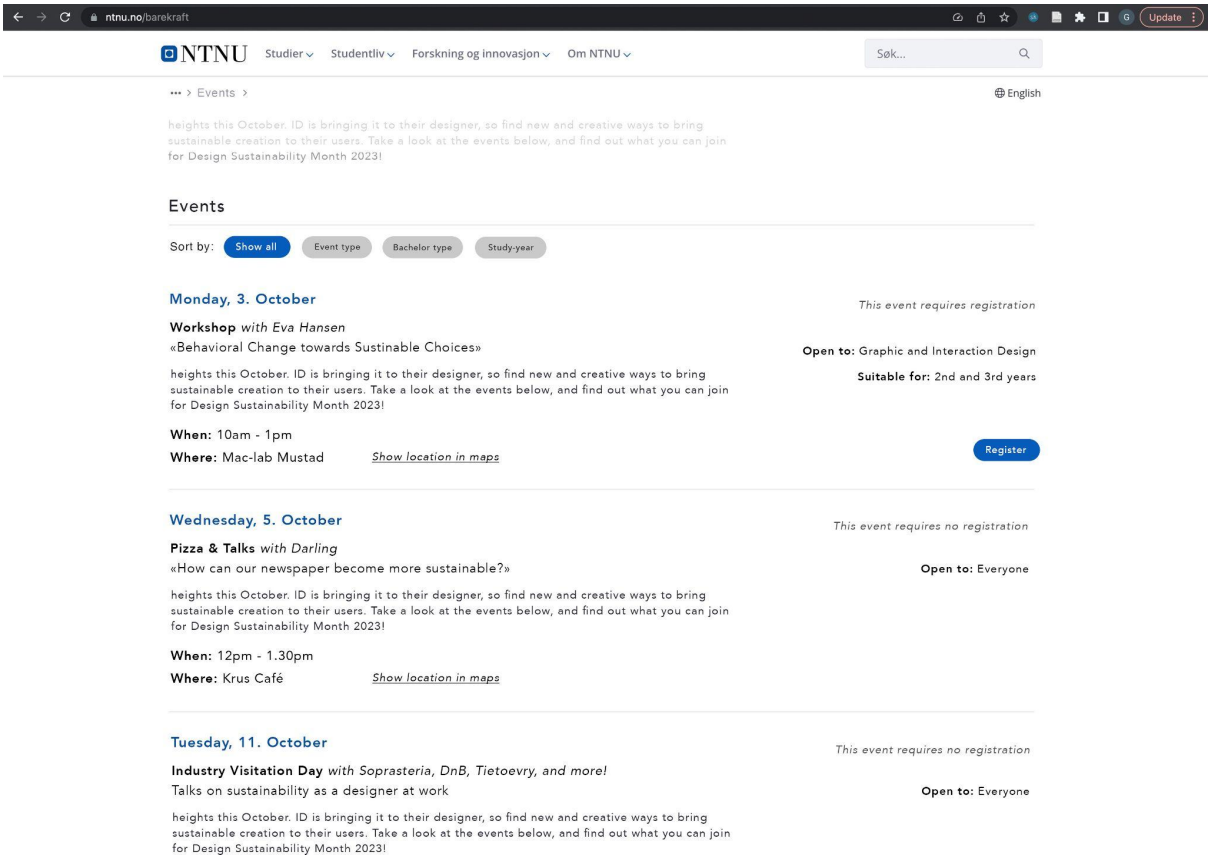


Figure 5.6: Events on Web Page Idea

When registering for an event, there should be an option to have the event show up on your personal time schedule, which NTNU provides. This time table shows a student's classes. It is not known if this is a real possibility, but some sort of calendar should be provided, to keep track of all registrations and events a student wants to attend.

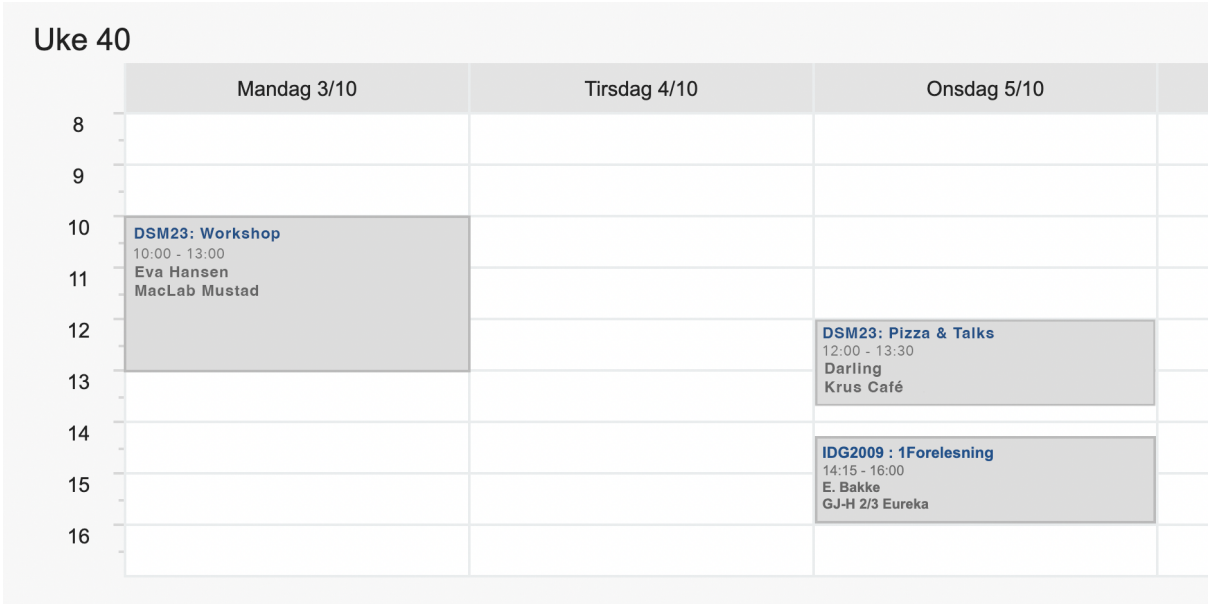


Figure 5.7: Example of Calendar with SDM Events

In addition to physical posters and the like, and the main web page, the event should be shared on social media. NTNU has a newspaper for instance, which should share an event of such a large scale.

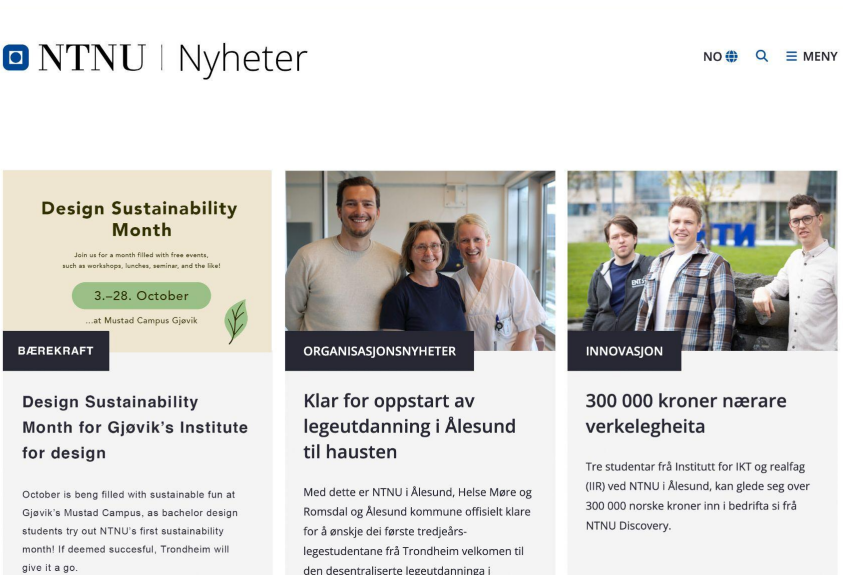


Figure 5.8: NTNU News Page with DSM

Same goes for popular social media, such as Instagram and Facebook. By informing students on the platforms they frequently use each day, the chance of them noticing DSM grows larger. Such content should summarise specific events, and provide links and information on where to register, find more information, etc.

Figure 5.9: Instagram Graphic Idea

6 Discussion

6.1 Possibility of Pressure on Students

Adding more to an already full study plan and completed curriculum poses a possibility for too much work and pressure on students. In an article by the University Paper in Norway, they have interviewed a leader within the Norwegian Student Organisation (NSO), Ingrid Foss Ballo (Mikkelsen, 2012). Ballo expressed here that students have unreasonably long working days and far too great a workload. NTNU's Student Parliament backs up these claims, by expressing that there is an ongoing educational race where only the brightest will manage to keep up (Mikkelsen, 2012). Ballo mentioned that some faculties have short semesters, and that the workload for these students becomes larger than what is advised. According to the norm for expected workload, students should not exceed the amount of 37.5, as this is the amount of a regular work week (Mikkelsen, 2012). So by adding more to a study plan, will pose the issue of pressure on students, as most of them already have a full work week. Adding in a sustainability week, with various additions to course content for students to learn, more compulsory points in deliveries for students to complete, and more activities for students to attend, this pressure can grow. To identify if this issue can become a reality, the affected studies need to be examined. Since DSM is planned to be used within the ID at Gjøvik, at a bachelor level to start with, the three design bachelors need to be examined for space, and possibility for implementation, to make sure the solution won't be too much for students to handle. As learned from interviews, both former and current students admitted to having less school than average (37.5 hours per week). Creative studies, like ID's bachelors are similar to, tend to consist of much practical work, which usually includes working/studying on one's own time. The ID bachelors have a mix between theoretical and practical courses, with most of their assignments being integrated into courses. This means that parts of the semesters are devoted to working on assignments, instead of having physical lecturers all the way through the semester. Based on when the students said they work the least and most, and based on when there are less lecturers on the study plan, October (the middle of a semester) seems to be a month with less pressure and less to do for the students, as well as the lecturers. Some former students even mentioned they felt they had so little school, it felt unfair compared to friends who were studying something other than design. A goal within DSM is also to include activities students like/prefer, which again can create more motivation than pressure. This topic of discussion is elaborated further down. Based on the students in the end-user groups being below the average on time spent on school, their statements in interviews, and their study plans allowing for more to be added to it, it is safe to assume that design bachelor students at NTNU Gjøvik have the capacity to add more into their studies.

As DSM tackles the topic of sustainability, another possibility of pressure arises. Sustainability in itself can be seen as a whip. Norway is today a society that is gradually becoming more and more concerned with consumption. Most Norwegians have the freedom to buy what they need, when they need it, and many also buy things they absolutely do not need. Society has acquired a consumer mentality where people constantly buy new things that might not be used, before it is thrown away. In other words, consumerism is a linear economy, where things are bought, used and thrown away. This is the opposite of a circular economy, where products and solutions are supposed to have infinite life through using sustainable methods. This linear mentality is

the last thing a society needs in a social development that should be sustainable. In addition, people become obsessed with these materialistic goods, and being told to let go of them, and not consume as they always have, is what feels like pressure and a whip companies are throwing on people. Asking people to let go of their normal, comfortable, consumerist ways is a lot to ask, since humans are creatures of habit. Therefore, being sustainable is seen as difficult and demanding, as it moves outside of people's norms and forces them to go outside of routine.

Many companies and businesses also convey sustainability by focusing on the negative. They tend to fill commercials and social media with the amount of emissions, the melting ice, overflowing scrapyards, and the like. These issues are real and an important part of sustainability, but people do not like to be told what "they do wrong". On a personal level, no one is the reason for these issues, but as a society, we are. But people take these commercials personally, and tend to therefore back away from sustainability, as it feels like a constant whip which criticises their consumerist ways. The solution to this issue, will be to convey sustainability through opportunities/possibilities, instead of faults. Instead of "the ice is melting, so you *have to* do this", one can turn it into "if you do this, look at the change you can make!". The whip needs to be replaced by a carrot, which can motivate people towards change, by showing the consumers what change can do. DSM can be the carrot, by holding its focus on motivation, and possibilities. Dilemmas is a great tool to mix in the faults, as the effects of sustainability are also important to convey. Dilemmas will simultaneously try to solve these faults with possibilities, which can bring an even balance between the whip and carrot. Bringing in engaging, social common activities can also remove the pressure, as sustainability can be associated with building bonds and having a good time.

6.2 Balance Between Motivation and "Just Doing"

To be motivated is to be engaged, active and alert. When a person is motivated, they have drive, are curious and want to achieve a specific goal or more. Motivation is the energy or driving force that gets a person to initiate, and that keeps them going towards completing what they are doing. One can say that motivation controls one's behaviour and actions in different situations. The positive thing about being motivated is that it makes a person engaged and more persistent in different situations. One can work more intensely and be more focused, and have their attention focused on what they have to do. Being persistent means to want to persevere, and that one perseveres when things get difficult. In a state of motivation, one will try to solve problems and challenges that are encountered along the way. When motivated, the desire to do something increases, and do more, which thereby increases the opportunity to practise. Therefore, motivation and commitment provides increased opportunities for learning and development (Cherry, 2022).

Motivation is not something that can be learned, but one can help to inspire and support the motivation and commitment of users. Knowledge of motivational theories can help to think systematically through which conditions may be of importance to the user group. It also gives the opportunity to assess what one needs to do to arouse users' motivation to take care of their own learning (Cherry, 2022).

Within traditional motivation theory, it is distinguished between extrinsic motivation and intrinsic motivation. Extrinsic motivation means rewards (for example praise, pay, good grades, etc.) or the absence of sanctions (for example negative reactions, risk of "punishment" if one makes a mistake) that occurs after an action has been carried out. Here, the source of motivation lies outside the activity itself. Internal

motivation means an inherent driving force that causes people to carry out an activity because it is perceived as interesting, and because it gives a feeling of happiness. The inner reward in the form of satisfaction, joy or meaning is linked to the actions performed. The joy or the positive feelings the completion of an activity or a task gives the user, makes them want to start, do and continue. The source of motivation lies in the execution itself (Cherry, 2022).

It is claimed that too strong a focus on external motivation, such as rewards, contributes to losing the motivation that lies in doing the actual work in an activity or a task. One can become more focused on the reward and not as interested or engaged in doing the task itself (Cherry, 2022). With the solution proposal for this thesis, there will be an underlying, external motivation factor throughout DSM, which is having the topic of sustainability implemented into deliveries. This could lead to the student's motivation being getting a good grade, instead of personal reasons. Then the 'motivation' becomes 'just doing'. Because when the students are internally motivated, the reward lies in the actual execution of what they do. People who are intrinsically motivated also more often apply themselves to more challenging activities or tasks. If the internal motivation is overshadowed by the external, the students might only engage in what has to be done, without the true interest to engage and pay attention. They will do what they have to, to fulfil the demands, and nothing more.

Within DSM, there needs to be a level of motivation for students to attend common activities and take part in course activities in class. Therefore, the motivational push should lay on internal reasons instead of external ones, such as sustainability being included in their deliveries. The weight of this should not be of the size that students feel pressured. Instead, it should be at a comprehensive, realistic amount, which does not bring more stress on the students. By motivating students by linking the activities and knowledge to their futures, and its societal value, their internal motivation might rise. Some students, who are interested in the topic and/or aware of there being a demand to know much on sustainability in their future, will have a great internal motivation and attend DSM at a high level. It was also proven in interviews and workshops that there is a real interest amongst all the informants and participants to learn more on sustainability. But not all students have this internal motivation, and could need some directional, aspiring words to boost their motivation. Adding social events could also boost internal motivation, as these loosen up the serious, academic tone of the events. So for DSM to run as desired, with motivated students attending and participating in all activities, the students who are 'just doing' need to be motivated by DSM's content and future potential, and brought up to a balanced level with their already, internally motivated, fellow students.

6.3 Potential for Further Development

This thesis proposes a solution proposal that has not been tested to the extent that it should. The idea of DSM was planned to be tested in a focus group, with lecturers, students, and other faculty members in attendance, where they were to give feedback on possible pain points and possibilities. Unfortunately, there was not enough time for this to happen within the time-limit for this thesis. Before implementing something at the scale of DSM, there also needs to be prototyping stages, where the solution-content goes through iterations and testing before being implemented. Therefore, the next logical development of DSM is to begin testing and tweaking the solution proposal towards implementation. By doing this, the solution will be better adapted and prepared for launch.

As the solution is currently developed for bachelor design students under ID, there are not many steps needed to include the entirety of ID to take part. ID consists of master degrees as well, which revolve around similar topics as the bachelor degrees. For master students to join, some content/activities need to be set to a higher level of complexity. Otherwise, the master students can follow the template for the bachelors, and no further change needs to be taken. As DSM is an easily adaptable solution, there is also a possibility for implementing it in the entire NTNU. By making it into a common Sustainability Month, each department NTNU has, such as ID, can adapt and control their own activities. Course and delivery implementation is up to each lecturer, which each lecturer in every possible course could do. As the solution is so adaptable, and this thesis proposes a possible set up for ID, each department and campus can adapt a sustainability month to their liking, and to fit their studies the best. The goal would be for the entirety of NTNU to include such a month. For NTNU to implement a sustainability month, as one of Norway's biggest universities, could lead to thousands of sustainability-focused future employees and tremendous change.

7 Conclusion

In the introduction to this thesis, it was generally identified a need for teaching more sustainability in universities, specifically in designer-education, as they create the products and solutions of the future. This need has been identified as true, by collecting first-hand data from design students themselves, and their lecturers. They expressed a lack of knowledge, and called for more sustainability in their learning, as students did not feel ready for their future working life, and lecturers felt as if they did not know enough to teach on the topic. True engagement to the issue has been seen in their statements, and a motivation to solve the issue has been identified among the students and lecturers. Through workshops with the focus groups, their goals and needs within the issue were found. As creative students and lecturers, they generated ideas in great numbers, and provided insights into what they saw as feasible and impactful. By adding various design approaches into the mix, which inductively explored all identified needs and goals, narrowed the scope down to one solution; a design-focused sustainability month. By taking the qualitative, design approach, the solution proposal can be deemed of high validity and feasibility, which gives it a high chance of thriving, and being the answer to the end-user's goals. This thesis has therefore proven that a design-focused sustainability month is the answer to the overarching research question, which reads: How can students be provided with tools that will help them address sustainability related issues in their education?

These tools contain engaging, common activities, which will remove the whip sustainability is known for having, and motivate the students towards participation. As seen in the workshops, both students and lecturers prefer creative and collective ways of learning. These common activities, which have endless opportunities, can be adapted to the department's needs, be inclusive in its nature and welcome both lecturers and students to learn together. For further elaboration, this combined knowledge can be brought into classrooms and explored in discussions and dilemmas through reflection and defining possibilities. This solution will therefore not put a lot of pressure on lecturers to know everything on sustainability, and the solution will help motivate students to learn and collaborate towards a sustainable future. Their entrepreneurial mindsets will grow and prepare them more for the working life ahead of them. Further motivation, with some academic push, will be provided through involving some sustainability-reflection into deliveries. By having the focus on reflection, instead of theory, this requirement will further their critical thinking, instead of becoming an extra requirement for them to "just do".

By having ID as the starting department, NTNU should follow their lead. For the university as a whole, the opportunity to include such a month will be revolutionary and the first of its kind amongst universities in Norway. This is a call for NTNU to become a bigger and more active participant in the changing world, and take the next step, to prepare their students towards becoming sustainability experts, by implementing Design Sustainability Month to their ever-growing academia.

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Appendix

Table 1:
Interaction Design Semester Overview
1st year, 1 semester: C - Compulsory, V - Voluntary

Code	Name	SP	Status
IDG1000	Graphic Tools, Principles and Methods	7.5	C
IDG1006	Physical Prototyping	7.5	C
IDG1292	Web Coding	7.5	C
IDG1362	Introduction to User-Centred Design	7.5	C
HMSID	Safety (HMS) and Practical Machine Course	-	C

1st year, 2nd semester:

EXPH0100	Examen Philosophicum for Humaniora and Esthetic Courses (ExPhil)	7.5	C
IDG1004	Colours in Interface Design	7.5	C
IDG1200	Basics in Psychology	7.5	C
SMF1007	Projects Management	7.5	C

2nd year, 1st semester:

IDG2000	Area Study: Design in Health Services	7.5	C
IDG2009	Communication	7.5	C
IDG3009	Information Architecture	7.5	C
BYGG2362	Universal Creation	7.5	V
IDG1101	Typography 1	7.5	V

2nd year, 2nd semester:

IDG2200	Design and Prototyping for Digital Products	7.5	C
IDG3002	Service Design	7.5	C
IDG3750	Sensoric- and Touch-Friendly Interaction Design	7.5	C
SMF2290	Ethics, Sustainability and Social Responsibility	7.5	C

3rd year, 1st semester:

IDG3541	Work in the Field, Part 1	-	C

IDG3541	Work in the Field, Part 2	15	C
IDG3006	The Things' Web	7.5	C
IDG3101	Depth-Project (fordypningsemne)	7.5	C
IDG3910	Bachelor Thesis, Part 1	-	C

3rd year, 2nd semester:

IDG3910	Bachelor Thesis, Part 2	22.5	C
IDG3800	Portfolio and Exhibition	7.5	C

(NTNU, n.d.-i)

Table 2:
Graphic Design Semester Overview
1st year, 1 semester: C - Compulsory, V - Voluntary

Code	**Name**	**SP**	**Status**
IDG1101	Typography 1	7.5	C
IDG1112	Photograph History and Image Communication	7.5	C
IDG1292	Web Coding	7.5	C
IDG1362	Introduction to User-Centred Design	7.5	C
HMSID	Safety (HMS) and Practical Machine Course	-	C

1st year, 2nd semester:

EXPH0100	Examen Philosophicum for Humaniora and Esthetic Courses (ExPhil)	7.5	C
IDG1009	Multi-Channel Publishing	7.5	C
IDG1010	Typography 2	7.5	C
IDG1051	Information Graphics	7.5	C

2nd year, 1st semester:

IDG2000	Area Study: Design in Health Services	7.5	C
IDG2014	Editorial Design	7.5	C
IDG2312	Typography History	15	C

2nd year, 2nd semester:

IDG2002	Colour Management	7.5	C

IDG2013	Calligraphy and Type Design	7.5	C
IDG2015	Strategic Design	7.5	C
IDG2342	Design History and Design Theory	7.5	C

3rd year, 1st semester:

IDG2009	Communication	7.5	C
IDG3009	Information Architecture	7.5	C
IDG3010	Packaging Design	7.5	C
IDG3950	Navigational Systems	7.5	C

3rd year, 2nd semester:

IDG2201	Design Systems and Universal Development for Digital Surfaces	7.5	C
IDG3013	Editorial Design 2	7.5	C
IDG3014	Subject-Wide Project, Portfolio and Graduation Exhibition	7.5	C
SMF1007	Project Management	7.5	C

(NTNU, n.d.-h)

Table 3:
Web Development Semester Overview
1st year, 1 semester: C - Compulsory, V - Voluntary

Code	**Name**	**SP**	**Status**
IDG1000	Graphic Tools, Principles and Methods	7.5	C
IDG1100	Basic Web	7.5	C
IDG1292	Web Coding	7.5	C
IDG1362	Introduction to User-Centred Design	7.5	C
HMSID	Safety (HMS) and Practical Machine Course	-	C

1st year, 2nd semester:

EXPH0100	Examen Philosophicum for Humaniora and Aesthetic Courses	7.5	C
IDG1011	Front-End Web Development	7.5	C
IDG1293	Advanced CSS	7.5	C

SMF1007	Project Management	7.5	C

2nd year, 1st semester:

IDG2000	Area-Course: Design in Health Services	7.5	C
IDG2003	Back-End Web Development	7.5	C
IDG2004	Information Architecture and Databases	7.5	C
IDG2012	Availability, Ease of Use and Ethics	7.5	C

2nd year, 2nd semester:

IDG2001	Cloud Technologies	7.5	C
IDG2100	Full-Stack Web Development	15	C
IDG2671	Web Project	7.5	C

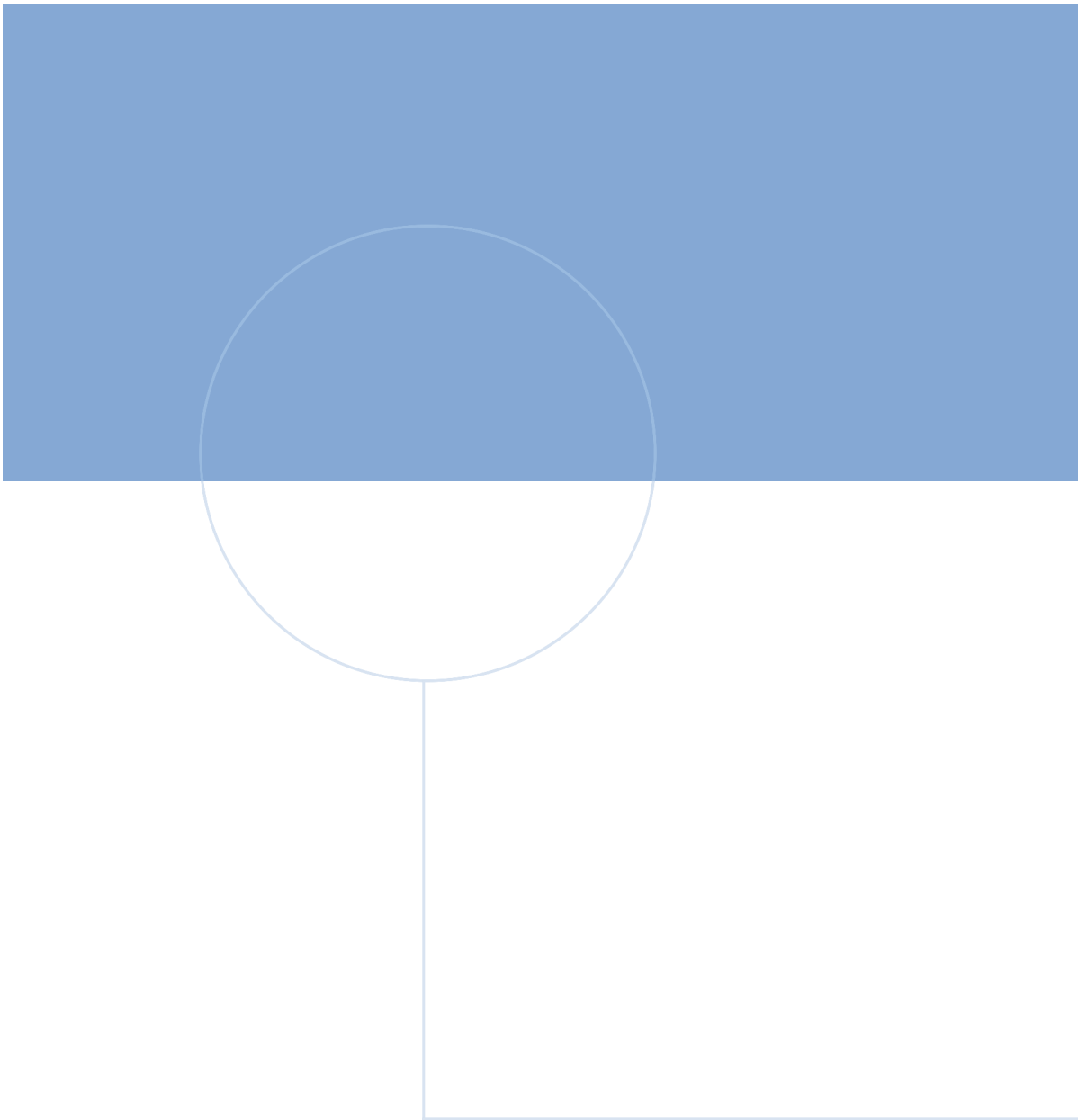
3rd year, 1st semester:

IDG2009	Communication	7.5	C
IDG3006	Web of Things	7.5	C
IDG3101	Immersion Project	7.5	C
IDG3920	Bachelor thesis BWU - Part 1	-	C
IDG1101	Typography	7.5	V
IDG3009	Information Architecture	7.5	V
IDG3542	Optional Practice	7.5	V
TEK3107	Student Company, Technology Design and Leadership	7.5	V

3rd year, 2nd semester:

IDG3920	Bachelor Thesis BWU - Part 2	22.5	C
IDG3800	Portfolio and Exhibition	7.5	C

(NTNU, n.d.-g)



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