

Merete Lunde Bertheau

# Communicating Possibilities Through Data Visualization

Master's thesis in Design

Supervisor: Ole Edward Wattne

Co-supervisor: Ann Kristin Forshaug

June 2022





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



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Master thesis 2022

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# Acknowledgments

This master's thesis is written by Merete Lunde Bertheau at the Department of Design at NTNU.

I would like to express my appreciation to all the incredible people who have contributed throughout this thesis. First of all, I would like to thank my supervisor, Ole Edward Wattne, for wise and constructive feedback, and for guiding me this semester. Furthermore, I would like to thank my mentors at Sikt, Ann Kristin Forshaug and Sondre Ek, for their support and encouragement in navigating the project. Lastly, I would like to thank my family for their support and my classmates for making this a fun, loving, and crazy last semester.

A handwritten signature in black ink that reads "Merete Bertheau". The signature is written in a cursive, flowing style and is centered within a light gray rectangular box.





## Master thesis for Merete Lunde Bertheau

### Communicating possibilities through data visualization Kommunisere muligheter gjennom datavisualisering

Data visualization has a goal to display data in a way to make it understandable for the observer. Data visualizations can make data accessible by turning it into information, and lead the viewer to discover trends and patterns in the data. In addition, it allows for the identification and highlighting of observations that may not be as noticeable when looking at a list of numerical, quantitative information or values.

The focus of this thesis is to explore the wide varieties of different types of data visualization, connected to one overall statistical topic: education, and especially of higher education. There are several open datasets on this topic available, and these datasets span over different areas which can be used for comparing a variety of statistics. The project is intended to help people make better choices in their educational pathways, showing them the different possibilities and opportunities of higher education.

#### Proposed activities:

- Research how data visualization is used today to display higher educational statistics and present a summary of findings on data and various datasets available on the topic of higher education.
- Generate insights on how this can be displayed and visualized to create value. Use various tools to visualize datasets connected to education. Create different visualizations, and get feedback on the clarity, intelligibility and effect of the visualizations.
- Scope the primary user and how the data visualization generates specific value to their situation.
- Translate insights to a concept, prototype or tool for users to gain a greater understanding of higher education, in both Norway and maybe other parts of the world.
- Test the concept, prototype or tool making it understandable, functional and user friendly for the intended users.
- Refine the concept, prototype or tool to make it meet the design challenges.

This project is executed in accordance to the "Retningslinjer for Masteroppgaver i Industriell Design".

Course supervisor (from ID): Ole Edward Wattne

Company contact: Ann Kristin Forshaug

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**Ole Edward Wattne**  
Course supervisor



**Sara Brinch**  
Head of Department

# Abstract

The handling and interpretation of numbers and numeric data is what we call numeric reasoning, and it has become a significant part of how to gain knowledge about the state of the world. Data visualization uses graphical elements to display numeric data and, when carried out responsibly, can allow for a more complete understanding of what the data is saying.

The thesis will look into the current discourse of data visualization; how it is used, understood, and developed to understand its current role in society. The topic will be tied to a relevant issue about young adults' choices regarding their education and career paths. The thesis intends to deep-dive into how young adults interpret the aspect of making a career choice and how they address this concern. Further, the thesis will explore various ways to bridge the information young adults need by communicating possibilities through the use of data visualization methods and techniques. The thesis results in a concept for facilitating decision-making in choosing careers and education with the goal of making young adults more informed, aware, inspired, or assured of their chosen career path.

# Sammendrag

Håndtering og tolkning av tall og numeriske data er det vi kaller numerisk resonnement, og det har blitt en vesentlig del av hvordan man tilegne seg kunnskap om verden. Datavisualisering bruker grafiske elementer for å kommunisere numerisk data, og når dette utføres på en ansvarlig måte, kan det gi en mer fullstendig forståelse av hva dataen sier som helhet.

Masteroppgaven vil se på dagens diskurs om datavisualisering; hvordan den blir brukt, forstått og utviklet for å forstå dens nåværende rolle i samfunnet. Temaet vil deretter bli knyttet opp mot en relevant problemstilling angående unge voksnes valg av utdanning og karriereveier. Oppgaven vil ta for seg hvordan unge voksne tolker aspektet ved å ta et yrkesvalg og hvordan de adresserer denne situasjonen. Videre vil oppgaven utforske ulike måter å koble informasjonen unge voksne trenger ved å kommunisere muligheter gjennom bruk av datavisualiseringsmetoder og -teknikker. Oppgaven resulterer i et konsept for å lette beslutningstaking ved valg av karriere og utdanning med mål om å gjøre unge voksne mer informert, bevisst, inspirert eller trygg på deres valgte karrierevei.



# People involved

## **Merete Lunde Bertheau**

Master candidate

*Department of Design at NTNU*

## **Ole Edward Wattne**

Master supervisor

*Department of Design at NTNU*

## **Collaborating company - Sikt**

Sikt develops, delivers, and provides digital services for Norway's education and research sector. Sikt aims to provide safe and coherent services for everyone working in the education sector in Norway and everyone affected by it (Sikt, 2022).

## **Ann Kristin Forshaug**

Ann Kristin has been the company contact throughout this thesis, and she works at Sikt as a senior strategic designer.

## **Sondre Ek**

Sondre has helped to contribute with guidance, and works as a service designer at Sikt.

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# CHAPTER 1

# BACKGROUND

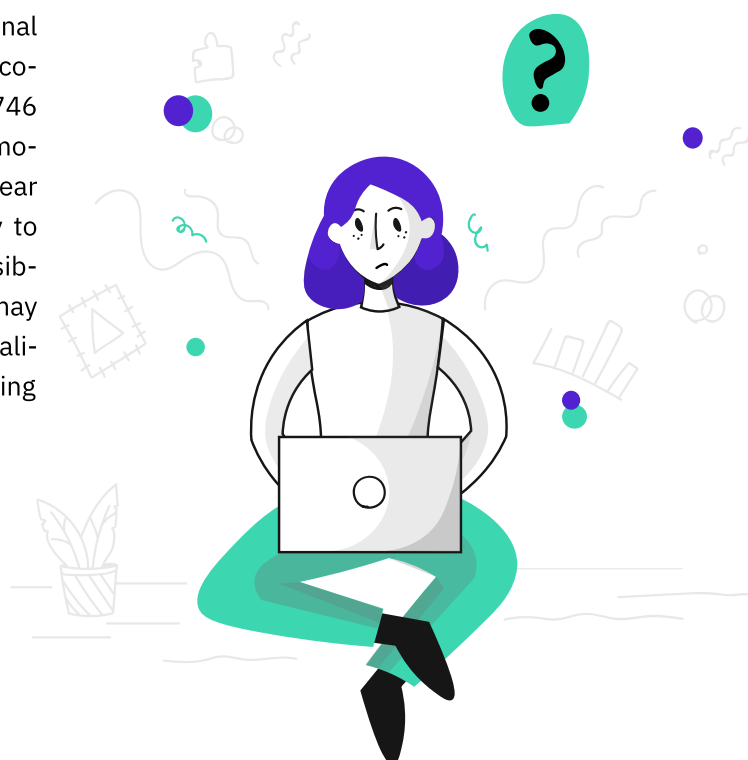
This chapter outlines the backdrop for the thesis and sheds light on why the thesis took form, the overall goal, and the approach used to attain the goal. The chapter covers the overall process used for the project, a prestudy, and some chosen delimitations for carrying out the thesis.

## Why write this thesis?

Data and information have become essential for how we gain an understanding of a topic or a situation. Today we see the use of data visualizations in academia, in the news, in research, in advertisements, and more, to convey a message, support an argument or create an understanding of a subject. Almost all disciplines have become dependent on statistical information and data to access, monitor, and understand their methods.

Choices of education or what profession to choose are complex for young adults today. A survey by the Directorate for Higher Education and Competence in Norway states that more than half of the young adults who took part in the survey find it difficult to choose an education (Jacobsen & Bjerke, 2021). Currently, there are 563 job titles at [www.utdanning.no](http://www.utdanning.no), 1317 different educational programs accessible on Samordna Opptak being the primary platform to apply for higher education, and if we take into account higher vocational education and various programs in upper secondary school in the calculation, we amount to 7746 various educations (Utdanning.no, 2022 (a); Samordna Opptak, 2022). With these statistics, it is clear that one can get lost in the field of which way to take or what to pursue. The choices and possibilities of *what* to become and *how* to become it may be hidden in vast amounts of data. Data visualizations can become a rhetorical tool for displaying

quantitative information to facilitate a more efficient or complete understanding of the data. The teenage years are probably the most profound years of building one's independent thoughts and views of the world. It is the years for trying to navigate toward becoming an independent human being in line with one's ambitions and values. By visualizing some of these choices, young adults might be more equipped when making their career choices.



# Motivation

The way we can use visual elements to communicate information has fascinated me for a long time. In addition, the choice and situation of choosing a career is something I find meaningful. Together, the topics drive an eagerness to explore different types of data visualizations combined with a qualitative research approach.

# Master thesis goal

The main objective of this thesis is to explore how one can use data visualization to promote and facilitate an understanding of complex choices, here with an outlook on young adults' career choices. By utilizing the potential benefits of data visualization, one may be able to enhance and inspire young adults in their career pathways. The aim is to bridge data visualization with a person's career choice by helping them navigate in a field they may find intimidating or chaotic by visualizing the information they need. The thesis focuses on young adults between the ages of 16 and 19 who attend upper secondary school.



# Research objectives

To reach the overall goal, the thesis aims to explore and answer some sought-out sub-goals. The sub-goals entail a combination of gaining knowledge in the field of data visualization, understanding viewpoints amongst young adults and gaining skills in developing different data visualizations.

## 1.

Gain an understanding of the current discussion of data visualization, how data visualization is used to effectively convey information, and look into possible pitfalls of data visualization

## 2.

Identify and describe how young adults aged 16 to 19 contemplate their choice of choosing their next phase of career or job and education after ending upper secondary education.

## 3.

Bridge the two by developing a concept where young adults can better understand and be more equipped to make career and higher education choices by creating understandable and comprehensible data visualizations to inspire.

# Approach

The project followed a qualitative research methodology with a human-centered design approach, where the people designing are at the very core of the design, development, and implementation process (Stickdorn et al., 2018, p. 27). The goal is to understand the needs of the primary user, which provides a basis for further development of a tool or concept meeting their needs, providing aid, support or guidance. The methods contributing to gathering and translating the insight into a concept vary from gathering information, scoping the user, testing, and refining the concept. A description of how each specific method was carried out and why is defined at the beginning of each section throughout the thesis.

## Research and practice

The thesis addresses design research and practice to enable design of a service or tool in a specific context; for young adults in a choice setting. This approach can be referred to in the design sphere as “research for design” (Frankel & Racine, 2010). Using research gathered on the topic of data visualization and qualitative data from young adults with the intention of designing to improve a process is one of the pillars of research for design (Downton, 2003, p. 17). Through gathering information, altering, and actively testing for more insight, the designers can achieve a result based on the value from the research to enable the design (Downton, 2003, p. 18). This approach uses practice, and insights gathered from the practices, as an active force to achieve an outcome. Fallman

describes that the knowledge gained from the process of bringing a product into existence is the primary contributor to the field, while the product in itself can be seen as an artifact, being a means to the end (Fällman, 2004). In this case, the artifact can be considered to be the concepts developed, while the main result is the knowledge gained in the process.

The thesis can also touch upon another field of design research; research through design. Here, the critical aspect of the research practice is to provide theory within a broader context and not merely restricted to the product developed (Frankel & Racine, 2010). By looking into a possible coherence of how one can use data visualization to communicate possibilities and facilitate decision-making for a young audience, one can maybe create design knowledge as to how the connection between the two can be achieved in a theoretical sense.

The thesis is written in a format making it adaptable to be read by people outside the research sector or the design environment. In addition, the thesis is written with the intention of being read by stakeholders at Sikt for inspiration and exploration for further development of services aimed at young adults and their education choices provided by Sikt.

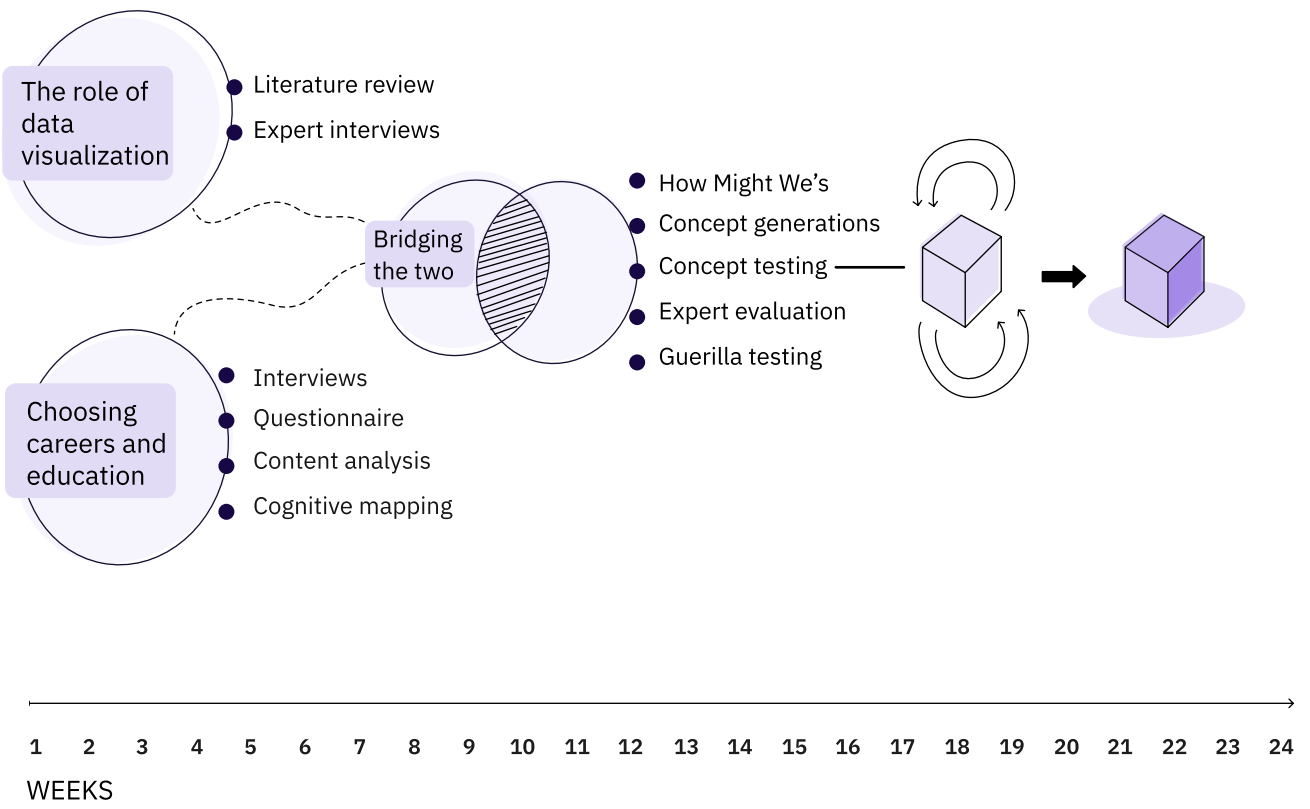


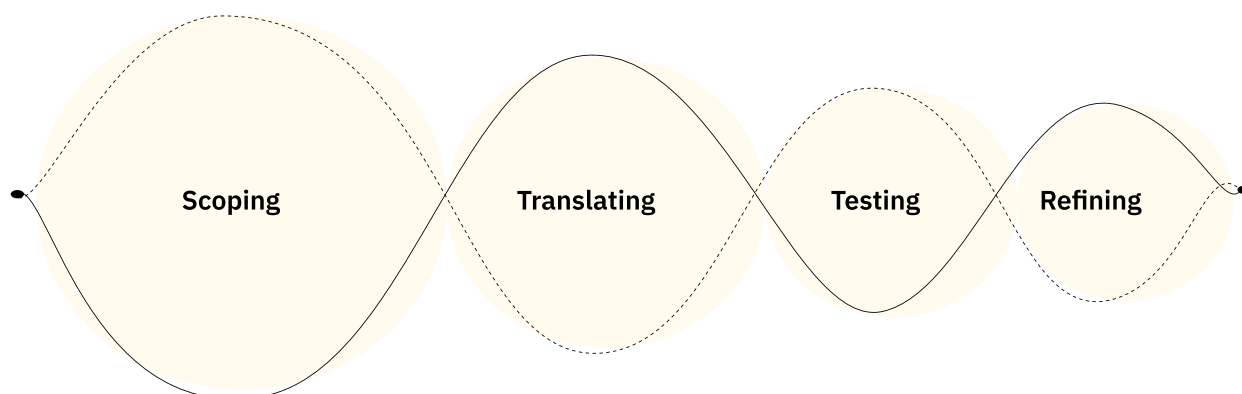
## Ethical concerns

Handling and processing information about people requires responsible handling to perform ethical data gathering. There are several techniques to operate in line with keeping the privacy of those included in the research. To seek a well-conducted thesis, preserving people's privacy should be prominent in how one gathers material, which can be decided by how one performs the methods used. This method is referred to as *privacy by design* (Cavoukian, 2009). The specific precautions taken into account to preserve fair and responsible design and information practice are as follows:

- Using [www.nettskjema.no](http://www.nettskjema.no) to gather data from questionnaires (Appendix 4).
- Following the guidelines of NSD (Norwegian Centre for Research Data).
- The use of a consent form for all interviews was carried out (Appendix 1).
- Aggregating and anonymizing data from individuals in places where this seems evident.

● Methods





--- *Data visualization theory - THE ROLE OF DATA VISUALIZATION*

— *Insights from student and choices - CHOOSING CAREERS AND EDUCATION*

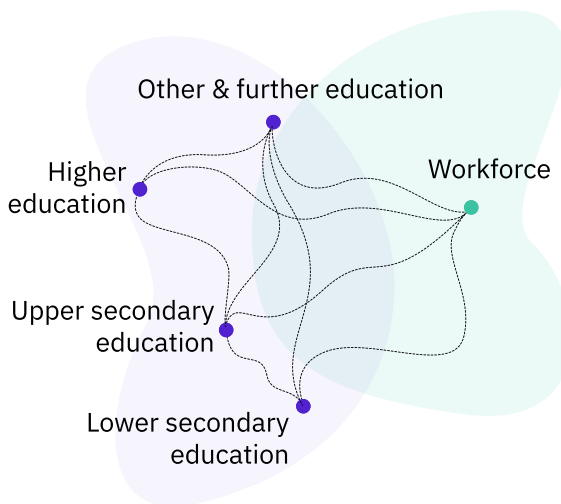
## Process

The plan for the thesis roughly followed a path that addressed four main areas; doing research and gathering insight, translating insight, testing, and refinement. As the process evolved, the plan was reiterated due to the need for a more thorough insight phase. The thesis followed two main lines, one for gathering theory on the current discourse and role of data visualization and the other for more hands-on research of young adults and their career choices. These parallel lines stretch throughout the master's timeline, obtaining data and

information from the different perspectives of data visualization theory and observations from the primary users throughout the thesis. The suited plan for the thesis is a tailored design plan based on the double diamond principles where the goal is to alter between scoping out and in throughout the process. Here one first applies divergent thinking by exploring possibilities and then exploits the mechanics of convergent thinking, going forward in one or some chosen possible directions (Design Council, 2022).

# Prestudy

A prestudy was carried out to understand the main parts of the education system today and future developments intended to be implemented in the years to come, which will affect young adults' career choices.



## The school system in Norway

All children in Norway must attend primary and lower secondary education until they turn 16. After completing primary and lower secondary education or equivalent training, all pupils are eligible for three years of full-time upper secondary education or training (“Videregående opplæring” in Norwegian) (Utdanning, 2022). Upper secondary education builds on the knowledge gained at primary school and aims to qualify young adults for the working field or further studies. Upper secondary education in Norway consists of 15 different educational programs, five study preparation programs, and ten vocational education programs. In the first year, one chooses an education program, and in the second and third years, one selects a program area within the education program (Utdanning.no, 2022). From the five study preparation programs or by taking a year with needed courses, one can achieve general study competence (“Generell studiekompetanse” in Norwegian), which provides the opportunity to apply for admission to most studies at universities and

college degree programs in Norway. Higher education in Norway is generally free, where students are accepted based on admission certificates from upper secondary school. Higher education consists of one-year programs, university college grad., bachelor's degree, master's degree, professional qualifications, and Ph.D.

It is also possible to achieve vocational competence, which means a person is trained to practice a profession. A person can achieve different forms of vocational competence by choosing program areas from the vocational education programs. This usually implies attending two years of upper secondary school and two years of company training. One can also apply for vocational schools, where work or practical experience and other informal qualifications are weighted (Utdanning, 2022). There is also an opportunity to take education in the Norwegian Armed Forces, in-company training, or further education (Utdanning, 2022).

## **Project “Lifelong learning” (Livslang læring)**

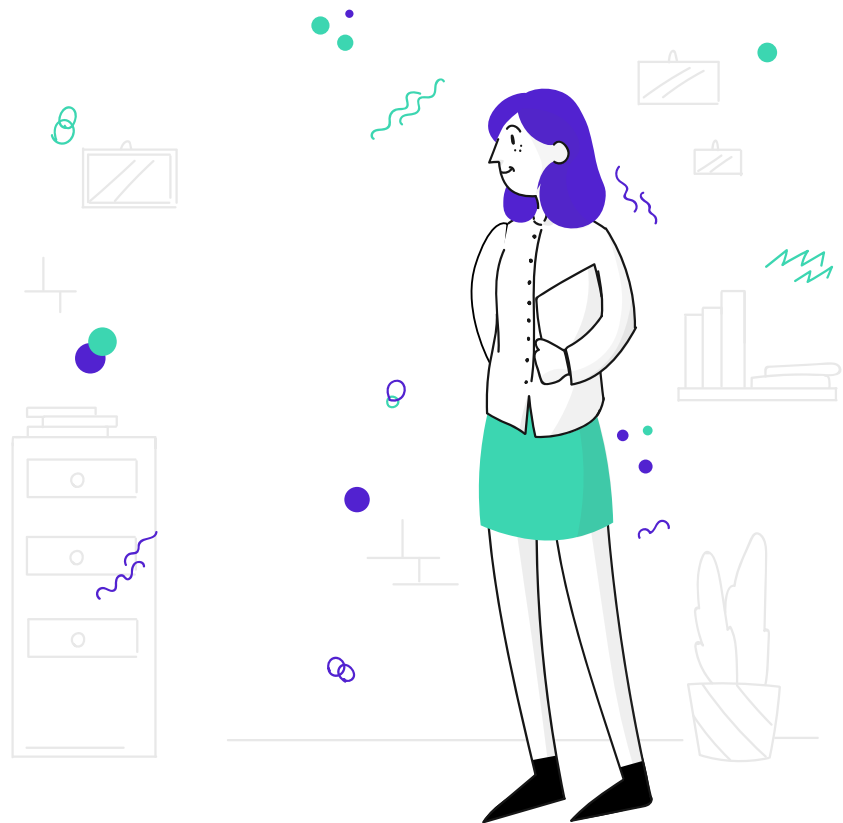
The department of higher education in Norway has focused significantly on future development in the education sector, trying to digitize more aspects of the processes. Not only digitizing, but using an innovative approach for seeking more radical improvement on the services offered for the education sector to ensure an efficient and updated sector. "Lifelong learning" is a project for expanding the services offered in the education sector, with the intention to let each citizen have a valuable and meaningful life (Directorate for Higher Education Norway, 2022). People's sense of meaning can often be directly connected with one's job. Sharing data and expertise within the knowledge sector and with players outside the sector is limited. A digital competence platform for lifelong learning is intended to meet these societal challenges and the growing competence gap (Directorate for Higher Education Norway, 2022). In the project "Lifelong Learning," a central part is developing a digital competence platform. This platform aims to facilitate learning throughout one's life so that no one should be outdated due to a lack of competence. Everyone should have the opportunity to renew and supplement their competence so that more people can stay in the workforce longer. The platform is also meant to be connected to NAV, the Norwegian Labor and Welfare Administration.

## **Project “Future admittance” (Framtidens opptak)**

Another innovation in the education sector is including all forms of higher education admissions and education taken after upper secondary school on the same platform. This project is called project “Future admittance” (Framtidens opptak) (Kunnskapssektorens tjenesteleverandør (Sikt), 2022, p. 4). Today, the platform a person uses to apply for higher education is called Samordna Opptak (Coordinated admittance), where the platform includes most, but not all, forms of higher education in Norway. By expanding the platform to contain all forms of higher education, from public to private schools, single courses, and other forms of education, people searching for higher education only need to relate to one platform. Samordna Opptak today contains over 1300 educational programs for universities and colleges in Norway (Samordna Opptak, 2022). The innovation in the education sector also includes an extended database for collecting education achievements for each student in the Norwegian system. This innovation is called National Certificate Database (NVB) and allows for each person to have their own digital certificate on all grade points achieved (Samordna Opptak, 2022).

# Delimiting the task

To define the task, the primary users chosen are young adults in the last and second to last years of upper secondary school, from 16 to 19 years old. This is when most people pick their career pathways and apply to higher education from upper secondary school. The problem addresses young adults in this age group, and primarily young adults who achieve general study competence (“generell studiekompetanse” in Norwegian) in upper secondary school (“videregående skole” in Norwegian). The thesis also centers the task around the Norwegian education system and workforce. Norway is a highly educated country with a low unemployment rate, which serves as a premise for the thesis.







## CHAPTER 2

# THE ROLE OF DATA VISUALIZATION

This chapter aims to provide key insights into the established research on data visualization and how it is further discussed by experts to get an outline of the role of data visualization in society today. The part will also consider how one interprets and reads data visualizations and some research on how data visualization has been used in the education sector to visualize quantitative information to policymakers, teachers, and pupils.

# Methods

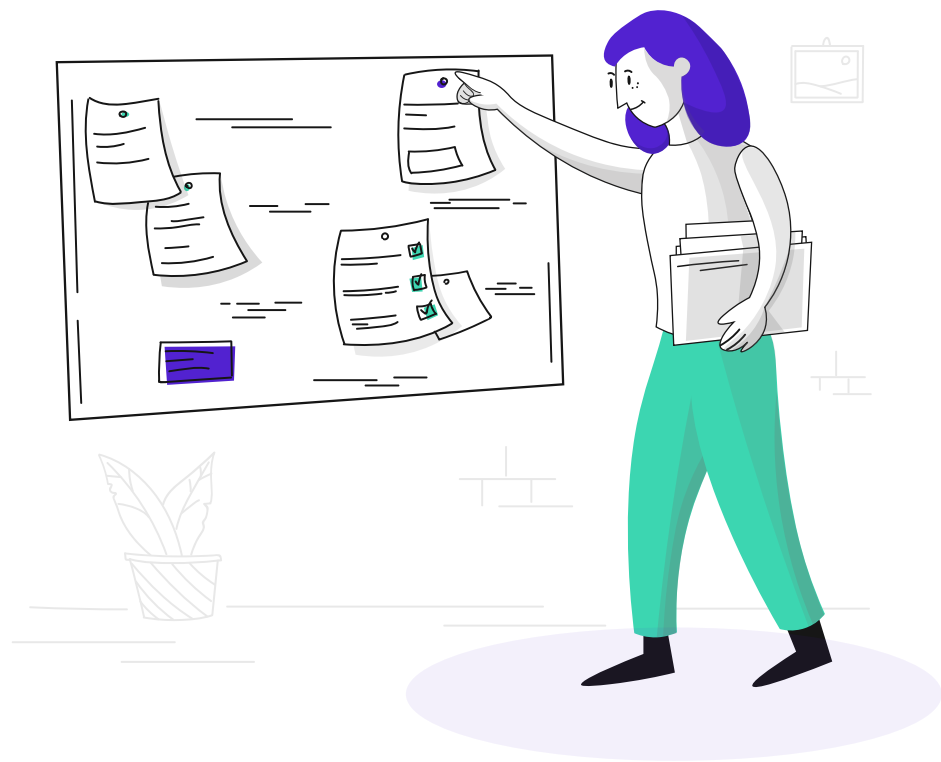
Chapter two includes a more descriptive research approach to gather different definitions and narratives on the topic of data visualization.

## Literature review

First of all, the section gathers information from a selective and critical literature review, seeking out relevant articles from acknowledged mediators and other researchers in the field of data visualization and how it is used to visualize statistics regarding education. A literature review aims to get an overview and understanding of the topic and the most prominent theories and theorists in the field. The literature review attempts to identify the most relevant articles and their relevant references. Other articles could be of interest, but a selection of the most prominent articles was carried out. The literature review was completed by gathering relevant articles from multiple sources from research articles, books, reports, and websites on data visualization and accessed through Oria and Google Scholar. The keywords used to collect the articles were: 'Data Visualization,' 'Visualization Theory,' 'Perception Theory,' and 'Data Handling.' The research also included key researchers in the field of visualization: 'Tufte,' 'Cario,' 'Kirk,' 'Playfair,' and 'Bertin' to provide a fundamental perspective on the subject and a general understanding of the field. In addition, the literature review seeks information on how researchers or policymakers intend to use visualizations in communicating educational statistics and what experiments and findings there may be.

## Expert interviews

Further, insights were gathered from expert interviews with three experts working with data visualization in both academia and from a company's perspective. Two of the people interviewed, Prof. Martin Engebretsen and Prof. Elise Seip Tønnessen, have researched how data visualization can create meaning and how people read data visualizations. Another expert interview was carried out with a service designer at Cognite, Sebastian Skar, who works with how one can visualize large amounts of data directed to a specific sector. This qualitative method was carried out as semi-structured interviews, where the participants could elaborate on their professional experience and opinions regarding how data visualization is practiced in their field. Expert interviews allow for direct contact with people with profound experience and help provide credibility and depth to the topic addressed.





**“Data visualization facilitates numeric reasoning by communicating numeric and statistical information in a graphical format.”**

Andy Kirk, 2019, p. 15

# Framing data visualization

Data visualization is a field in development, and with the rise of digitalization, the use of cross-mixing different modalities for communication has become an extensive practice. These different modalities can be a combination of text, images, sound, light, video, and more, such as different visualizations, to be used to communicate. Most of us learn to read and interpret text at a young age, with clear rules and laws for how one builds a text, reads it, and understands it. Data visualization, on the other hand, has not had the same extensive ground for interpretation. Maybe it is because it requires various skills to decipher, from artistic readiness to mathematical competence (Tufte, 2001, p. 87). As data visualization designer Andy Kirk illustrates, data visualization is the art and science of combining numeric and statistical data and information with graphical elements to facilitate understanding the data in a graphic context (Kirk, 2019, p. 15). Data visualization presents the viewer with visual elements to try to decode the numerical information in another modality or medium. To construct a data visualization, one often uses a combination of visual elements such as lines, points, numbers, coordinate systems, symbols, words, shading, and color (Tufte, 2001, p. 9). Data visualization aims to communicate reasoning on the numerical information presented. As with text, there are different levels of reading the complexities of data visualizations, from simply recognizing what is presented to acting upon it and further reflecting on what is presented (Hasan, 1996). These three levels of reading will need to be considered when analyzing how a data visualization manages to communicate information.

Ideally, data visualization can help the viewer get a more precise overview of the data, highlighting connections and developments over time and letting the viewer get a more thorough understanding of what the data is saying. Data visualization is a representation of data and information, and therefore there may be settings where data visualization can enhance the data, giving the viewer a correct view of the data. However, there can also be situations where data visualization fails to achieve its goal, complicating the situation or give a false representation of reality.

# Established theory on data visualization

Through time data visualization has additionally been seen in maps and cartography, where one uses points, lines, and other graphical elements to construct visual maps for orientation (Tufte, 2001, p. 20). These maps were first concentrated as geographic measures in a set coordinate system, advancing in graphs for disseminating spatial data (Beniger & Robyn, 1978). While the first data visualizations referred to a format using space or time as variables, the British engineer William Playfair introduced a graph that looked at the relationship between two independent variables based on non-spatial data (Beniger & Robyn, 1978). A new era of communicating information in the form of data visualization began, using the visualization in a broader spectrum of fields, whereas in the 20th century, scientific journals began frequently using data visualizations to communicate their findings (Tufte, 2001, p. 47). Later, the French cartographer and theorist Jacques Bertin began to more systematically arrange the different techniques of the graphical elements used in data visualizations in his book *Semiology of Graphics*, first published in 1967. He looked at the very construction of visual works, firstly connected to maps and cartography, and found that they all consisted of one or more of his visual variables; shape, orientation, color, texture, volume, and size (Bertin, 1967). Bertin's synthesizing of information in these visual blocks resulted in looking at each element both standing alone and in context, experimenting with maps and diagrams to see how these elements work in practice (Bertin, 1967). His detailed research has later been transferred to other genres of visual representation.

Later, elaborating further on the research of how visual elements display quantitative data, Edward Tufte develops specific rules and laws that, in his opinion, should be followed to make truthful visualizations (Tufte, 2001, p. 51). His book *The Visual Display of Quantitative Information*, initially published in 1983, has become somewhat of a manifesto, and Tufte himself a muse, for data and information visualization designers, creators, statisticians, and data artists today. The book centers around two matters, graphical integrity and graphical excellence. These two themes are highlighted with examples of different visualizations that have altered through the last three centuries, pointing at good and bad examples of how the visualizations succeed in graphical integrity and excellence and where they fail (Tufte, 2001, p. 54). Graphical integrity is, as Tufte writes: "Telling the truth about the data" (Tufte, 2001, p. 53), and he states some principles to be followed to practice honest, consistent, and uncompromising data visualizations (Tufte, 2001, p. 77). The latter, graphical excellence, combines how the substance of what one is communicating, the statistics, and the design, must all be of exquisite quality to achieve graphical excellence when presenting interesting data (Tufte, 2001, p. 51). Graphical excellence involves communicating complex ideas precisely and efficient and is what one should strive to achieve in data visualizations (Tufte, 2001, p. 51). Graphical integrity is needed to achieve graphical excellence. Two terms derived from Tufte's theory are "lie factor" and "data-ink." Lie factor is a value in how much a visualization is said to lie and is based on how the representation of numbers is compared to the numerical quantities it

represents (Tufte, 2001, p. 56). The lie factor should be equal to one, where the size of effect in the graphic should be directly proportional to the size of effect in data:

$$\text{Lie factor} = \frac{\text{Size of effect shown in graphic}}{\text{Size of effect in data}}$$

Data ink is referred to as the core and minimal ink needed to depict the data in the graphic (Tufte, 2001, p. 93). The data-ink ratio is then the proportion of the ink used in the graphic, which is only devoted to displaying the data. Whichever variables exceed the ratio over one can be removed without data loss (Tufte, 2001, p. 93).

$$\text{Data-ink ratio} = \frac{\text{Data-ink}}{\text{Total ink used to print the graphic}}$$

The information designer Alberto Cairo is extending the discourse of data visualization and contributing to greater nuance in the field. His fascination with the more cognitive aspect of interpreting data and visual representation of data has led to his expression of data visualization as "the functional art" (Cairo, 2013). Cairo depicts the prominent role of visualizations as a tool for the viewer, guiding them through hierarchies of sense-making and transforming the unstructured information found in the outer world into something graspable and understandable the viewer can draw meaning (Cairo, 2013, p. 16). To proceed, Cairo continues to build upon his work with a more

practical approach to how good data visualization not only works as a functional tool, but great visualizations also inherent qualities such as being truthful, beautiful, insightful, and for the visualizations to be enlightening (Cairo, 2016).

Together, the research done by these theorists, statisticians, and designers, forms some groundwork for the further evolution of the data visualization field. Their systematic approach, detailed analysis of examples and explorations, and attentive elaboration of rules and frameworks have all contributed to an understanding of how people interpret graphical elements and how people draw an understanding of information from these graphical representations. They explore the beauty, and the pitfalls, of data visualizations through time up to what can be seen today.

# Visualization as a communication tool

Visualizations can be a powerful communication tool, highlighting irregularities and essential developments and data comparisons. The use of visualizations can be effective because how visualizations can accumulate large quantities of data into a format that can be more comprehensible than sets of numerical information. Since Bertin's systematic approach of quantifying visual representations from maps and cartography representing spatial phenomena (Bertin, 1967), we can also use relational maps to communicate abstract phenomena. Today, with the way we use digital means to control much of our quantitative data, the ability to communicate more abstractly can be even more critical, i. e. using relational maps and abstract mapping of complexities and connections between entities.

Even though there are limitations to our visual representation, we see data visualization as a tool or a means for communication that can be highly efficient in facilitating an understanding of something. Even more so if we want to communicate something with a certain level of complexity, where Tufte highlighted, the trait of clearly communicating an idea and simplifying its complexity is the primary value of favorable data visualizations (Tufte, 2001, p. 51). Transforming complexity into a visual format can let more people access, read, and understand the information because our sense of visual perception is a strong mechanic from which we extract knowledge (Kandel et al., 2000). By using data visualizations, one can let a more significant number of people participate in the knowledge exchange, allowing for a more trans-

parent and inclusive dialog about the topic addressed, making the role of data visualization strengthened. For example, people with dyslexia have reading and writing disabilities, but their intelligence isn't affected (Shaywitz, 1998). For them, data visualization may be a key to their understanding of general or important information and may help them succeed in life. Some may see data visualizations as a technology (Cairo, 2013, p. 19), helping us create and control the environment around us (Hughes, 2004). Since it can be a powerful tool, it is also essential to approach data visualizations with a critical view.



**”Graphical excellence begins with telling the truth about the data”**

Tufte, 2001, p. 53



# The data in data visualizations

## Data as a source of information

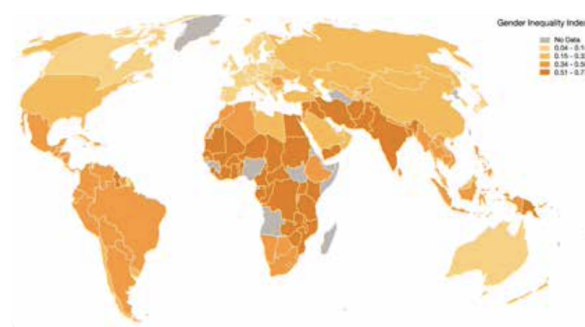
As the world constantly gets more digitized, data has become an essential source of knowledge because it can contain immense amounts of information. Data as measured quantitative information in a specific data format can be seen as the most unstructured form of information; where-in most cases, it needs to be processed to give significant value (Conger & Probst, 2014). The idea of making everything quantifiable to data points has led to a new paradigm; the datafication paradigm (van Dijk, 2014). Datafication as a way to understand how people behave from collecting and analyzing data has been viewed as the new and fundamental source of information to try to read and comprehend the current world and investigate future outcomes (van Dijk, 2014). When we talk about data in this sense, we approach a more ambiguous term used when talking about data; big data. When hearing the words Big data, one might connect the names of the large corporations' Amazon, Google, Netflix, and Facebook. They have made a fortune in extracting numerous amounts of data to analyze and categorize people based on their preferences to make recommendations, sell, and generate results based on the collected data (Beer, 2013). How they do this in a technical sense is a mystery for most people, but there is developed a somewhat more tangible definition:

*"Big data technologies describe a new generation of technologies and architectures, designed to economically extract value from large volumes of a wide variety of data, by enabling the high-velocity capture, discovery, and/or analysis." (Reinsel & Gantz, 2011).*

In the definition, big data must generally cover four areas, the four V's: Value, Volume, Variety, and Velocity (Reinsel & Gantz, 2011). Of the four V's, value is the most significant because it embodies the power of value that can potentially be derived from the data. The definition has later been elaborated to add additional V's, such as veracity, the level of quality, accuracy, and uncertainty of data and the data sources, highlighting the role trustworthiness and authenticity have in the data (Riahi & Riahi, 2018).

## Data quality

To communicate correct and trustworthy information, one needs access to high-quality data. High-quality data is complete and timeliness data that also contains a defined context for the data; the metadata (Aljumaili et al., 2016). There has been an attempt to establish standardization for data quality (Aljumaili et al., 2016), an ISO 8000



**Figure 1:** “The gender inequality index: a map with the geographic distribution of inequality emphasizing high inequality”, designed by Ricker, Kraak, and Engelhardt (2020) p. 415. (<https://doi.org/10.1515/9789048543137-028>)

standard. However, some researchers point out that the standards are still too vague to give efficient value (Clarke, 2015). Either way, one should aim to use as high-quality data as possible because the use of incomplete datasets can contribute to a false representation of the documented situation. An example is a data visualization of The Gender Inequality Index (GII) (Figure 1) across different countries displayed as a geographical map where the darker color designated to the country’s area represents a higher inequality index for that country (Ricker et al., 2020). There are several countries colored gray from the map due to missing data, but that does not mean equality between the genders in these areas is present; rather, the GII may be significantly high in these areas (Ricker et al., 2020).

One can not always guarantee a high level of quality data. However, in the cases one might not have sufficient data to substantiate an argument, it is even more important to highlight and communicate what is lacking from the datasets. If not, it can result in a lack of credibility in the data presented, and more critically, give false information.

## Data critique

Although data can show us the most efficient ways to handle, perform or govern specific areas, one can argue against the legitimacy of capturing profound measures of people and things in mere data points. With society's growing trust in data, data has become a form of governance, where the infrastructures built upon digital databases become centers to manage and govern systems (Williamson, 2016). Let us, for example, look at a specific sector, the education sector. Here, digital databases contribute to controlling education systems on a regional, national, and global plan (Williamson, 2016). In this sense, one uses aggregated data to understand the whole picture and to see the more prominent lines, trends, and states of the education development. However, minorities and individuals often become hidden and forgotten in the masses. The relationship between the generalization that can come with aggregated data needs to be evaluated upon the individual variation. Some news reports have tried to solve this relationship by combining statistical information with personal stories. Say, for example, there is a feature on cancer patients and how there is a decreasing trend of a certain kind of cancer. They can construct the news with a graph of how many people are affected and a visual representation of a decrease in numbers by, e. g. using a line graph. Afterward, they can show a personal interview with one cancer patient and how the disease affects themselves or their families. So this technique is used to both see the whole picture from the aggregated numbers and trigger the view-

ers' pathos. However, what is essential to have in mind is that the numbers we manage consider real people.

How one handles data today often relies on algorithmic computations based on historical datasets, creating an outcome that can be skewed or even wrong, creating undemocratic and discriminatory outcomes (O'Neil, 2016). There can be bias in the data, bias in the selection of data, and bias in consequences when the data leads to action. The prerequisites of the historical datasets themselves may be wrong and may portray a state the world is trying to move away from and improve on. An even more critical aspect is how it might be tough to recognize when the outcome is falsely or weighted in one's favor. Unfortunately, when, or if, they recognize it, it is often when the damage is already done.

Today, one can say that people amount to the generation of data, contributing to the mass exchange of data for them to play, listen to, buy or look at whatever they desire through their screens. This exchange of data is what professor van Dijk expresses in a dystopian manner as how data is becoming the new currency for citizens (van Dijk, 2014). She continues to depict how this interaction creates an ecosystem of connective media where one's power is lessened and put in the hands of governments, institutions, and private businesses (van Dijk, 2014). Being an advocate in the same field, Zuboff (2019) argues how this data currency

we operate with today creates an *economy* where human behavior is not born and raised, but shaped by the surveillance capitalists\* where the prediction of everyday people's behavior is the biggest profiteer of them all, and it is sold unknowingly (Zuboff, 2019).

There is a lot to fathom in discussing the use and handling of data, even more; big data. As diving into the ethical and political concerns of data usage is something one could get lost in, it is essential to draw a line and extract some of the most critical aspects. Understanding data in a setting can allow one to possess control. This control may be achieved in different ways. However, in some way, data visualizations can achieve this type of control, allowing for access and understanding of the data. Data visualizations strongly depend on data, so a discussion of the dangers data may carry is essential.

**“The question, however, is whether we’ve eliminated human bias or simply camouflaged it with technology”**

O’Neil, 2016, p. 25

\*“Surveillance capitalists” is a term derived from S. Zubouffs epoch-defining book *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* published in 2019

## Current discussion of data visualization

Even though data visualization has been around for a long time, we see that data visualization is a field that is evolving, even more with the growing means and technical platforms from which we get information. As mentioned, several people have been at the forefront of data and information visualization research, like Tufte, Bertin, and Cairo, which have set some ground for the direction of the field today. However, we also see that with a continuous evolution of research, development, and usage of various data visualizations, a discussion around the field can contribute to more perspectives on the field. Professor M. Engebretsen (interviewed p. 50) has contributed to the discussion with his project INDVIL, Innovative Data Visualization and Visual-Numeric Literacy, granted by The Research Council of Norway to examine the data visualization phenomena and its role today (Research Council of Norway, 2022).

How we convey data and statistical information in visualizations can raise social, political, and ethical concerns, which are at the backbone of the current data visualization discourse. Data visualizations are being used frequently to communicate important information, but are we for certain that the data or the visualization does not favor specific groups of society or assured that everyone can understand and interpret data visualizations in the way intended?

When Covid-19 came, visualizations of the spreading pandemic began to show up in news reports and web pages all over the world. These epidemiological models, showing the number of people infected, enlisted at the hospital, and predictions of the outlook of the pandemic, forced people to actively read the visualizations to comprehend the

then all-consuming situation we were in (Bowe et al., 2020). We see data visualizations can hold social power where the people displaying information in sets of graphs or charts assume people understand them. If people do not, they will not get access to the same information. Like many other skills, numeracy differs amongst people. Some people can even be opposed when seeing graphs, numbers, and charts due to struggling relationships with anything containing math, lacking self-efficacy, or even having dyscalculia, difficulty in understanding and reasoning with numbers. In this case, data visualizations can contribute to excluding some people from important information. This example could be solved by presenting the information in various formats, not only as a graph. When one designs using data visualization as a technology, one should design technology that fits people at each extreme rather than for the “average” person, advocating for a universal design approach when making data visualizations (Wachter-Boettcher, 2017).

Something the Covid-19 visualizations especially did was provide raw and incredibly timely datasets to a large number of people worldwide, releasing new data about the state of the pandemic up to every hour (Bowe et al., 2020). As it goes for the social role of data visualizations, letting it be open for the public can allow the public audience in on a broader sense of information, allowing them to understand its context better. Open visualizations can therefore work as audience democracy, holding some power as to what it conveys (Williamson, 2016). This exceeds the relationship between the designer and the data, causing it to be even more crucial to communicate correct data.

We might believe that data visualizations hold some analytical objectiveness to them because they are based on numbers and, therefore, may be seen as more correct (Rettberg, 2020, p. 39). This may not be true because of the use of skewed datasets, the personal decision of the designer making the data visualization, or how one can lie with visualizations (Tufte, 2001, p. 56). Communicating the source from which the numbers are gathered and in which context the visualization is made can strengthen a visualization's trustworthiness and stimulate critical reflection around the visualization. As Tufte stated, to achieve graphical integrity, the graphics must not quote data out of context (Tufte, 2001, p. 77).

# Data visualization literacy

Data visualization literacy is how one understands, reads, and interprets data visualizations. From how one reads and understands elements, one touches upon the field of semiotics and how meaning is created and communicated (Engebretsen & Kennedy, 2020, p. 23). In the field of semiotics, one can decipher the meaning of elements by looking at the elements as “text” (Engebretsen & Kennedy, 2020, p. 23). This is also the case for decoding visualizations. Then, how we address how one reads and interprets a visualization can be consistent with the comparison with other forms of media text; posters, films, pictures, cartoons, and more.

Professor of linguistics, Ruqaiya Hasan, distinguishes between three levels of literacy; recognition, action, and reflection literacy (Hasan, 1996). These three levels differentiate complexities intertwined with the way one reads and gains information from a source. The first level is recognition literacy is the recognition of the different resources in a text and their predetermined semiotic meaning. This can, for example, be the letters in the alphabet or terms of visualizations, e. g. lines, points, circles, colors, and labels (Tønnessen, 2020). The second level, action literacy, is how the recognition of a text is acted upon and practiced, giving the understanding necessary to make meaningful choices (Tønnessen, 2020). The last level, reflection literacy, involves the ability to enquire, analyze and reflect upon what is presented (Tønnessen, 2020). Hasan claims there is a hierarchy between the steps, where recognition and action literacy is needed to attain reflection literacy (Hasan, 1996, p. 417). In

Curcio's study of how one comprehends mathematical relationships expressed in graphs, he referred to how graph reading occurs in some of the same three steps; "reading the data, reading between the data, and reading beyond the data." (Curcio, 1987).



# Data visualizations in different contexts

As there are different types of photographs and written text, data visualizations also come in different forms. These data visualizations' various shapes and sizes highlight or undermine various functions. Some visualizations may be better at communicating comparisons between one or more factors, while others may better convey a network of relationships between several entities (Lima, 2011, p. 79). In this case, different diagrams and formats to display data can result in not having one visualization that is better than another. However, that one uses different diagrams and charts for different purposes. Sometimes one wants to use visualizations to document or emphasize a point, where one may claim something and then use data to show or document that what is stated is correct concerning the dataset. In another situation, one might want people to themselves explore data to produce feelings of engagement with the data. Both variants can be legitimate but fill a different need. Finding that need must align with an understanding of the one interpreting the visualization and a clear definition of the target group. On the one hand, this is something Tufte has been criticized for as he states, "It is a frequent mistake in thinking about statistical graphics to underestimate the audience" (Tufte, 2001, p. 136). Where he continues to assume a high degree of numerical literacy, and if the creator understands the visualization, it can be evident that most other interpreters will also (Tufte, 2001, p. 136).

We can look into how one may proceed when developing a visualization with several ways of visualizing one or more concepts. As Sless points out, he looks at the method for carrying out a visualization as how one could go forward in

solving a complex problem (Sless, 1994). The steps consist of firstly defining the problem one is facing and involving the relevant stakeholders. Then, he points out the importance of measuring how things are currently done before developing prototypes and testing a prototype until an ideal is achieved (Sless, 1994). Finally, he states that to ensure a good outcome, one must implement and monitor the solution in use (Sless, 1994). We see the correspondence between how one goes forward in a design process and Sless's information visualization approach. By highlighting the process in which to go forward with making a visualization, Sless also highlights the importance of understanding the user for whom we design (Marchese, 2021, p. 67).

# Emotional responses to data visualizations

As discussed, data visualizations have the ability to produce feelings and engagements in their audiences, and most importantly, they can also substantiate meaning. Data visualization can therefore possess a social power (Engebretsen & Kennedy, 2020, p. 23). When examining how emotions play a part in engagements with data and their visualizations, Professor Helen Kennedy and researcher Rosemary Lucy Hill dedicated time to an empirical study on how people emotionally respond to different kinds of visualizations (Kennedy & Hill, 2018). Their research concludes that the emotional responses to visualizations are significant and that there is an intricate cause for the emotions one can experience from data visualizations (Kennedy & Hill, 2018). The emotion can rise from the data itself, where the numbers may surprise or trigger a sense of hopelessness, e. g. data on the climate crisis. The visual style of the visualization can also evoke emotions by being aesthetically pleasing or unpleasing, evoking emotions such as amazement and pleasurability or frustration with an unsatisfactory visual presentation.

The study also finds that most of the emotions obtained from the visualizations were not solely connected to the data or the visual elements but to various factors relating to them (Kennedy & Hill, 2018). This could be the subject matter of the visualization, a combination of the numeric and visual format where the subject it presents evokes strong emotions for the viewers. As pointed out, data visualizations portraying the number of people dying from a disease, pandemic, or war will bring out strong emotions because of the emotionally sensitive topics presented. People also

reported that the source from which the graphics were reported affected the viewers' emotions. Higher or lower trust in the numbers came from their thought reliability of the source. Lastly, people's skills in making sense of visualizations also seem to produce emotions. Lack of confidence in statistical literacy can be evident in producing negative emotions, while achieving an understanding of the data visualized or "solving" the visualization creates the feeling of achievement and motivates the viewer to understand the data further, creating positive emotions (Kennedy & Hill, 2018). Motivation to understand the visualization creates more time with the visualization and might lead to a greater understanding and reflection on the data. From the article, one can identify how data visualizations do not simply communicate numbers and lines, points, or circles but also emotions in response to data visualization in everyday engagements with data. As Kennedy and Hill state: "as visualizations are powerful tools for informing minds; they also have the power to affect hearts." (Kennedy & Hill, 2018, p. 846).

# Responsibility in making and interpreting data visualizations

A visualization in all its forms has a duality attached to it, the one that develops and the one that interprets the visualization. These two sides may be seen as two different roles in the communication transmission. An interesting discussion is to whom should the responsibility fall, the designer or the interpreter? A data visualization will be colored by the one developing the visualization, at times more than others. The developer, be it a designer, artist, statistician, or mathematician, has an active role in elaborating the visualization and, thereby, a responsibility. We can encounter data visualizations in different spheres, from a graph in an acknowledged paper about inflation or used in a political campaign to show voters' support. In these examples, one sees there may be situations where one is more aware of the integrity of the visualization than in others, and here when to be more aware lies in the hands of the interpreter. Since there are no standardized rules to follow when developing a graphical representation, although Tufte's graphical integrity principles may be a good starting point, we see the importance of gaining a critical sense when interpreting data visualizations. In all visualizations, there have been choices to display the data to communicate an underlying message. Not only essential to be critical of what one is interpreting but also how. There is a tendency to detect patterns, where the reader may see what they want to see, confirming something they want to confirm, i. e. confirmation bias (Ellis, 2018). To conclude, the active design choices and responsible and ethical concerns of the creator leading up to a visualization, together with the viewer's critical reflection, determine if a data visualization acts responsibly.

# Expert interviews on data visualization

## Interview with Prof. Martin Engebretsen

*Department of Nordic and Media Science, University of Agder*

*Prof. Engebretsen has researched strategic communication and the digitalization of different communication genres. He has focused on multimodality in terms of visual communication and different social semiotics, i. e. how things create meaning. He has a background in journalism, and much of his research has evolved from a text-oriented background in linguistics. Prof. Engebretsen was the leader of the research project "Innovative Data Visualization and Visual-Numeric Literacy" (indvil.org), which was supported by the Norwegian Research Council (NFR) and lasted from 2016 to 2020. The project concluded in a book, "Data Visualization in Society", where various authors cover different aspects and reflections on the phenomenon (Indvil, 2019).*

Prof. Engebretsen has studied the phenomena of data visualization literacy and fathoms the ability to understand what a text tells and the idea of utilizing the text for something useful. Here a critical eye is essential because a text is written or made from a perspective and may have rhetorical means or underlying intentions. Again, we see layers of understanding the relevant codes, utilizing the content, and gaining critical reflections. Engebretsen elaborates on how people have different prerequisites of understanding at all levels. Some may have a slightly naive attitude, where the idea of "all data is true" and statistical presentation are considered trustworthy, or the ones skeptical of statistics, thinking it has a hidden agenda of manipulation. These are two pitfalls to be aware of, and he believes the naive attitude towards visualizations may be the biggest threat of the two.

People may take data visualization as a form of truth and objectivity, where the case may be that the visualization is used as a mere expression of thought.

He points out that much research supports that data visualization has had an active development even before Covid and that it has become a necessary part of the public conversation. This is, e. g. seen in election broadcasts, which have strongly incorporated the use of graphics. Before the Covid-19 pandemic, people were more flexible in avoiding dealing with visualizations. However, with the pandemic, the data visualizations became an essential source of information for the general public, and people saw the importance of being able to read such graphs. He elaborates on how data visualizations have the property that they look very objective as a window to the truth, but this is often not the case. He believes one solution to this is the exposure to many different types of visualizations, increasing the critical reflection one makes around the visualizations. Data visualizations can be a solid rhetorical tool, and prof. Engebretsen believes that the more it is used in society, the more conscious one becomes of all sides of it, both the opportunities it possesses and the possibilities of it being abused. Prof. Engebretsen also mentioned how the graphic language can be more complex than what is often seen today. There are several types of data visualizations that are not much used on public arenas today, but which can communicate significant information if used properly.

## Interview with Prof. Emerita Elise Seip Tønnessen

*Department of Nordic and Media Science, University of Agder*

*Prof. Emerita Tønnessen has extensive experience teaching media communication, and her research interests include literacy across different modes and media and how these are used and understood in an educational setting. Her research focuses on children and young people's media culture, reading, literature didactics, and multimodal texts.*

Prof. Emerita Tønnessen contributed with a chapter in the INDVIL book titled "What is visual-numeric literacy, and how does it work?" where she explores literacy concerning data visualization both in a theoretical and empirical aspect. In professor Tønnessen's article, literacy is "the ability to make sense from semiotic resources in an educational context" (Tønnessen, 2020). She discusses how literacy in data visualization has been labeled as visual-numeric literacy. The visual element is relevant to reading graphs organized in a composition in terms of size, direction, and relative distance (Tønnessen, 2020, p. 191). The numeric dimension is developed within the fields of mathematics and statistics. Here the focus lies on the spatial convention about how systems of axes or columns work and the relationship between the different variables, e. g. a variable moving time from left to right or values that move upwards (Tønnessen 2020, p. 191). Reading graphs require different modes, mainly mastering both the numeric and visual aspect of the visualization.\* She discusses how she experienced a tendency to focus on either one of these in previous research.\*

Prof. Tønnessen has experienced the general public and experts in the field failing to understand data visualizations correctly.\* This can pose a possible threat to the overall value of information visualizations. She believes visual-numeric literacy requires a good amount of practice and should be included in multiple subjects in general education.\* A single course should not be "responsible" for teaching data literacy but should instead be a joint effort between science and social studies. She elaborates how exposure to a wide variety of data visualization in media, social, and educational settings should contribute to better visual-numeric literacy and understanding.\*

*\*From interview with Prof. Emerita Tønnessen*

## Interview with Sebastian Skar

*Service designer at Cognite*

With the rising need to control and understand large datasets, there is a demand for the datasets to be understood and, more than often, understood in a visual format. Cognite is a company working with large complex datasets in different industries from oil and gas, electricity and manufacturing, and processing and displaying the data in a digital interface. Until now, these industries have operated very manually, and there has been little innovation in digitizing their sources of information. Cognite has worked with gathering data in these relatively heavy sectors to a digital infrastructure handling the various layers of data they operate with. From a meeting with a designer from Cognite I got some insight into how they gather, handle, and visualize data in order to make decision-making easier for people. Cognite works aim to let their customer achieve governance in their field by having access and the possibility to control their own data.

Cognite has developed a platform called *Cognite Discover* which can be seen as a visual “google search” function for companies and people in the industry looking for specific information. Often one may not know what it is that one is searching for, and therefore Cognite has developed several functions in its platform to decrease this problem. One of the factors is centralizing the platform around a map, showing the different geographical areas in which a company works within. Maps are something that most people have a relationship with, and it is therefore at the core of the platform. From there, one can filter a wide variety of instances that

can give some indication of what one is looking for, allowing the user to filter out irrelevant information. This is done by layering different types of data on top of each other, letting one access both large silos of information down to data at a micro-level. The platform also clusters similar information together, making it easier to navigate the data. Having in mind ways of representing data, it is also important to look at the relationship between limiting the cognitive load and working to avoid a cognitive overload of information.

Together, the techniques Cognite offers to control various datasets lead to a major reduction in time efficiency, thereby making it cost-efficient. Not only is time and money reduced, but the system makes it easier for people without a strong background knowledge to get an understanding of the data, allowing for a more democratizing process.



# Data visualization in the education sector

In education, much information about courses, curriculum, career possibilities, or requirements lay in the form of numbers. Institutions, especially schools and governments, now hold even more information in various digital databases than before. These databases can focus on a school, a study program, or a specific student. By having such information available, it can be used as a policy instrument and decision-making tool. This literature review seeks to determine some of the research done on visualizing statistics in the education sector for teachers, policymakers, and students.

*Digital education governance* is where advances in digital technologies generate, store, and process data, and it is seemingly more applied in the education system, both in its infrastructure and policy-making (Williamson, 2016). On the one hand, it can be inherently efficient taking decisions when the fundamentals are backed up with massive amounts of data to validate or invalidate an argument. On the other hand, the qualitative information from the people affected by the infrastructure or the decisions taken may not be as straightforward. Hundreds of decisions are taken in the educational sphere to achieve the best possible way for students to learn and grow into independent humans. These decisions are taken on a universal, national, regional, and individual level, from the United Nations stating in their human rights declaration that each “individual has the right to education” down to an individual teacher deciding their teaching approach (UN, 1948). These decisions affect, of course, the children, youths, and students attending school,

and the decisions can profoundly influence their lives. The relationship between the numbers and the people can sometimes seem like a tug-of-war. We have the individuals, and their variations are on one side. On the other hand, we can see that the overall quantification of the numbers can contribute to generalizing the population, only seeing it as a part of a whole.

## Visualization of education statistics

Visualizing numbers regarding education statistics can make education more transparent and more accessible for a more significant number of people (Williamson, 2016). Since more of the foundations for policymaking and regulations are moved to digital mediums and based on data, it is essential to understand the process and comprehend the digital format. At its best, data visualizations can help structure meaning faster than looking at numbers in data formats. This function can be a key in policymaking and gathering learning analytics to develop better education systems. Several databases contain vast amounts of information about students, teachers, schools, administrative records, and more.

Some examples are the National Pupil Database (NPD), controlled by the Department of Education in England as a part of their open data governance regime (UK Government, 2022). The NPD contains data on child and school levels for all children attending public schools in England (Jay et al., 2019). Education DataLab is another database containing data on educational statistics in the UK.



It provides policymakers the foundation to inform education policy and for the schools to improve their practice and systems (FFT Education Datalab, 2020).

Together, these datasets can be considered big data because of the data's volume, velocity, and variety. With a large amount of data, there may be opportunities within the data, both in learning analytics data and data for educational governance. These databases can be used to monitor student's behavior by being used as data for visualizations regarding the student's or the school's status or progress. An example of this is the Office for Standards and Educations' (Ofsted) "School Data Dashboard," which visualizes the school performance for stakeholders of relevance and the public (Williamson, 2016). The dashboard represents data regarding exam results, attendance, progress, and other factors of relevance to context in graphical elements such as tables and bar charts (Williamson, 2016).

There are some articles regarding the use of visualization in different educational scenarios. One is a competency map visualized by Capella University (Bushway and Grann, 2014). This map is a digital dashboard for students to see their progress in different courses to promote learning and connect their student status to a set of competencies. The results were not directly positive but did significantly provide the students with a higher motivation to continue to study, with the same students applying for more courses the following semester (Bushway and Grann, 2014).

In Norway, several open datasets are available on SSB<sup>1</sup> (Statistics Norway) and Felles Datakatalog<sup>2</sup> regarding educational statistics. The datasets are mostly drawn from DBH<sup>3</sup>, Database for statistics on higher education, which contains information on Norway's entire higher education system, including universities, colleges, and higher vocational education. In addition, does Samordna Opptak<sup>4</sup> publish yearly a document containing all data on the application process the following year. The document is detailed, and numbers from a broad range of topics are displayed in charts, tables, and graphs, and can say a lot about how students choose higher education in Norway. The document is still deficient due to the service not including all schools and educational programs in Norway. The Directorate for Education in Norway has a plan to improve this with project Future admittance (see p. 27) to let all forms of higher education applications go through the platform.

<sup>1</sup>For more information about SSB, Statistics Norway, see: <https://www.ssb.no/en/omssb/ssbs-virksomhet>

<sup>2</sup>For more information about Felles Datakatalog see <https://data.norge.no/about>

<sup>3</sup>For more information about DBH, Database for statistics on higher education, see <https://dbh.hkdir.no/about>

<sup>4</sup>For more information about Samordna Opptak see <https://www.samordnaopptak.no/info/om/sokertall/>

## Visualizations of choosing careers and educations

Datafication, with all its implications and possibilities, can now more than ever be used to serve students in the digital era better. Some services to provide aid for students can be career calculators which are developed to guide young adults in career and education choices. These calculators are often based on their current academic performances and their current interests, skills, and personality. The calculators show a limited overview of the more concrete possibilities of higher education or workforce and how these are connected with the choices one takes at an elementary and upper secondary level. We also see more composite tools specializing in career guidance, each following its philosophy. The Holland code career test and Arne Svendsruds career tool focus on people's personality traits to guide people in choosing careers (Buboltz et al., 1999; Karriereverktøy, n.d.). The practical information about admission requirements, which affects their choices to a large degree, is found other places on the internet.

Since the increasing use of digital means and data to access, monitor, and understand educational practices has led to more digital traces of people in an education setting, we see both opportunities and downsides with this technology. The literature review focuses on some research that has been done in the field. As discussed above, there is some evident research on datafication in terms of educational policymaking and learning analytics and how different learning approaches can optimize monitoring students' grades or academic practices. Visualizing the learning environment and dynamic visualization can contribute to enhanced

learning. From the literature review, we see a focus on communicating statistics in a graphical format to the people high up in the systems, e. g. school boards and policymakers. This can be the case because it can seem more critical to communicate numbers and trends to policymakers. After all, they are trying to navigate the numbers, opting for the best practice of how education should be governed. There is less focus on navigating the numbers for the students and pupils attending the various institutions of education, which contributes to creating a hierarchy of information exchange. The students are, after all, the central piece in the puzzle, so maybe it is necessary to give them tools to read and understand the development of the educational sphere.



# CHAPTER 2

## **KEY TAKEAWAYS**

## Summary from chapter two

Data visualization facilitates numeric reasoning by communicating numeric and statistical information in a graphical format. There have been several acknowledged people in the field that have contributed to the data visualization discourse.

The data quality is significant, and the way data is handled, sourced, and communicated can raise political and ethical concerns.

How one reads a data visualization is built up of a decoding hierarchy, from recognition, action, and reflection literacy.

Visualization has a duality attached to it; the one that develops the visualization and interprets it both contribute to the communication transmission. The responsibility falls both in the design choices leading up to the visualization and the critical reflection of the viewer.

People tend to connect emotions when reading and reflecting upon a data visualization.

There seems to be less use of data visualization to communicate information about educational statistics directed toward students and pupils. As of today, it is primarily directed to policymakers.

Touching upon data visualization and its role in society, one can set a fundament for further investigation and exploration of the thesis. This fundament will hopefully help with the design choices taken in developing visualizations and the reflection around what they can convey and how they convey information.



## CHAPTER 3

# CHOOSING CAREERS AND EDUCATION

This chapter aims to map out the primary needs of young adults in upper secondary school leaping to higher education or the workforce. The insights are drawn from young adults, career advisors, and official reports on pupils relating to their choice of career paths after upper secondary school. This section aims to provide a solid foundation to enable proper decision-making for later on throughout the thesis. This part focuses on different topics to gain insight concerning the choice of choosing an education and career.

# Methods

The path of choosing an education or a career may not be as evident, especially in a fast-paced and rapidly changing workforce. The third chapter of the thesis centers around this issue which can be seen in society today. Several methods were carried out to reach a greater understanding of the attitudes and behaviors of young adults—both methods for gathering insights and analyzing these insights. The chapter will further map pain points the young adults encounter and sought-out areas for further focus and value creation. The insight phase started with desktop reviews and interviews to form secondary insight. Further, in-depth interviews of young adults and questionnaires were gathered to obtain primary insight directly from the people in focus. Cognitive mapping and affinity diagramming were carried out to structure the material and analyze the insights. The methods used in this chapter are presented below, divided into insight and analysis.

## INSIGHT

### Interviews with career advisors

Secondary insight was gathered through three interviews with career advisors. Career advisors have expertise in guiding students who may be uncertain or confident about their future in possible paths. In this research, they have been used as a secondary source for gathering general information on young adults aged 16 to 19. They have contact with a wide variety of young adults and can help with sketching out the trends in how students behave.

### In-depth interviews with young adults

Primary insight was gathered based on in-depth interviews with six upper secondary school young adults to get a more personal and direct perspective on their situation. The semi-structured in-depth interviews allowed the interviewees to elaborate on the parts they saw as more important, getting a more detailed picture of some of the thoughts and challenges these individuals might have. This open-ended and discovery-oriented method allows for gathering detailed information about the respondent's point of view, experiences, feelings, and perspectives on the topic. All the people have their personal experiences, thoughts, and views, and because they all viewed the choice of education and career as meaningful, the topic, in some cases, generated feelings of compassion or concern for the young adults.

### Questionnaire

A questionnaire was held with a more extensive selection of pupils to get a broader perspective. The questionnaire had a more rigid format, making it easier to compare answers across the different parts. The pupils interviewed are firstly gathered from a selection of people in my circuit. Then also tips from people previously interviewed, creating a snowball effect of pupils with various backgrounds and situations all attending upper secondary school. The method was carried out to supplement further insights gathered from young adults and, together with in-depth interviews, make a fundament for primary knowledge from the intended people in focus.



## **ANALYSIS**

### **Content analysis**

To structure the findings from the in-depth interviews and analyze the key results, a content analysis was carried out, helping to extract themes and make meaning out of unstructured materials from the interviews (Martin & Hanington, 2012, p. 41). The content analysis consisted of breaking up the question asked in the interviews and mapping how each of the people interviewed related to the questions stated. This method allows for making meaning of the key results from the qualitative data gathered.

### **Cognitive mapping**

A cognitive mapping was performed to create a visual representation of the pupils' collected mental model of the overall theme to map out these thoughts (Martin & Hanington, 2012, p. 30). A cognitive mapping intends to highlight connections between thought processes and was used to analyze how the young adults' thoughts influenced other ideas (Martin & Hanington, 2012, p. 30). The most remarkable experiences and perspectives were mapped with connecting arrows to indicate if one declaration influenced another.

## On the psychology of making a choice

As a designer, one must often look into sociological, psychological, and economic aspects of the situation one is designing for, to develop good quality systems and services. By looking into the psychology of making a choice and how the mind behaves when evaluating an outcome, one can better understand *how* one acts and *why* one acts this way when making choices.

Several acknowledged scientists and psychologists with a background in economics have established theories on the psychology of making choices. One of them is Prof. Herbert Simon, awarded the Nobel prize in economics in 1978, who argues for how people make decisions under limited calculations and informational resources (Simon, (1947/ 1976)). He discusses how decision-making centers around the decision-maker's degree of uncertainty regarding the decision. The book by psychologist Barry Schwartz "The Paradox of Choice," continues to follow the idea of how the more choices one has, the more uncertain one gets (Schwartz, 2004). By looking at consumer goods, Schwartz identifies that we now have a vast amount of options to choose from, but our satisfaction has not increased on the same linear path as the options. One might think that greater choices lead to greater freedom of choice, but as Schwartz argues, limitless choices can make us less happy with a decision (Schwartz, 2004).

**“People have a tendency to replace a difficult question with one which is easy to answer.”**

Prof. Daniel Kahneman, 2011

Influenced by Prof. Simon, is Prof. Daniel Kahneman, and he has gained profound attention for his works regarding human behavior, thought processes, and decision making. Among his many theories regarding decision making, one of them centers around people's tendency to break up and replace a problem into more comprehensible elements.

## When does it become difficult to choose?

There is a difficulty in choosing an outcome, especially if these four factors are present (Chernev et al., 2015);

1. That one has many options.
2. That there is a struggle to predict the consequences of the choice.
3. The choice means a lot to the person making it.
4. It is difficult to compare what to choose from.

For many, the choice of education ticks all four boxes on these factors. The result can be what psychologists call a choice overload (Chernev et al., 2015). Some sign that can become apparent when choice overload prevails is that one avoids deciding for as long as possible, leading to choice deferral (Tversky & Shafir, 1992). Additionally, one can be afraid to regret whatever the choice may be, which can result in making a quick choice based on gut feeling, and necessarily not lead to the best outcome for the person (Chernev et al., 2015).

### Key findings

→ If one can lessen the degree of uncertainty and break big questions into smaller, more comprehensible parts, one can become more equipped to tackle the problem one is facing.

→ Choosing a career and education can be challenging because the choice often possesses many options and unpredictable consequences, the choice is meaningful, and it is difficult to compare the options to one another.

**“Learning to choose is hard. Learning to choose well is harder. And learning to choose well in a world of unlimited possibilities is harder still, perhaps too hard.”**

— Barry Schwartz, *The Paradox of Choice: Why More Is Less*, 2004

## Best practice - Choice simulators

Choice simulators for evaluating what one might vote in an election are based on a structured analysis of the parties, their values, policies, and techniques to communicate information to participants, trying to get an as accurate evaluation as possible. These tools use graphical elements so the viewer can quickly make choices based on their preferences and thoughts regarding political statements. The user is evaluated in a relatively short analysis, visualizing their results. Several techniques are recurring in such simulators, based on what is considered best practice in evaluating people's choices. One is the possibility to choose an answer from several points on an axis arranged from "agreeing" to "disagreeing," and simply not only a yes or no answer. The answers can be seen as versions of the Likert scale, which was developed in order to measure "attitude" in scientific research (Joshi et al., 2015). The person answering is presented with a statement and asked to answer how much one agrees with the particular statement, varying from seven to four different stages of agreeing. When presented with a statement, many simulators also allow the user to read more about the specific context to get sufficient background information to evaluate one's choice if one is uncertain. Lastly, the user is presented with

where one seems to agree the most on the political axis and why this party or political side seems to be the best fit. Calculators for simulating loaning possibilities are another example. Here, one inserts current information regarding loaning ability and evaluates how much one can pay and how one can repay the loan over time. This calculator evaluates a person's possibilities and limits when it comes to, e. g.—buying a house, which highly influences the possibilities. A well-designed simulator can show the viewer a more detailed explanation of the outcome and help them better understand their role or possibilities.

## Expert interview of election simulator designers

Looking into how to proceed in developing an election simulator, an interview was carried out with the two designers who developed the election simulator in 2021 for NRK. Even though the simulator was based on previous election machines used at NRK, the one developed last year is a result of a design process with a specific target group in mind; young adults who are perceived as the "second-time voter." The two designers elaborated on how the goal of the simulator is to give people a better understanding of the election choice they decide to make and better their political self-confidence. The simulator then uses several graphical elements to highlight this overall goal.

Visibility was a key factor for the designers in showing what the parties believe, where they placed themselves on the political axis, and trans-

parency of how the algorithm works. The platform considers that the user does not necessarily know much about a topic in advance, allowing them to obtain more information about each claim. For the 2021 simulator, they stripped down some of the graphical elements, making the experience more professional and trustworthy. They worked with presenting the outcome, and the party one most agreed with was more subtle, showing a range of top parties and how the respondents themselves seem to be placed on various political axes. NRK is the largest state-owned media producer in Norway, with a high prevalence among its citizens. A simulator like the NRKs election simulator will need to be carefully developed because it covers the areas where people are uncertain. Therefore small nudges can tend to influence the people affected significantly.

## Interview with career advisors

In Norway, every pupil, from elementary to upper secondary school, has the right to necessary advice on education, career choices, and social issues regarding their situation in school (Udir, 2022). This includes the right to necessary counseling and career guidance, where education and career counseling aim to help pupils become aware of their values, interests, and needs. The school aims to contribute to the pupils' personal, social and professional development and learning. Overall, the school is responsible for qualifying the pupils for a good life so they can function well in different areas and contribute to society's growth and development (Udir, 2022).

Career advisors have expertise in guiding students who may be uncertain about their future in possible paths. Combining this secondary insight with primary insights directly from the young adults can contribute to a complete understanding of the pupils' thoughts and behavior. The thesis includes three meetings with career counselors, one informal dialog with a career advisor, and two semi-structured interviews with career advisors at both upper- and lower secondary schools.

### Findings

Like most other schools, the institutions work with pupils from different backgrounds and often encounter pupils uncertain about what to pursue or which roads to take to get there. They get comments that the information the students search for can be experienced as confusing and incomplete. Some mean that it is the upper secondary schools that are responsible for giving the students the necessary information, but we can often see they do not give sufficient information.



**Dialog with a career advisor at a private institution**



**Interview with a career advisor lower secondary school**



**Interview with career advisors upper secondary school**

The counselors are mandated to listen to and see each pupil and what is important to them in their life. However, counselors also have a social responsibility, especially at the public institutions. They know, for example, that there is a lack of health-care workers, and so there is a need for society to push more people into the healthcare sector. However, the most critical step is to listen to what the pupils want because if they drop out, end up not finishing their education, or are dissatisfied with their work, it can become a considerable expense for the government and cause an unfulfilling life for the individual.

Matrix of findings derived from the interviews with career counselors. More detailed information can be found in Appendix 2 and Appendix 3.

<b>Institution</b>	<b>Approach</b>	<b>Guidance</b>
<b>Private institution</b>	Specialized	Individual
<b>Lower secondary school</b>	Holistic	General & Individual
<b>Upper secondary school</b>	Holistic	General & Individual

**Figure 2:** Matrix of findings from interviews with career counselors

**"The concept of one's career as it is understood in society is very much about success at work. One should rather see one's career from birth to the grave and how it is about mastering life in the best possible way. It is about making wise and informative choices along the way."**

Career advisor, lower secondary school

## A report on young adults' education and career choices

In 2021, Opinionen carried out a survey on young people's education and career choices, mapping trends among youth in Norway. Opinionen is an independent market analysis agency, and the survey was conducted by an order from The Directorate for Higher Education and Competence in Norway (HKdir). The report gathers responses from 1 103 people aged 15 to 25 years. The data and results are weighted by gender, age, and region according to official statistics for how the Norwegian population is distributed (Jacobsen & Bjerke, 2021). The report summarizes some key findings (Jacobsen & Bjerke, 2021):

- More than 8 out of 10 plan to take further education after upper secondary education. Among those who want to take education after upper secondary education, 70% consider an education at college or university level.
- Self-interest is the most critical factor in educational choices and career preferences
- More than half found it difficult to find the proper education. 49% find understanding which professions one can get with different educations is challenging.
- 1/3 are dissatisfied with the advice they have received at school. More than half of those who are dissatisfied with the counseling service at the school say that it is because they find better information themselves or that the counselor did not have sufficient competence.
- There is a need for more descriptive information about the profession in practice and what professions are most relevant in the future.
- The Internet is the most important source of information about educational opportunities, and 3/5 prefer to find information themselves.



## Interesting findings

From the report, there seems to be a clear need for more information about non-traditional and future-oriented professions. Just over half (55%) feel they have the necessary information to make sound educational and career choices. The proportion who feel they do not have sufficient information (29%) has increased since 2019, and they are calling for more descriptive information about the profession in practice and what is future-oriented (Jacobsen & Bjerke, 2021). Many miss information about more untraditional professions and a better follow-up from primary school.

The Internet continues to be the primary source of information on educational opportunities. 4 out of 5 believe that the Internet is an essential source for providing them with helpful information about educational opportunities. 3 out of 5 prefer to find information online when they receive information about educational opportunities. About half also prefer to talk to a counselor or supervisor face to face.

Self-interest and well-being are, in general, the most important criteria for educational and career choices. Regarding educational choices and career preferences, self-interest is the most crucial factor. Regarding education, it is essential that the subject area is of interest and that the pupils get the job they want. When choosing a profession, the majority are concerned that the profession should be adapted to their interests, well-being, or work environment, that they can use their abilities, and that the work should feel meaningful.

# Primary insights from young adults

Although insights from career advisors and mappings done in the field on the user group contribute to the greater picture, primary research from direct contact with the end-user is needed to fully understand whom one is designing for. The in-depth interviews and the questionnaire ask about the pupils' current situation, career and educational plans for the future, why they want to go in these different directions, and how they see themselves in the working sphere. The questions also revolve around how the information about career choices is communicated.

## In-depth interview with young adults aged 16 to 19

The six young adults interviewed are from various parts of the country. The young adults attend different education programs in upper secondary school, varying from general studies, music, media and communication, and nature. All the people interviewed are active and engaged people, and some even have political careers besides attending their schooling.



### First year of upper secondary school, agricultural line

A 16-year-old girl in the first year of upper secondary school has chosen to attend the agricultural line. The specialized program allows her to get a degree after finishing upper secondary school, and the line also allows her to specialize in math and science, preparing her for higher education. She wanted more practical schooldays, which is one reason she attended the agriculture line. She has voluntarily worked in politics while attending lower and upper secondary school, which has led her to want to take higher education in political science to pursue a career in politics.



### Second year of upper secondary school, media line

A 17-year-old boy attends the media line because he has an interest in film and theater. His parents both work in the entertainment industry, which has influenced his desire to work in the entertainment industry himself. He has not thought about what to pursue after upper secondary school. However, he notes that flexibility in a job is crucial for him, as is trying to do something out of the ordinary and not necessarily taking a traditional path to higher education.



### First year of upper secondary school, music line

A 17-year-old girl attending the music line in upper secondary school. She was very uncertain about which upper secondary school to attend, resulting in first choosing general studies influenced by friends and family. Some time into the first year, she realized that the school and the study program were not suited for her, so she switched to the music line at another school. Now she attends the first year again but is pleased with the decision she has made because now she can pursue her hobby at school.



### Last year of upper secondary school, general studies

He attends general studies at a lower secondary school and has chosen general studies with a specialization in science to have all doors open for further studies. He is certain about taking higher education, precisely what is uncertain, but he sees himself pursuing something related to science to some degree. Older siblings attending higher education have reduced his fear around the choice. He sees the value of not going directly to higher education and that there is a possibility to change paths if one wishes.



### First year of upper secondary school, music line

After long and thorough work of reading up on the choices for upper secondary school, this young adult chose to attend a music line, which led him to move out at a relatively young age. He is also very active in youth politics, where information and guidance about young adults' choices and rights regarding education is something he considers important.

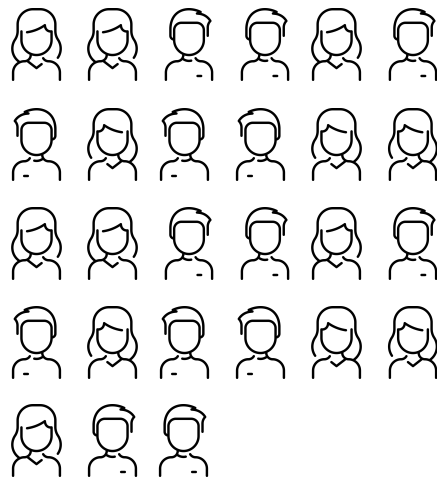


### Last year of upper secondary school, general studies

A 19-year-old girl in her last year of upper secondary school attending general studies. She has recently been through the process of choosing higher education. After searching through relevant programs online, she has just applied to a program that could fit her a bachelor's in graphic design.

### A questionnaire with young adults aged 17 to 19 years

A questionnaire was sent out to gather more insights into pupils' thoughts in the aimed user group (see Appendix 4). The questionnaire obtained 27 results, containing data from multiple choice answers and text boxes. Much of the answers highlighted the already provided results from Opinionen. Some interesting findings are that from the pupils participating in the study, 67% said that family is one of the main places for gathering information about career and education choices. The majority, 70.8%, also answered that they have either really or to some degree felt afraid of choosing "wrong" when choosing what to do after upper secondary school.



### Hvor er det du innhenter informasjon om utdanning og karrierevalg?

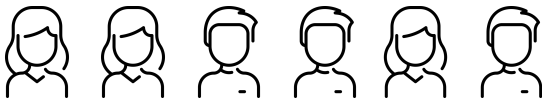
Svar	Antall	Prosent
Snakke med venner/bekjente	14	51,9 %
Snakke med familie	18	66,7 %
Internett	17	63 %
Fra lærere/veiledere ved VGS	8	29,6 %
Direkte kontakt med universiteter/høgskoler/jobb	2	7,4 %
Ingen av delene	1	3,7 %

### Har du kjent på tanken at du er redd for å velge "feil" når du skal velge hva du skal gjøre etter VGS?

Svar	Antall	Prosent
Ja, mye	3	12,5 %
Ja, litt	14	58,3 %
Likegyldig	1	4,2 %
Ikke særlig	5	20,8 %
Nei	1	4,2 %

**Figure 3:** Excerpt from the questionnaire. For more detail for the questionnaire, see Appendix X

# Content analysis

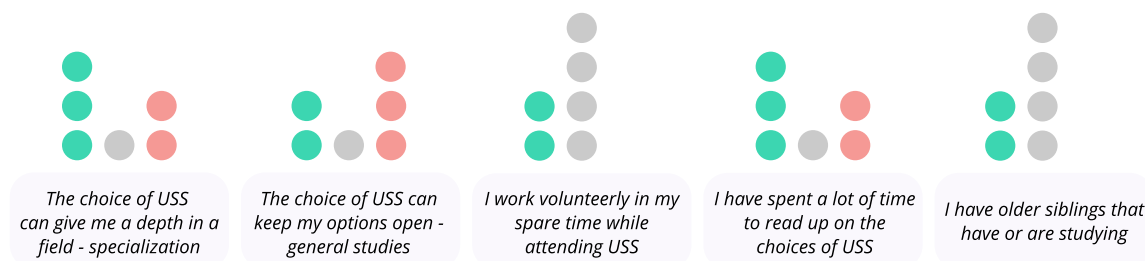


## Primary insights from interviews

The questions asked during the interviews span over five main categories; their current status in upper secondary school, what is essential for them in a career, their future thoughts on career and education, information received, and how Covid-19 have affected their choices. The matrix derived from the content analysis mapped how each of the young adults related to the questions stated, stating either positive, negative, or neutral to the claims. When an unclear answer was provided, the young adults fell into the category neutral, which also included the times not able to gather data.

From the matrix, we see half of the people interviewed mentioned that it is essential to choose a career where they have many possibilities open. We also see that all the young adults interviewed want to take higher education, and most of them know what kind of education to pursue, but only one of them knows what profession they want to pursue. In addition, four out of the six young adults have felt afraid of choosing the “wrong” field of study.

Regarding information received at school, all people comment that they have not received information about higher education in time. They wish to have information about possibilities regarding education and careers earlier, ideally in lower secondary school. The information received at lower secondary school regarding the options afterward was severely lacking. This is also when one may be least capable of seeing the bigger picture of the possibilities and choices to take. Almost all the young adults feel they have not received good information about career and education choices at their school, which influence their need to find the majority of information about careers and education online themselves.



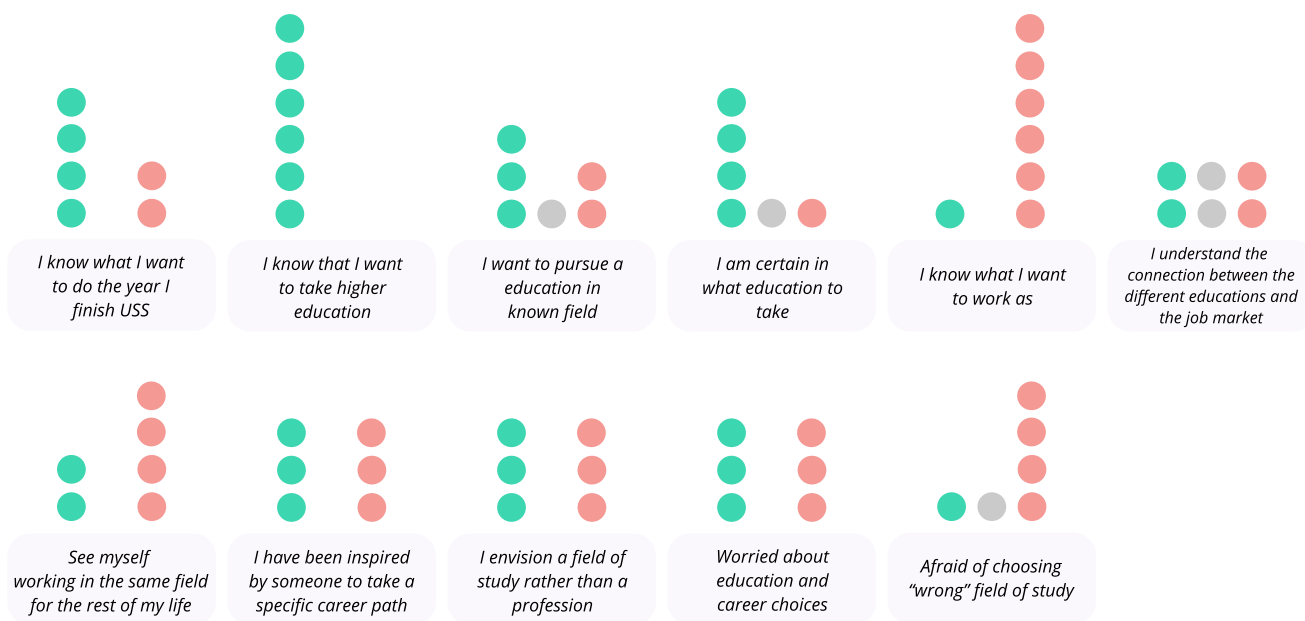
## Current status in upper secondary school

- Positive
- Neutral / no data
- Negative

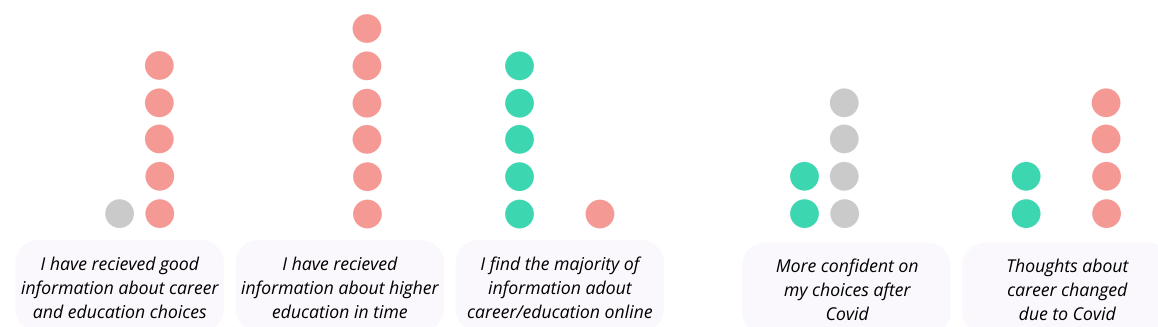
USS = Upper Secondary School



### Important factors in career choices



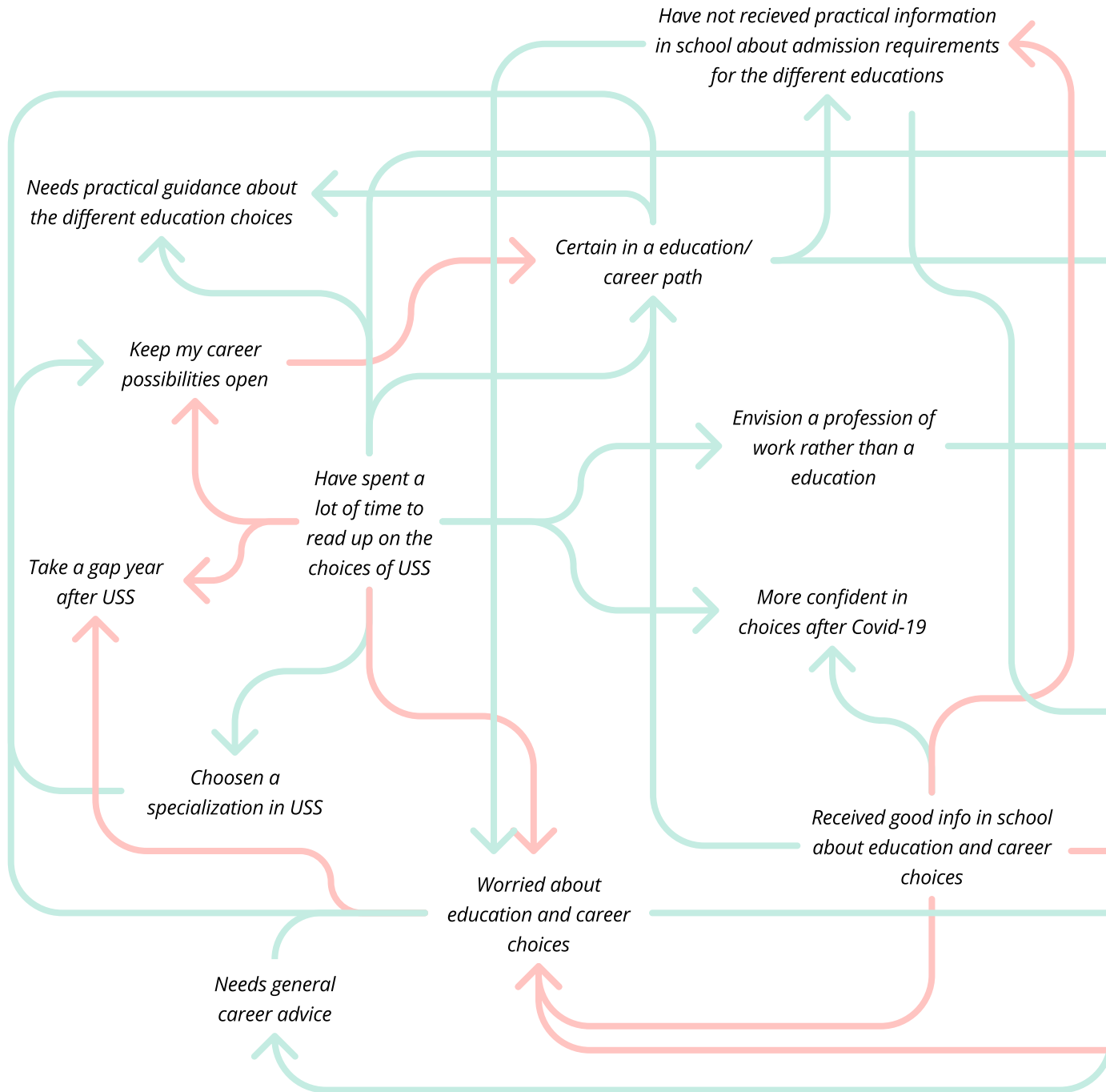
### Future thoughts on career and education



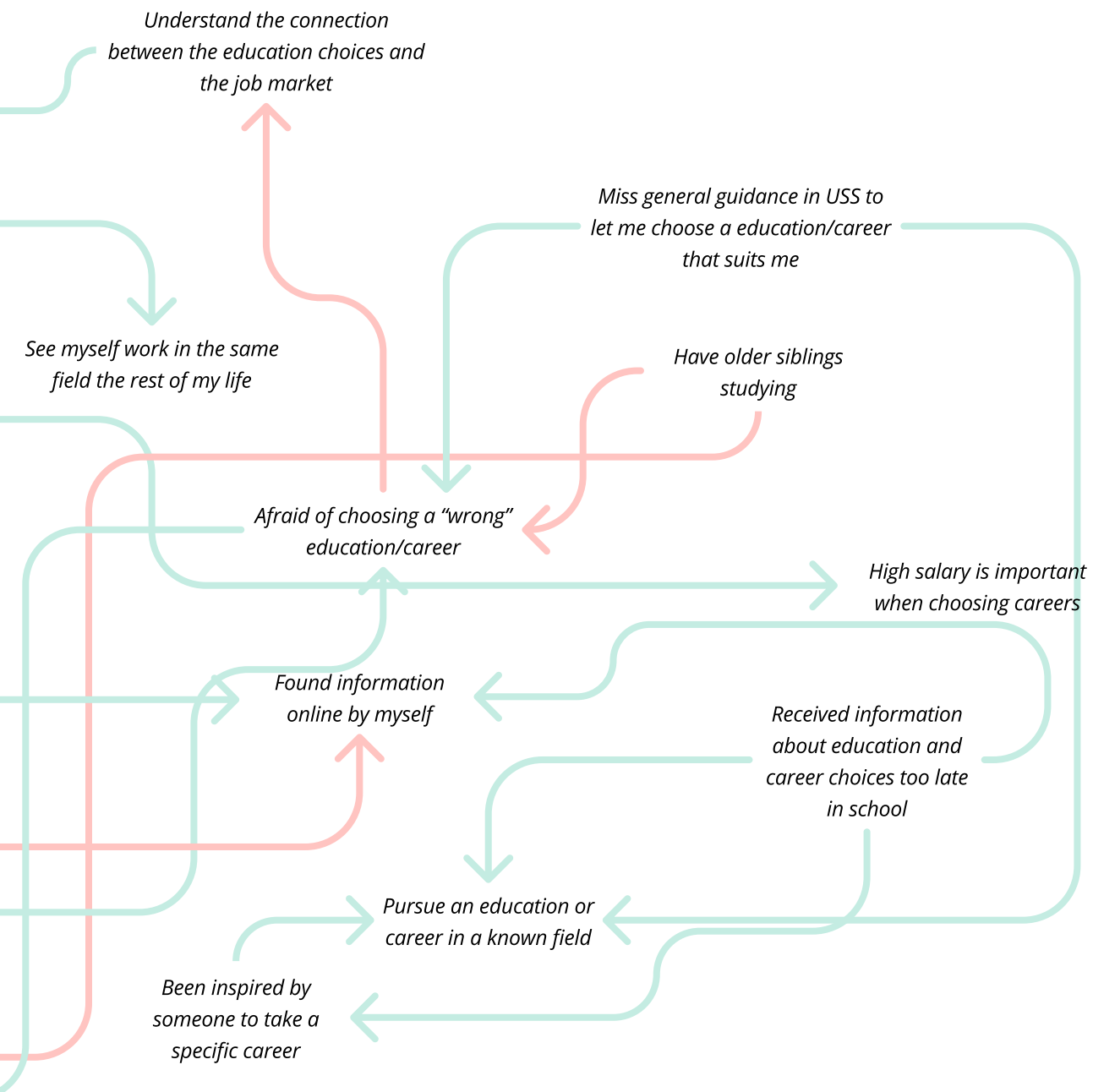
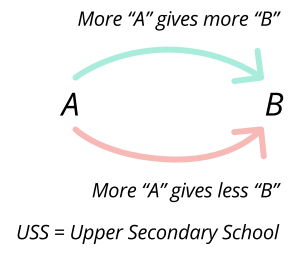
### Information

### Covid-19 and choices

# Cognitive mapping







## Cognitive mapping

The cognitive mapping pictures the thought processes of the young adults interviewed, where from the map, a hypothesis can lead to more or less of something else, highlighting this with either green or red arrows indicating more or less.

Several themes were recurring in the interviews, and certain factors tended to influence these themes. All six young adults noted the most evident topic as lack of information about career and education choices. They feel detached from the possible choices regarding what careers to take because the options are either fronted as too narrow or received too late. Older siblings can lead to a more relaxed relationship with higher education and choices. Those who have spent time reading up on the opportunities for upper secondary school are generally more confident in career paths and better understand the connection between the educational choices and the labor market for these choices. Those who have not spent time reading up on the possibilities of upper secondary school are more eager to take a year off after upper secondary school and are generally more insecure in their career paths. Where thoughts about careers have changed due to the pandemic, they have become more confident in their choices and, in a greater sense, know what they want to work within because the pandemic

has led to more time for reflection, and they see more clearly where their grades can lead them. There is a connection between those who are more confident in their career choices and would instead want practical information on how to get where they want to go versus those young adults who are more insecure and need more substantial guidance on suitable choices to make. First-year pupils tend to focus more on the career path, while last-year pupils focus more on which education programs to attend.

# Comparative attitude matrix

Three central attitudes became apparent based on the insight from the interviews, questionnaires, and the market analysis. Below are three different categories for attitudes regarding career and education.

- The first category addresses active young adults who research and make strategic choices through school. Most of the young adults interviewed fell into this category. They also see the benefits of being active and often experience researching information on education and career choices and their initiative as fun.
- The second category focuses on the pupils who have little to no idea what choice to take after USS. They can experience sticking their heads in the sand because of their uncertainty and lack of confidence regarding their future. They tend to delay the choice until the final deadline.
- The last category involves pupils who might not do so well at school and are not so interested in working so much with the school either, but who want all the opportunities open. They tend to make choices that allow them to choose everything, which can lead to the inability to achieve what they want. Sometimes, trying to open all the possibilities may not be the best option.

# CHAPTER 3

## **KEY TAKEAWAYS**

## **Shortcomings in today's system and pain points derived from insights from the young adults:**

Today, solutions and services appear fragmented for end users. In addition, many young adults feel their first choice will determine the rest of their careers.

There seems to be little information about creative paths from education to career. Today the career descriptions are very narrow, as well as the path to get there, i. e. choosing one direction does not mean one needs to be limited to that specific profession.

The system is very grade-oriented and less person-oriented, making it frustrating for people who do not have high grades, especially in higher education. They tend to delay the choice, sticking their heads in the sand and feeling excluded from the system because they see no possibilities.

Young adults feel they have little overview of what different jobs education can lead to. They perceive the end-state as very limited from the official websites, even though they know in reality that people can work in a very different profession than what they have an education in.

There is a need for more information about non-traditional and future-oriented professions. The young adults seek information about which professions will be highly relevant in the future because they want to ensure they go in a direction where they have a high possibility of acquiring a job.

The information received at lower secondary school regarding the choices and possibilities after finishing lower secondary school is severely lacking. This is also when one may be the least capable of seeing the bigger picture of the possibilities and choices to take. In both lower secondary school and upper secondary school, young adults have commented on the impression they get of the school being limited focused on a career and what careers and direction one can go.



## CHAPTER 4

# BRIDGING THE TWO

This chapter explores the use of data visualization to communicate career and education choices and possibilities. The chapter focuses on analyzing an idéal and existing datasets, conceptualization, and early testing of the concept.

# Methods

The methods used in chapter four mainly explored two areas of focus; methods for generating ideas for possible concepts and methods for testing the ideas.

## CONCEPTUALIZATION

### How might we

The conceptualization phase introduced the process of generating several proposals for how an ideal system may work. The how might we (HMW) method helps uncover underlying problems or connections and impacts other statements may have on the main problem (Rosala, 2021). The HMW method was used to generate as many problem statements as possible, forcing us to look at the problem from different angles before gathering some precise problem statements.

### Concept generations

Concept generations allowed for quickly sketching out ideas for each of the HMWs. The method includes directly sketching and examining how one might visualize the various statements. When a problem statement stood lingering and found it hard to develop a sketched solution, inspiration was sought from other online sources or discussions and brainstorming with co-students.

## TESTING

### Concept testing with pupils

By testing the concept with the intended users, one can quickly uncover gaps where the concepts fail to communicate what was intended and find places where the concept positively surprises them. Their feedback and comments on further developments became of great value to include in the subsequent iterations.

### Expert feedback

To evaluate the visualized concepts, help from a data visualization expert, Martin Engebretsen, was gathered. Together we could pinpoint strengths and weaknesses in the low-fidelity prototypes and find areas to reiterate for further developments of the visualizations.

### Guerilla testing

The guerilla testing method to test a service is quick and can efficiently highlight weaknesses and strengths in the design choices (Ligertwood, 2020). The test was conducted at an upper secondary school to get direct access to people who are the intended users of the platform. As a rule of guerilla testing, the participants of the tests were not recruited in advance, causing the pupils to participate without preparations and an environment and setting they are used to. This allowed for more direct answers, and this spontaneous test technique created a more unconstrained evaluation of the service by direct feedback from the intended audience (Ligertwood, 2020).



# Design for society

The education system leading up to a job tends to be complex. Coincidences and influences beyond our knowledge tend to contribute to what path we choose to take regarding education and careers, and this aspect will we never be fully able to depict. How can we visualize something that may be personal and include many aspects that can not be calculated? Almost half of the pupils, 45%, feel they do not have the information they need to make sound educational and career choices (Jacobsen & Bjerke, 2021). Although from insight from pupils, there are aspects or parts of the system that young adults find especially difficult to comprehend and understand. By targeting these areas of interest, one can try to tame the obscure and confusing experiences the pupils tend to encounter when figuring out what to do after ending upper secondary school. By first recognizing these areas, we can bring value to the pupils. By uniting young adults' career choices with the properties of data visualization, we can combine two aspects to uncover more information or better understand the current education system for the users.

# Design brief

A design brief was carried out to pinpoint the project's specifications and how to proceed forward. The brief is directed towards Sikt, allowing them to get an overview of the project's intended scope and goal.

## Vision

The vision is to make a database with sources of information about education and career possibilities for young adults attending upper secondary school, guiding them to make better choices regarding their education path and desired career.

## Goal

The goal is to make a service that inspires young adults to seek out information about their options when choosing education leading up to a career. The concept is intended to outline a service that could be used as a tool for guiding pupils in navigating career and education choices.

## Target audience

The target audience is young adults in upper secondary school's second to last year. These are the years in which pupils are presented with the choice of what they want to pursue after finishing upper secondary school. The focus is directed at first-time choosers, primary pupils achieving general study competence in the upper secondary school. From analyzing the various attitudes, the service is intended to initially serve those pupils who are uncertain about what they want to pursue and those who find themselves delaying their choice due to uncertainty.

## Time perspective

The concept is due to be designed in a matter of four weeks. This is a limited time; therefore, the service only focuses on some highlighted parts and is not a fully implemented service. However, one can test the prototypes and simulate a full service, to get feedback on the strengths and weaknesses of the concept.

## Limitations

Time may be the most apparent limitation. Lacking programming skills and limitations in understanding statistical datasets will also be a limitation, as the concept ideally intends to work with evident datasets gathered from various platforms showing educational statistics.

## Must, should, could

The service must include an overview of the current education system and its possibilities. In addition, the service must include the various higher education possibilities and what careers the different educations can induce. The service must let the pupils filter or sort educations and careers based on interests as this is the most crucial factor. The service must be appealing to young adults aged 16 to 19, and it should be something they want to explore and minimize information overload. The service should include information about career paths other people and students have taken as a source of inspiration for alternative education and career paths. Lastly, the service could include information about future-oriented jobs/careers as this is something the pupils want to know.

## Actors and the financial aspects

Sikt and HkDir (Directorate for higher education in Norway). An exploratory thesis for Sikt. Due to high innovation in the education sector in the years to come, this research and explored concept can be used to inspire further development and show possibilities for possible solutions delivered by Sikt.



## Mapping pain points to areas of focus

Section three concluded several shortcomings in today's system and pain points the young adults encounter. From prioritizing these pain points from the must, should, and could in the design brief, four focus areas were selected where innovation could give the most value. The four focus areas are primarily centered around what desired information a pupil in the last or second to last year in upper secondary school would want. The lack of information or confusing information in these areas contributes to the undesired experience the pupils may have in their situation.

They would want to, to a much higher degree, be able to think creatively around the choices regarding competence and competence development. The first step to thinking creatively about one's educational path is knowing that the choices exist. There are no right or wrong choices, but they wish they knew the possibilities that existed before they were pushed in one direction. In addition, they want more creative compositions of career choice and education, more open-ended career descriptions and information, and various paths to get to one or the other place.

Four primary focus areas to emphasize and to move forward within a thought solution:

- The first area of focus is the education system as a whole. Here to show the main parts of the Norwegian system and how this is connected to the existing careers. Pupils tend to think the system is very rigid and with little flexibility when the system is more flexible than one might have the impression.
- Information about the labor market and the different professions and what the labor market looks like in Norway. Here is information about what profession is needed for future demand in Norway, and possibly show where the market is more saturated and in less need.
- The third focus area centers on a better understanding of the connections between the different educations to specific jobs and vice versa. The aim is to highlight different paths from how an education can lead to a profession and vice versa.
- Communicate information on how other people have taken a career choice, and show their paths to get to that profession or study.



# Analysis of datasets

## The ideal dataset

The ideal datasets will vary due to the visualization's desired goal. Since the area of focus centers around education offered at various Norwegian institutions and professions connected to the Norwegian industry, the datasets will need to be based on the Norwegian society. In addition, the idéal dataset should be timely and complete to get as accurate a description of the situation as possible.

First of all, the idéal datasets will include how the Norwegian education system is built up, with the different educational institutions. It will contain how these systems are connected, how many percentages of the population are at each level, and the percentage which moves from one level to another, e. g. from lower secondary school to upper secondary school. Idéally we could also want a prospect on how the flow can be seen in the future or a prospect of how the education system will tend to look.

Secondly, the idéal datasets will center around Norway's various education options and levels. We would want to see how they are connected to which institution, at what level, which specific school, location, and, idéely, what area of focus the education spans, e. g. is it connected to an industry or the health sector. The desired dataset is complete, including all education available in Norway filtered on level of competence, i. e., year unit, bachelor level, master level, after- and further education, Ph.D. level, or other, and as up-to-date as possible, ideally from 2021/2022.

## Objectives of the data analysis

*Find what data is needed to understand the areas of focus depicted above.*

Lastly, the idéal datasets will include a complete overview of the different professions in Norway, categorized on the area of focus and sector. It would also include the level of competence needed to enter each profession. Preferably the datasets would also contain different skills needed in each profession. It will also need to be timely, based on the workforce as seen today. A prospect of what the workforce in Norway may look like in approximately 5 to 20 years would be of interest, so the young adults can get an impression of what the workforce will look like when they enter the workforce.

## Analysis of existing dataset

The visualizations should be based on actual data from the education sector in Norway and equivalently for the Norwegian workforce so that the visualization can be as truthful as possible. As previously discussed, a data visualization is – and should be – completely dependent on the data being visualized. The quality of the data will affect the quality of the visualization. This section analyzes some relevant datasets found that could work as a basis for the visualizations. For the project, open and publicly available datasets were considered. The datasets were gathered from various platforms regarding statistics, primarily on education and the Norwegian industry and workforce. Another goal is to gain a deeper understanding of the format of the datasets to get a greater understanding of what parts can give essential information.

- **STYRK-08** - Nominal data, classifying the Norwegian workforce based on the International Standard Classification of Occupations – ISCO-08. Occupational classification is intended for use in labor market statistics and has a 4-digit level for each occupation sub-group. The current version is valid since January 2011 and is the official version used today.
- **NUS-codes** - Nominal data, for classifying education based on the international education standard ISCED
- **Utdanning.no** - Utdanning.no is the national web portal for information about education and profession, with an overview of the Norwegian educational offer. This platform is also distributed by the Directorate for Higher Education in Norway.
  - Descriptions from various professions gathered from utdanning.no.
  - Descriptions from various educations gathered from utdanning.no.
- **DBH** - Database for statistics on higher education in Norway. The database for statistics on higher education (DBH) contains information on the entire tertiary education system in Norway, which includes universities, colleges, and higher vocational education.
- **Statistics Norway (SSB)**
  - Competence level in the Norwegian population from Statistics Norway (SSB)
  - Projections of the labor force and employment by education towards 2040

# Conceptualization

## How might we

The HMW method (Rosala, 2021) is a way to break down the problem areas and force you to look at the problem areas from different perspectives. The method entails writing down as many HMW statements as possible under each focus area. It also allows for grasping the more significant problems into smaller, tangible areas. Firstly, the key of the method is only to sketch out questions, gather a large pool of unresolved statements, and then, after deciding on some key statements, begin to sketch out solutions. Now that we have gathered insights, the methods allow for rephrasing the known challenges as a question beginning with “How might we..”.

*How might we visualize the flexibility in the education system in a way that pupils see new opportunities for a chosen path?*

*How might we visualize the different professions in a clear way that also prevents possible information overload?*

*How might we show how an education may be connected to a specific profession and vice versa?*

*How might we visualize alternative paths taken to a specific profession or education so that pupils can be inspired to see new ways of navigating to a goal?*

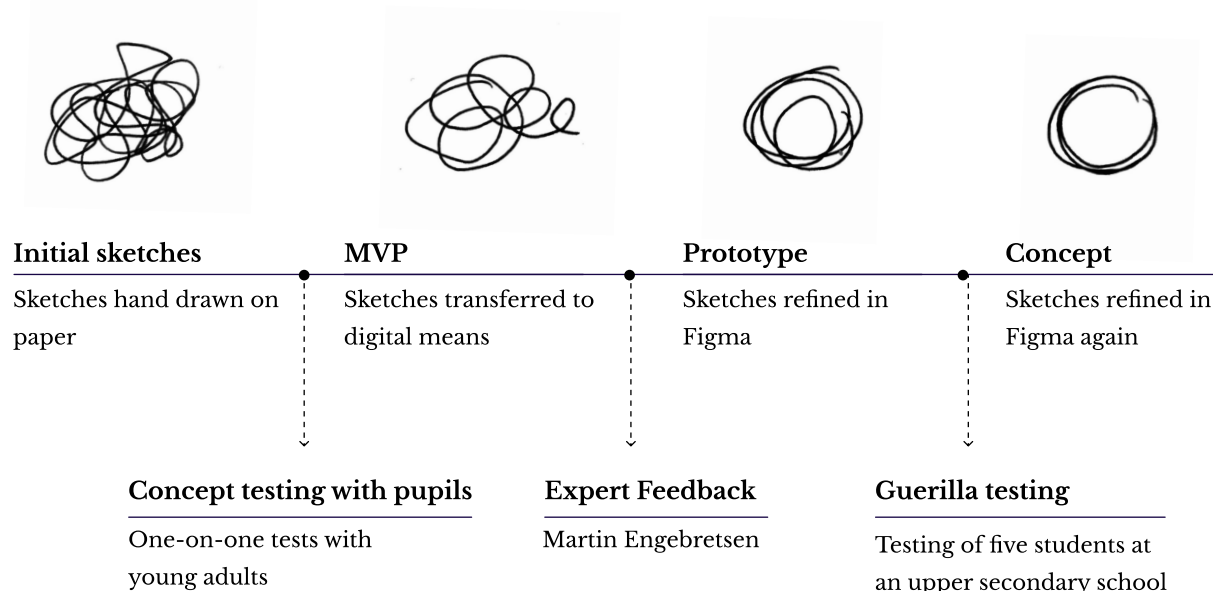


# Early transformation of chosen datasets to visualizations

The early conceptualizations were performed by hand, listing the relevant information, and finding out how to present the information in visual terms. The sketches were quick and with little detail to get an idea of possible ways to put the problem areas in a visual context. The sketches were developed by first considering each HMW-statement and then trying to answer the question of what specific function we want to visualize in each of the examples. Do we, for example, want to compare different variables, or do we want to visualize an abstract concept? Maybe we want to communicate a correlation or distribution of several variables? In other cases, one might want to represent geographical data or developments over a specific period.

Either way, all the concept developments evolved from a thought process consisting of three steps: what do the young adults need of information, what data do I have, and how do I visualize it in the best possible way?

Further, RawGraphs and Flourish were used to upload some of the chosen datasets to explore various ways to present the data (Mauri et al., 2017; Flourish, 2022). RawGraphs and Flourish are open-source programs, allowing for visualizing one's dataset in various ways. Some visualizations were based on mere graphical elements from Figma, although they were based on data from *utdanning.no* and SSB.



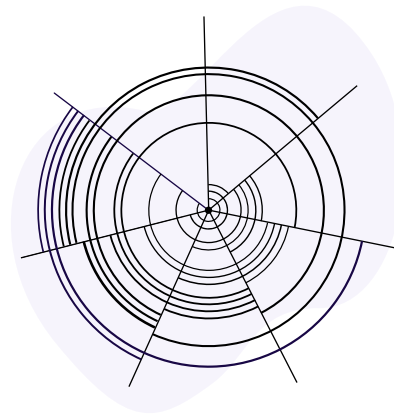
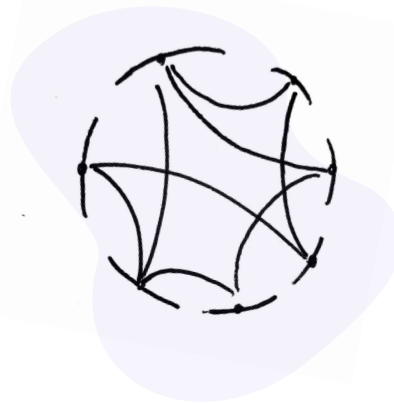
**Figure 3:** Process of transformation of datasets to visualizations and testing.

“How might we visualize the flexibility in the education system in a way that young adults see new opportunities for a chosen path?”

## CONCEPT 1

### EXPLORATION - SKETCHES - MVP - LOW FIDELITY PROTOTYPE

From the insight, an impression was that the pupils had a linear picture of how one goes through the education system. An idea was to change this perspective by visualizing it in a cyclic form and highlighting how dynamic and flexible the system can be. The first concept centered around mapping relations between different parts of the education system and how these relate to the workforce and the connections between the institutions. Several different visualizations were explored to visualize the connections, from network diagramming, arc diagrams, hyperbolic trees, chord diagrams, and non-ribbon chord diagrams. The initial thought centered around communicating how one can navigate through the institutions and not necessarily how people tend to go from one instance to another.

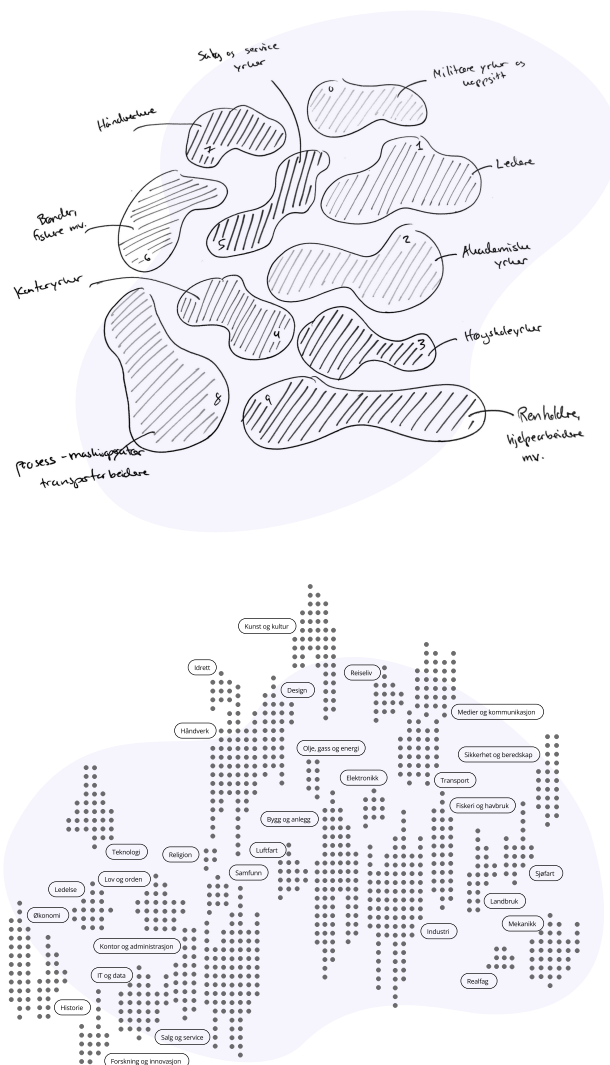


“How might we visualize the different professions in a clear way that also prevents possible information overload?”

## CONCEPT 2

### EXPLORATION - SKETCHES - MVP - LOW FIDELITY PROTOTYPE

For the second concept, the statement "How might we visualize the different professions clearly and prevent possible information overload?" was tried to be visualized using graphical elements. Utdanning.no lists over 600 different professions categorized thematically in 41 different interest groups. This categorization is made by the editors of utdanning.no and is not linked to national or international standards (Felles Datakatalog, 2017). Interest seems to be key factor pupils search for in both educational pathways and their profession. In addition, most students answer to being more career-oriented than education-oriented when evaluating their future. Therefore the initial visualization centers around a visualization taking the workforce as a fundament, categorized or clustered by interests. Some professions tend to show up in more than one category, so the initial thought was to apply a clustering method that was more relevant as the profession can cluster up towards the most relevant profession. The visualization should display the workforce as a terrain of possible jobs or professions to work within. Since the data is not numeric, showing the workforce in a distribution became difficult. Data from Statistics Norway, a report on projections of the labor force and employment by education towards 2040, was analyzed to display future relevance in the different professions. Here the idea was to present the future relevance as a layer on top of the current terrain.

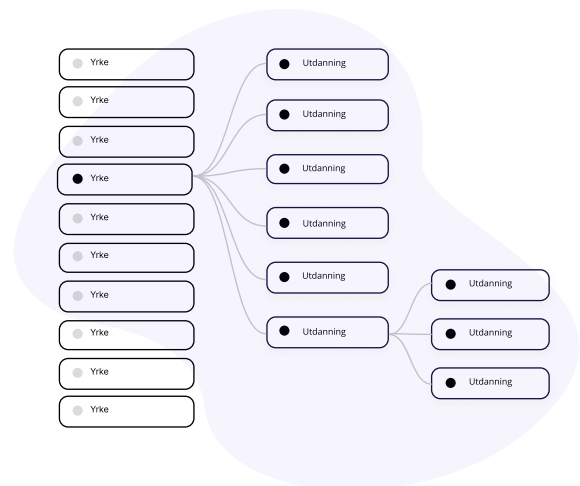
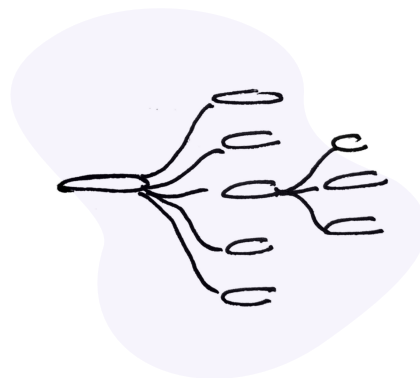


“How might we show how an education may be connected to a specific profession and vice versa?”

### CONCEPT 3

#### EXPLORATION - SKETCHES - MVP - LOW FIDELITY PROTOTYPE

The third concept explores the relationships and connections between a chosen education and its related professions and vice versa. The key is to open up for more possible solutions of possible professions or possible educations, not only a link between one instance to one possible outcome. The exploration began by looking into how one can visualize hierarchies, as education is a means to a profession. To display the data, hyperbolic or radial trees, dendrograms, and sunburst diagrams were explored. These visualizations explore hierarchies, either radially like in a hyperbolic tree and sunburst diagram or with a clear direction like a dendrogram (Kirk, 2019, p. 163 - 164). Initially, the circular visualizations were explored with the thought of centering the pupil in the center with his or her possibilities ranging out from their standpoint. These visualizations became cluttered. A dendrogram displays hierarchical relationships across multiple tiers of different categorical dimensions, as relevant in the case of professions relevant to the chosen education. The choice of basing the concept on a dendrogram moving from left to right became the preferred solution for the low fidelity prototype.

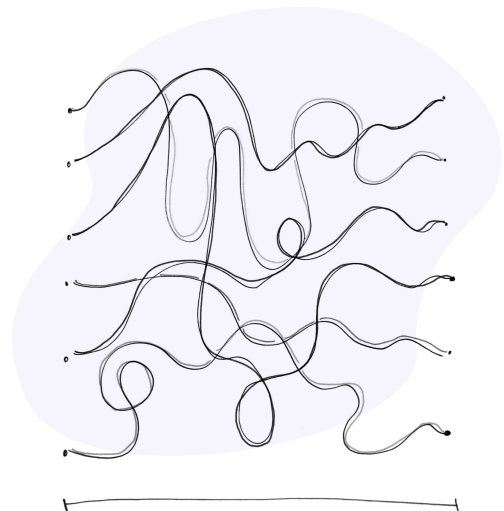
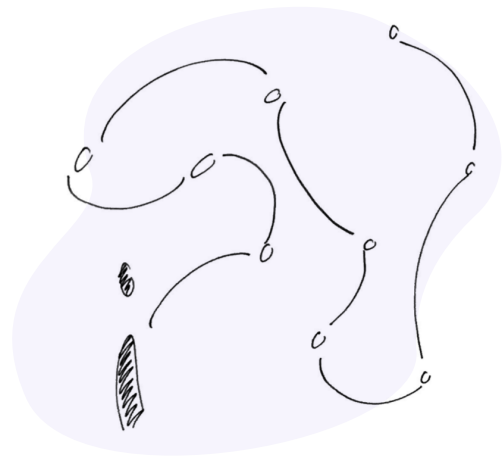


“How might we visualize alternative paths taken to a specific profession or education so that pupils can be inspired to see new ways of navigating to a goal?”

## CONCEPT 4

### EXPLORATION - SKETCHES - MVP - LOW FIDELITY PROTOTYPE

The fourth concept focuses on personal roads to get to a specific education or a profession. At [utdanning.no](http://utdanning.no), each job title contains an interview with a person working in that specific job. These interviews are often very long, and the path they have taken to get there is not as apparent in the interviews but is something the young adults communicate that is desired information for them. An idea in this context is to display a set of peoples' paths through the education system to a set profession or education. Here we are lacking ideal datasets to display this specific information. We want to display changes over time, and the initial visualizations entailed a stepping-stone visualization, and then later a more refined alluvial diagram, showing the flow from a starting point throughout multiple stages, linked to crucial parts in one's career path from start to finish.



# Concept testing

The concept testing entailed one-on-one meetings with pupils over Microsoft Teams, going through the sketches. The test consisted of three parts: preliminary questions, feedback on various visualizations on a conceptual level, and an evaluation of some low-fidelity visualizations. The concept testing gathered four young adults from upper secondary school.

## Findings

The first preliminary questions centered around the ideal information they would want to acquire. The answers here underline much of the insight gathered earlier, wanting information about the greater diversity of the professions and more inspiration from open-ended career descriptions. The second part of the testing entailed showing the pupils various visualizations at a theoretical level, where the visualizations themselves were only a mere graphical representation, with no association with a specific context. This test was based on seeing what the pupils thought the different graphical elements expressed. The pupils perceived the graphical representations they had seen earlier in textbooks, quickly linking words like hierarchy, comparisons, and connections to them. The visualizations that were more unknown were harder to pinpoint, such as parallel sets, sunburst diagrams, or cluster distributions. The last part of the testing revolved around each of the low fidelity visualization sketches; showing a non-ribboned chord diagram to visualize the connections in the education system and a terrain of different jobs in

dots creating a terrain. Some of the feedback concerned how they were pleased by seeing all possibilities in one frame, and then having a function of dialing down in each circumstance to get more detailed information. The lack of accuracy due to showing hand-drawn sketches became an error of distraction for two out of the four pupils. There was also feedback that in a more refined context they felt the visualizations could bring value in the graphical representation. Making it a fun and pleasurable experience by exploring the visualizations.

# Feedback from a data visualization expert

Feedback from a data visualization expert was carried out by Martin Engebretsen. Martin Engebretsen The involvement of an expert on data visualization at this part of the process allowed the early developed visualizations to synchronize with some of the main rules of displaying data in a visual format. For example, some of the visualizations direct in the opposite way in which one reads text. People read from left to right; the same goes for a visualization, for example when reading a line graph or a timeline. Therefore one should ideally place the visual elements in this flow. We also elaborated on how the use of hyperlinks affects visualization. When designing a visualization with hyperlinks, letting the user click on a specific part of the visualization to get more information, will create a hierarchy of information. This hierarchy is not as visible to the pupils. It creates architecture in the platform, and a three-dimensionality becomes present, not only a visualization in a two-dimensional sphere. By this, the relationship between a visualization and a user interface becomes more entangled.

Youth in the last years of upper secondary school have a different foundation for understanding more complex visualization than people attending lower secondary school or younger. These young adults are used to operating on websites, filtering based on what they want to see, and clicking on parts of interest to get more information.

## Guerilla testing in the field

As described at the beginning of the chapter, the guerilla testing method can allow for efficiently highlighting weaknesses and strengths in the design choices by a quick and spontaneous test technique (Ligertwood, 2020). Five pupils were tested, three female and two male, in the first, second, and third year of upper secondary school. Four attend study programs that achieve general study competence, and one takes a specialized study program. Most of the pupils were eager to give feedback as the theme of career and education choices is highly relevant for them and is something most of them strongly relate to.

The guerilla tests underline what works and does not in the four chosen concepts and the platform as a whole. In the test, a set of tasks for the pupils to explore through a Figma interface. As the test only uses a prototype, with some set tracks already implemented, which can be a constraint for the pupils as they can not click around on all parts of the prototype as one would in a ready-developed platform.

The test centered around the visualizations of the four different concepts and how the pupils felt the readability of the different visualizations. In the end, an overall evaluation of the service was considered. For the first concept, the pupils understood the goal of the visualization to illustrate that the connections between the instances communicate that there are many connections between the parts of the system. When it came to the flow of people, the visualization failed to communicate the goal of visualizing how many people go from one instance to another. Only one pupil understood

that the different chords expressed a percentage of people. The same goes for the comparison between today's flow and estimated flow in 2040. These visualizations of the comparison should rather stand next to each other to communicate more clearly the difference between them. There have been many considerations if I should display the quantity of flow of people as to whether this can influence people to choose the path most people take. However, seeing how other people move from one institution to another is something the participants communicated they would like to see.

From the visualization of the workforce, the young adults commented on how they were pleased by seeing all the professions at once. At first, some did not gather that the dots represent a specific profession. They also commented that this could be clearer if it were responsive to mouse hover, as intended when developed. They all commented on how they experienced that the interface invited to be interacted with to get more information about specific topics. They were presented with two versions of visualization of the workforce, where most preferred the workforce displayed as a terrain. Although here, the comparison between professions that are more relevant in the future is not as apparent.

The third visualized concept was straightforward for most of the participants. They quickly understood the filtering mechanism on the left side. When they pressed the various functions, what was displayed was more expected because this way of displaying information is something they are more



used to, e. g. from websites with different facets to filter out selections. Three of the five said that today's platforms are very narrow regarding what you can pursue within each education. Having displayed these other careers one can become with a particular education is not something they get information about in the same way today, but is something they feel could bring significant value.

The last visualization got some divided feedback as some did not necessarily need to see others' paths because they were more certain to which path to take themselves. The person with a vocational background commented that it was nice to see that one can, for instance, take vocational studies and build on further education later to work within the predetermined profession.

In general, the pupils liked the appearance of the service. Many platforms for information about choices and career choices they use today tend to be very text-heavy and with complex interfaces, which can often lead to more aversion against the platforms to get the information they need. By reducing the amount of text with interactive visualizations and some more color, one can feel it is easier to navigate throughout the platform.

**“I feel there is a need for a service like this today”.**

Girl, attending general studies at upper secondary school

**“I think I would have used time to explore the options if I had a tool like this available”.**

Boy, attending general studies at upper secondary school

# CHAPTER 4

## **KEY TAKEAWAYS**

## Summary from chapter four

Four primary focus areas were selected to emphasize and move forward with. The focus areas gather the education system as a whole, the different professions, the connections between professions and specific educations, and personal paths through the system.

An analysis of an idéal dataset was carried out, and looking at the existing datasets available, we have data classifying the educations (NUS-codes) and classifying the Norwegian workforce (STYRK-08). Additional data on a categorization of education and the workforce can be gathered from Utdanning.no. DBH - Database for statistics on higher education in Norway. Further, data on the competence level in the Norwegian population and projections of the labor force and employment by education can be accessed from Statistics Norway (SSB).

Conceptualization of how to visualize the four chosen focus areas was explored. RawGraphs and Flourish, open-sourced visualization programs, were used to upload some of the chosen datasets to explore various ways to present the data (Mauri et al., 2017; Flourish, 2022).

Further testing was completed to get feedback on the prototypes' understandability, clearness, and relevance. Three different testing and feedback techniques were used; concept testing, expert feedback, and guerilla testing.



# CHAPTER 5

# CONCEPT

This chapter addresses the final concept derived from insight, conceptualization, and testing throughout the thesis. The section combines knowledge gained from data visualization theory with young adults' expressed needs regarding education and career choices into an intended platform. The thought service focuses on showing the young adults data regarding possibilities of education and career, but with the possibility to focus on the areas that are relevant for them in their specific situation. The service centers around four visualized concepts covering the four critical areas from which young adults yearn for better information today.

## Description of the concept

TheNextStep (VeienVidere) is a design suggestion for a platform for young adults attending upper secondary school to get information about different possibilities after graduating from upper secondary education. The envisioned service focuses on showing young adults data related to possibilities within future education and career. The platform intends to inspire and let young adults explore information about opportunities that may suit them. The different visualizations revolve around different aspects of interest for the young adults and are meant to help them navigate in a field of many possible choices to make, and ideally help them gather some information on what may be the best choice for them.

### Who is it for?

The platform is intended for young adults attending upper secondary school, initially young adults in the second or third year. The platform is primarily for young adults achieving general study competence since these may be more distant from the workforce than young adults attending vocational studies, who usually already have some connections to a possible line of work or job.

### When to use it?

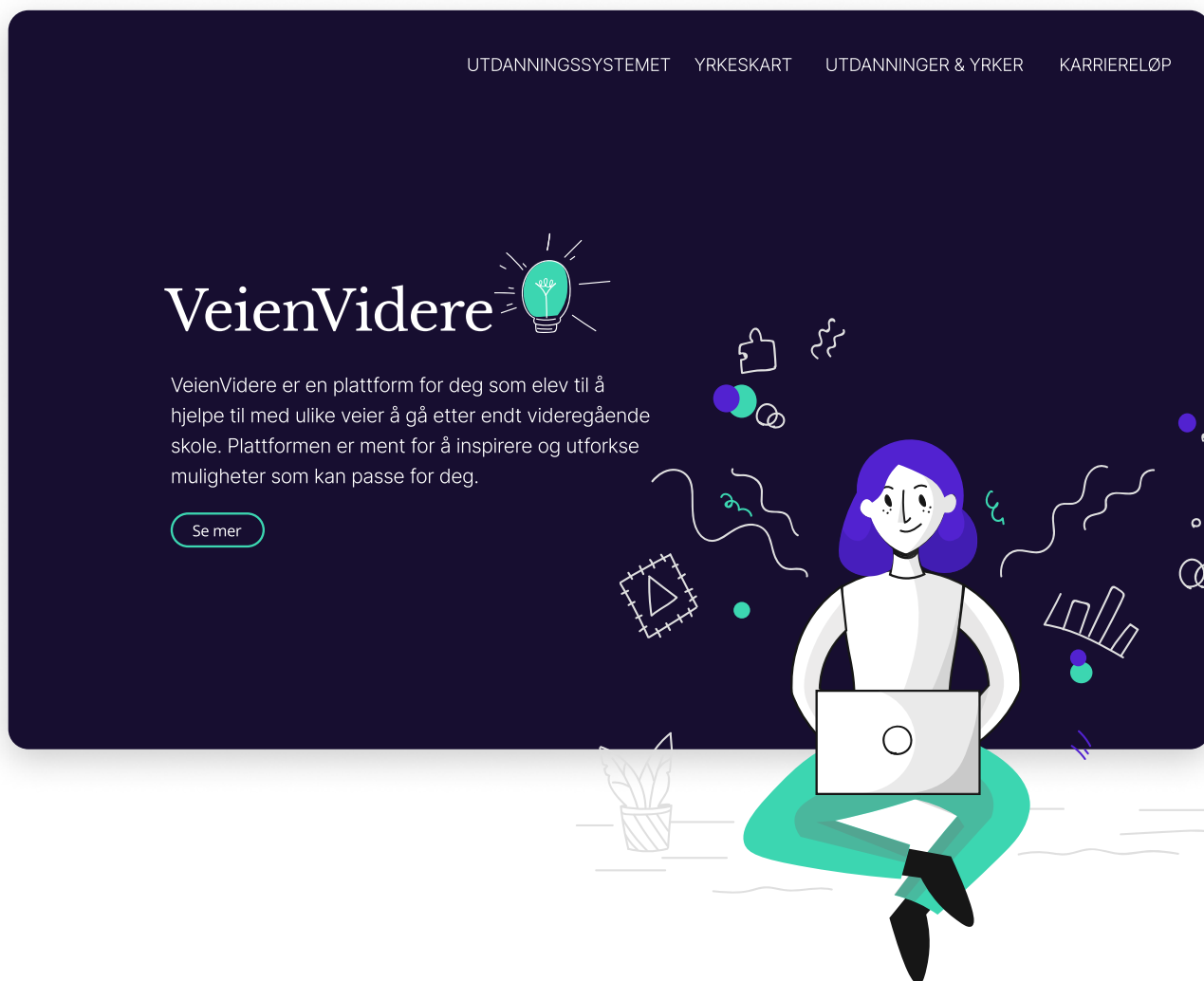
The tool is intended to be used in an exploratory setting, where young adults can use the time to investigate various factors and see how one chosen factor can influence other areas of importance. The context for intended use is on one's premise for exploring and gathering information, and young adults can expect to find information on possible aspects or areas to explore further.

### How to use it

Ideally, the platform is used as an external website where young adults can enter to investigate areas of interest. The platform can additionally be linked as a tool gathered from Utdanning.no or connected to Samordna Opptak (Coordinated admittance).

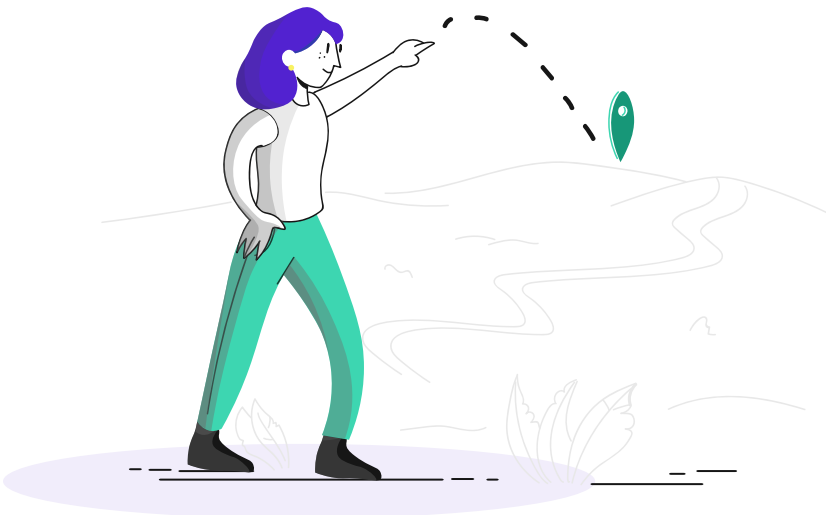
### Why use it?

To gather inspiration and explore possibilities of education and professions. The service allows for exploring information on the education system and occupations and shows indications of what may be relevant in the future. Access to such information from an accessible online platform can hopefully foster young adults to think more creatively about their own educations and career choices.



# TheNextStep

TheNextStep is a platform for you as a student to help with different paths to go after graduating high school. The platform is intended to inspire and explore opportunities that may suit you.





CONCEPT 1

**The education system and  
its connections**

CONCEPT 2

**A categorical terrain of  
different professions**

CONCEPT 3

**Connections between educations  
and different professions**

CONCEPT 4

**Different paths  
to an education or career**

# Color coding and fonts

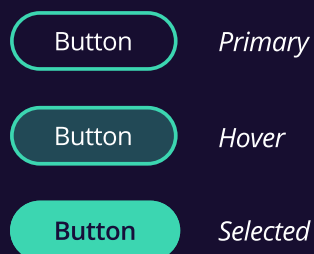
A small design system was developed to create a common denominator for the look of the four concepts. The design system allows for an overall feel of the platform, where the choice of color, shape, and fonts was analyzed, determined, and tested to get a professional, sophisticated, yet pleasurable look. The color palette used in the platform consists of colors with warm undertones, and two primary colors, purple and green, signifying active elements in the platform. Green is used consistently to color the workforce and professions, while purple is used to color education and the educational institutions. Light-colored text is presented against a dark purple background, creating a dark mode with less light emitted from the screen allowing for less energy use. In addition, it allows for better readability, and many youths today prefer the use of dark mode.

The font chosen for the headings is a wide serif font, “Libre Baskerville,” which allows it to work well for reading on-screen and, in contrast, the sans serif font “Open Sans” on the smaller text. The two chosen texts are a part of the Google fonts library and are well suited for reading on screen. The chosen fonts are round and elliptical compared to the deep purple background color. Even with a dark background, does the choice of fonts, warm undertones in the color palette, and the roundings on the various button contribute to a friendly appearance and welcoming feel on the platform.



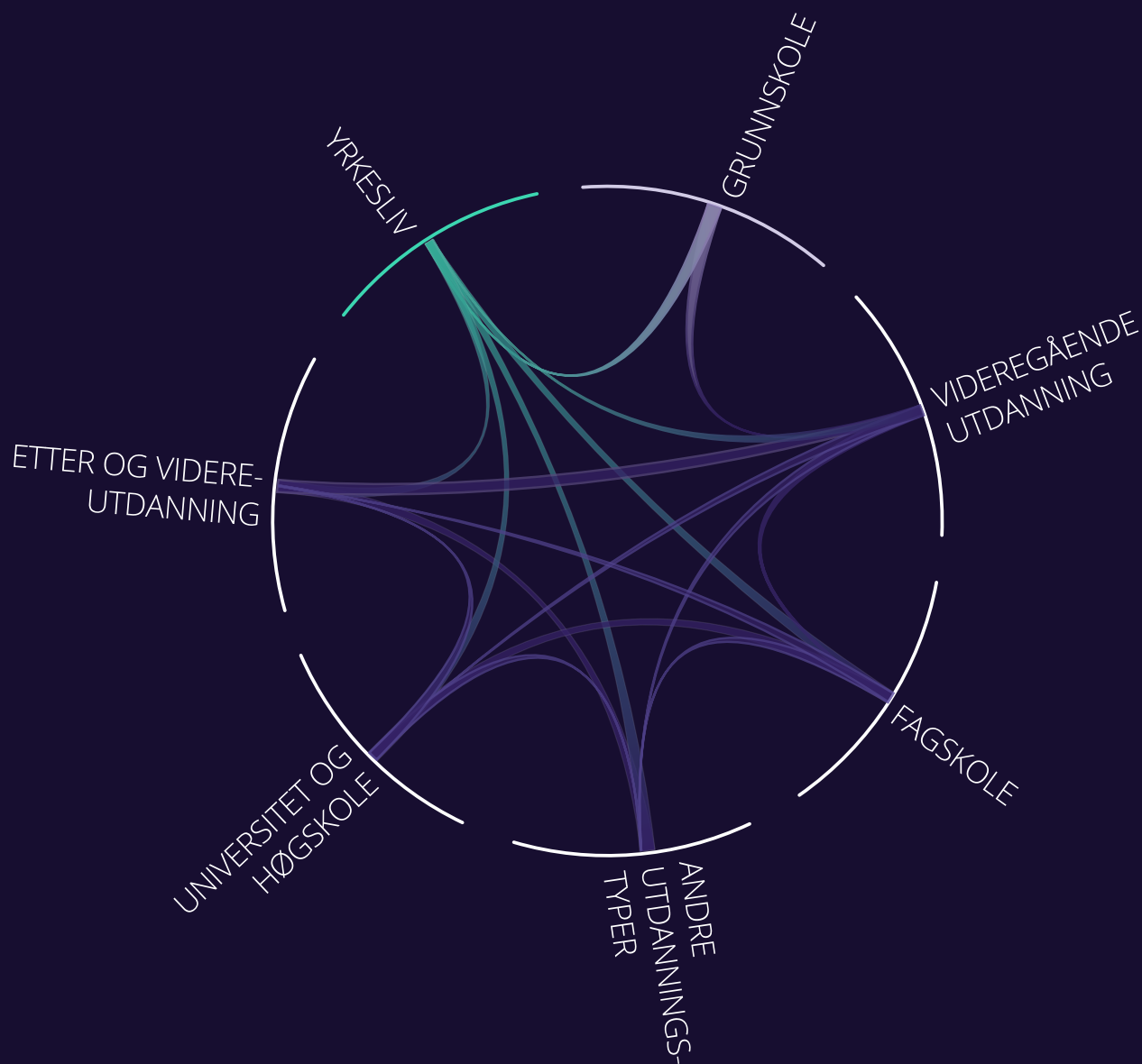
# Libre Baskerville

Open Sans Regular



# The education system and its connections

## CONCEPT 1



\*Data gathered from [utdanning.no](http://utdanning.no) and Statistics Norway (SSB).

## Why this visualization?

The goal of the visualization is to show that there are several connections between the parts of the education system and that there is not just one linear path through the system from education to the workforce. There is flexibility in the system that first-time choosers do not see as clearly, which is intended to be explored in the visualization. A more detailed picture of the visualizations can be seen in Appendix 5 and Appendix 6.

The visualization focuses on the connections between the different parts of the education system in Norway and their relation to the workforce. The system is categorized into seven parts; six categories for different institutions of education, and the seventh is the workforce. We are interested in mapping relations and exploring connections between the instances to represent this information.

In this case, a non-ribboned chord diagram was used to visualize connections and the flow between the categories. Compared to traditional Chord diagrams, Non-ribbon chord diagrams emphasize the connections between data points rather than the additional properties of those connections (Kirk, 2019, p. 170). Here the connections are designed to have a direction; if the line ends in one single point, the connection is only directed in one direction, but if the line is blunt at each end, the flow goes both ways. A layer is added to the visualization to show hierarchies of more possibilities on the sub-categories within each instance, showing different levels or subject areas within the category.

In addition, more layers were added to show information about the percentage of people that flow between the secondary education categories, workforce, higher education, and future flow, exploiting the properties of a chord diagram. The size of the chord represents the percentage of people that flow from one category to another. This can be drawn back to Tufte's lie factor principle of where the size of effect in the graphic should be directly proportional to the size of effect in data (Tufte, 2001, p. 57). Colors were used to express different properties for the categories: lower secondary education is obligatory, therefore colored in a different shade, and the workforce is colored green to symbolize that it is apart from the educational institutions. The visualization is intended to be displayed digitally; therefore, young adults can further click on the connections to get more information about why they are connected and how.

## How?

The visualization is made manually in Figma, but from inspiration from both Flourish and Tableau.

## Data

The primary data showing the connections in the visualization is gathered from qualitative data from [utdanning.no](http://utdanning.no) (Utdanning.no (b), 2022) and a description from SSB on the education system in Norway (Statistics Norway, 2020). The qualitative data was then produced into a table with the connections between the instances valued to true(1) or false(0), whether there is a possibility to move from one part to another or not (Appendix 11). The data on the current flow between the system is gathered from SSB, and the future prognosis is gathered from the report from SSB "Projections of the labor force and employment by education towards 2040" (Cappelen et al., 2020). The dataset for the basis of the visualization can be seen in Appendix 11.

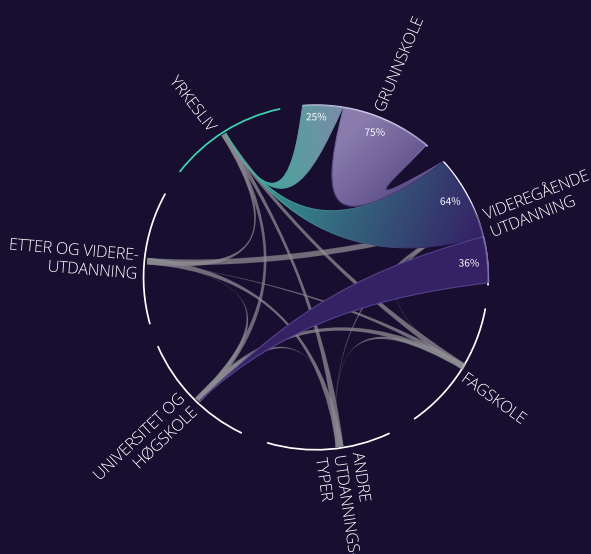
## Strengths and weaknesses

The visualization uses a diagram that the young adults may not have encountered much before, e. g. bar charts which are used more commonly. Therefore, the young adults encountering the visualization may need some time to understand it at first glance. Understanding the flexibility and seeing possible connections, hopefully, can foster a sense of achievement and motivation for further discovery of the platform, as Kennedy and Hill discussed (Kennedy & Hill, 2018). In addition, looking at the three levels of reading a visualization, if understanding and recognizing the meaning of the resources used in the visualization,

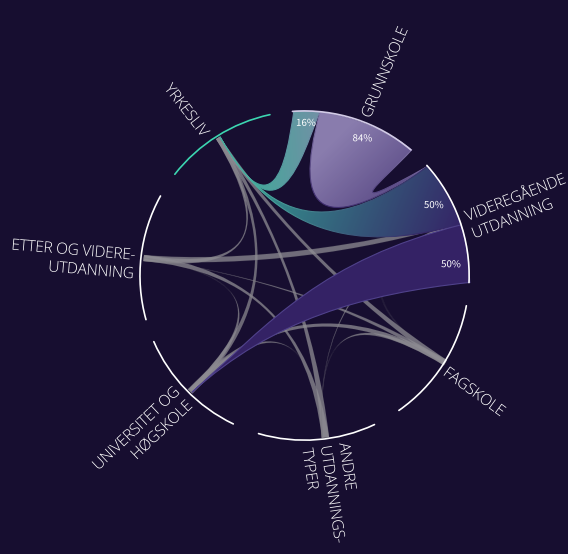
e. g. the lines between the instances and how they are directed, they can act and reflect on how this can give meaning to me (Tønnessen, 2020). In other words, if a person is attending upper secondary school, they can see the possible ways to take, reflecting on which of the connections may be relevant for themselves.

## The overall value of visualization

In line with the vision of lifelong learning, it shows that the road people take does not necessarily need to be linear or static but can be seen as a flow between one part of the system to another.



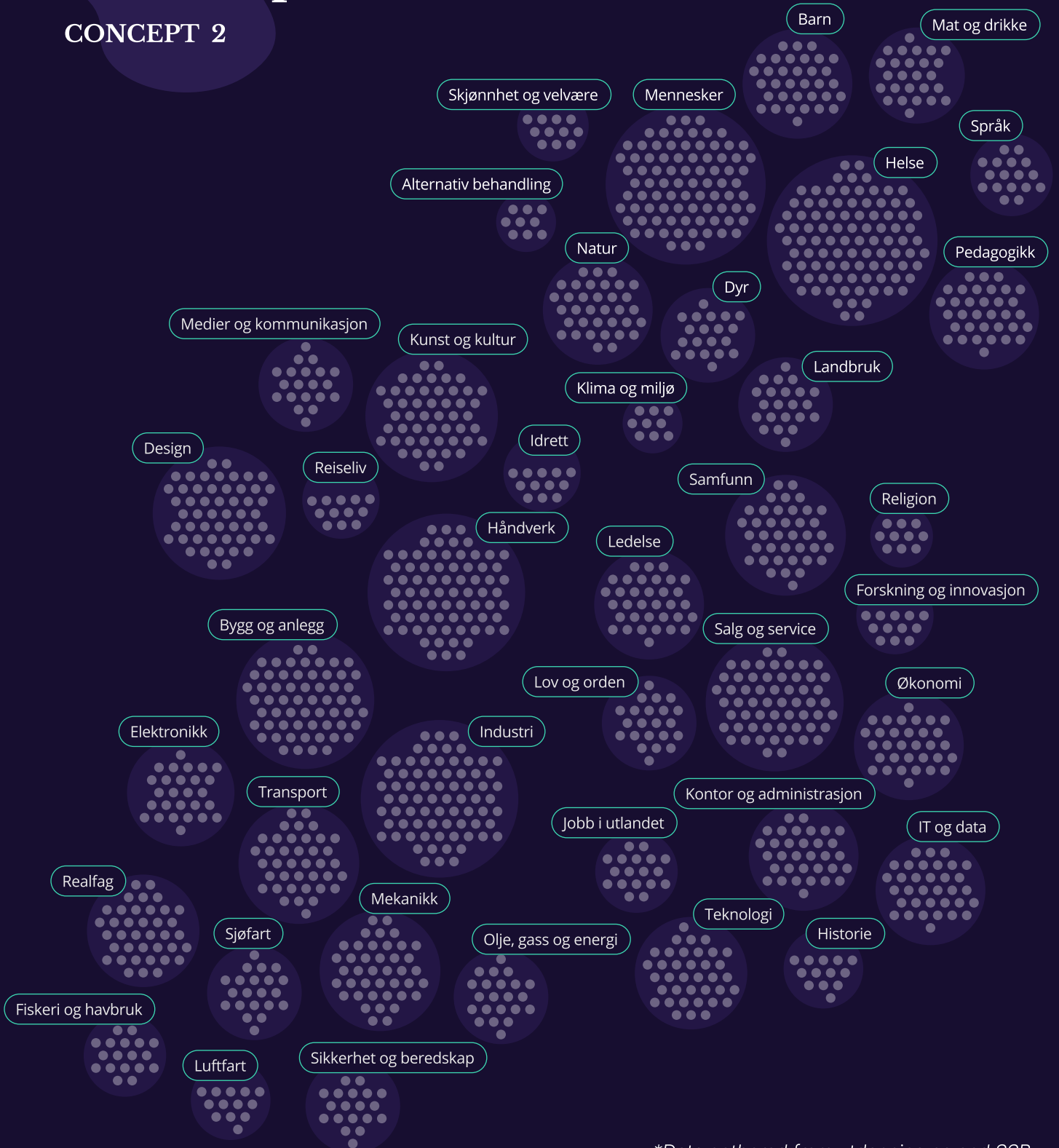
Flow of people - 2022



Flow of people - 2040

# A categorical terrain of different professions

## CONCEPT 2



\*Data gathered from [utdanning.no](http://utdanning.no) and SSB



## Why this visualization?

The goal of the visualization is to depict the possible professions as a whole, showing a terrain of different jobs within various areas of interest. In addition, the visualization intends to outline some evident trends in the future labor market relevant to young adults. A more detailed picture of the visualizations can be seen in Appendix 7 and Appendix 8.

One of the most critical factors for choosing a career path is interest; therefore, the main categorization of the professions were on interest areas gathered from [utdanning.no](http://utdanning.no). People who choose a path to take after upper secondary school want an overview of the possible jobs; therefore, the visualization centers around the relevant jobs in the Norwegian workforce in a spatial and categorical format. The different professions are sorted and clustered to visualize a distributed network of professions in a map or a terrain format. There is a possibility to click within each of the interest areas to uncover the various professions within the interest area. The level of relevance for the different jobs is mapped as an added layer to highlight the trends of higher relevance in 2040 (green) and lower relevance (pink) and is also depicted as a bar chart below to highlight the main trends (see p. 123).

## How?

The visualization is designed from a clustering visualization in Flourish, with additional adjustments made in Figma. Ideally, the datasets would be fed into a clustering algorithm to get a more accurate render.

## Data

The data for the job terrain is gathered from utdanning.no, as well as the categorization of the different professions. Even though the STYRK-08 dataset is more correct in the analysis of various jobs, categorization of jobs, and more flexible for other job markets, the dataset consists of all possible jobs, and not necessarily jobs one is to consider a career within. The projections were gathered from the report "Projections of the labor force and employment by education towards 2040" from Statistics Norway published in 2020 (Cappelen et al., 2020) (See Appendix 13). The data capture the share of the labor force as a part of the population development in Norway in comparison to the need for employment in each sector by level of education. The data is here gathered from a reading of the graphs in the report, but by having access to the models, the numbers are aggregated from one is able to get a more correct basis for the data. The dataset for the basis of the visualization can be seen in Appendix 12 and 13.

## Strengths and weaknesses

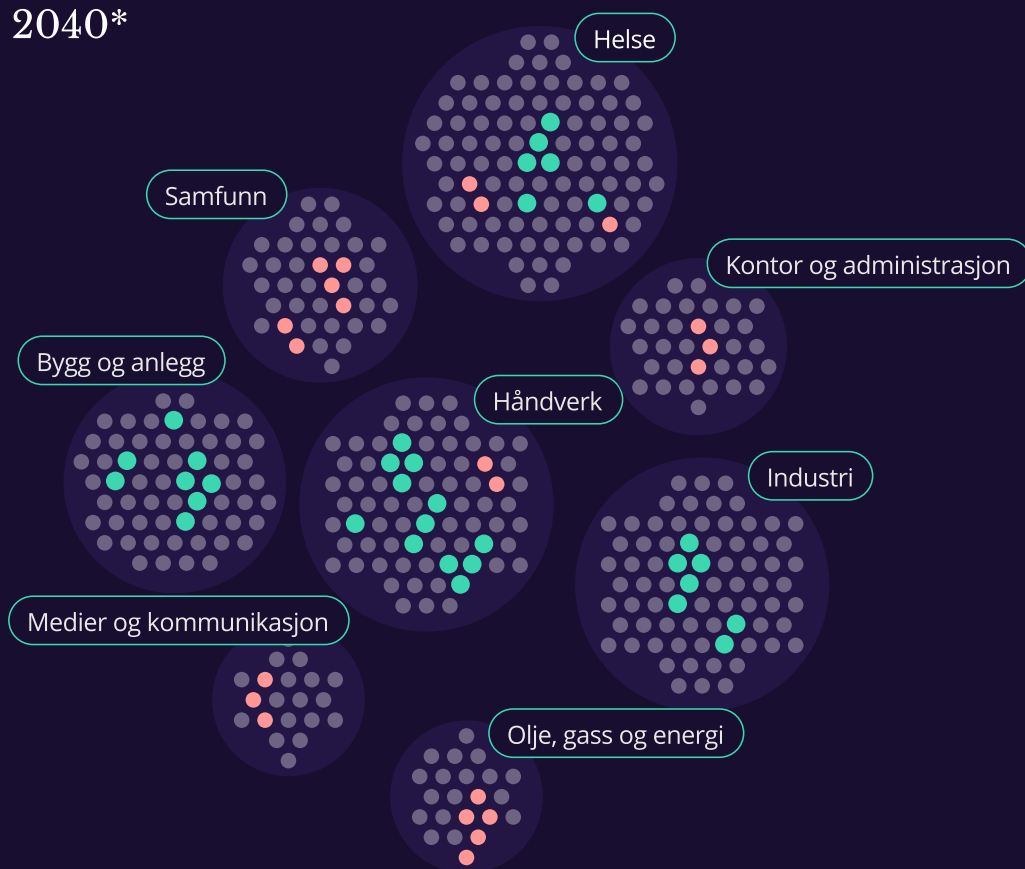
Occupations and needs for the various occupations are very fluid. New occupations arise, and some occupations disappear due to little relevance in

society. In the years to come, there will be a significant development in the labor market, and there may be a need for new professions, so there is a need for a dynamic map. The visualization depicts possible professions in a format that allows one to see all professions as points in one frame with the overall area of interest. The names of each profession are not visible to declutter information, leaving some information available when hovering over the components or clicking on them, using multi-facets to uncover more information.

## The overall value of visualization

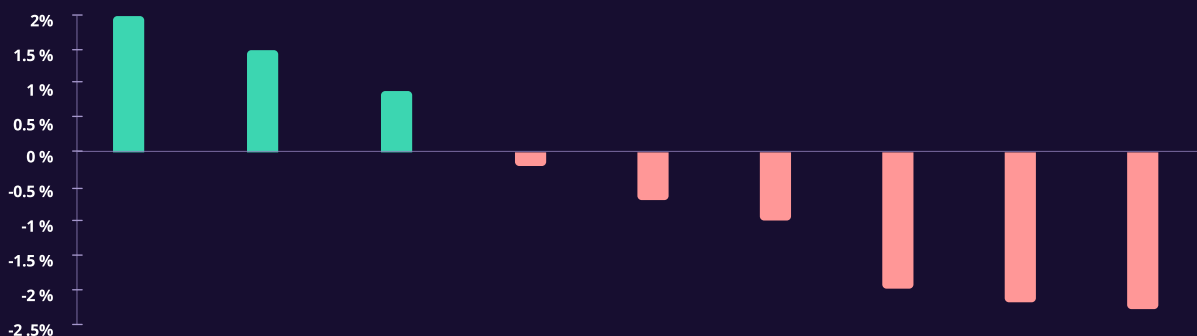
The visualization can allow for information about possible professions within an interest area young adults find attractive. In addition, they can see future needs of various jobs within the interest area or as a whole.

# Projections of needs in the labor force in 2040\*



### Stort behov for i 2040

Færre som utdanner seg i forhold til det samfunnet trenger



### Ikke stort behov for i 2040

Langt flere som utdanner seg i forhold til det samfunnet trenger

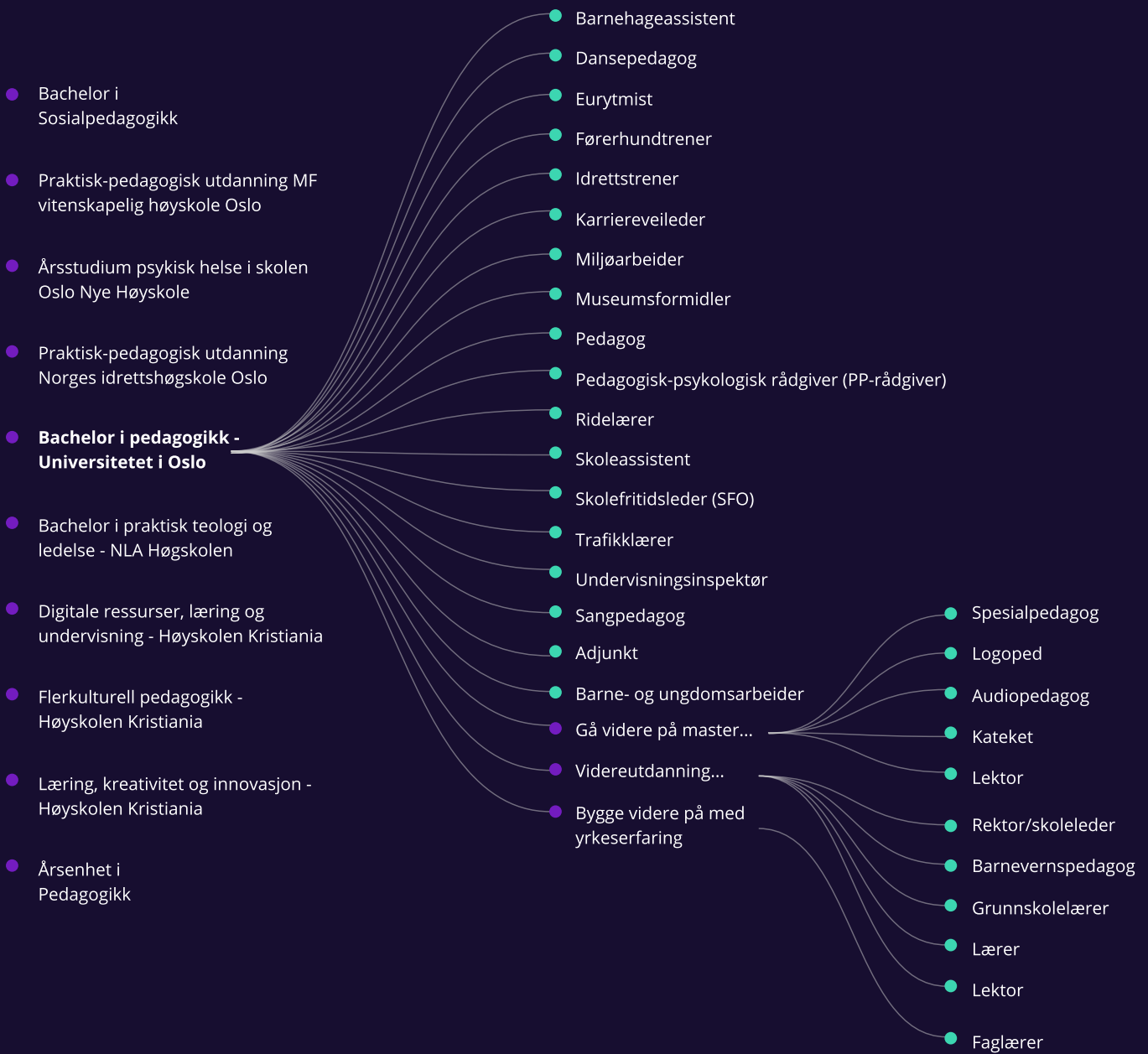
Elektrofag, mekaniske fag og maskinfag	Helse- og omsorgsfag	Pleie- og omsorgsfag	Pedagogiske fag	Andre helsefag	Ingeniørfag	Samfunnsvitenskapelige fag	Humanistiske fag	Økonomiske og administrative fag
Bygg- og anleggsfag	Videregående nivå	Bachelornivå	Bachelornivå	Bachelornivå	Andre naturvitenskapelige fag	Juridiske fag	Master nivå	Master nivå
Andre håndverksfag					Master nivå	Master nivå	Bachelornivå	Bachelornivå
Videregående nivå					Bachelornivå	Bachelornivå		

\*Projection of the difference between the populations labor force in the different educational areas and the need for employment of people in that area from share of total workforce

# Connections between educations and different professions

## CONCEPT 3

- Utdanning
- Yrke



\*Data gathered from utdanning.no and DBH

## Why this visualization?

The goal of the visualization is to show the potential jobs an education can lead to and the potential education one can take to attain a specific job. The young adults expressed that they miss certain information about what possible professions are feasible from the different educations. The visualization centers around depicting connections and hierarchies between education on the one hand and professions on the other; where a linear dendrogram was used as a base for the visualization. A dendrogram displays hierarchical relationships across multiple layers (Kirk, 2019, p. 164). Since education is a means to a profession combining the two with lines to indicate the relationship, a viewer can detect that there exists a connection between the profession and education. Since not all possible under categories can be displayed without creating cluttering, there have been some selections as to what to display and then hide more under categories under each category, e. g. under the “see more masters programs.” This visualization also builds up with the use of multi-faceted mechanics to discover more underlying information. A more detailed picture of the visualizations can be seen in Appendix 9.

## How?

The visualization is made manually in Figma, but from inspiration from Flourish and RawGraphs.

## Data

The data on the different educations is intentionally meant to be gathered from DBH, which has information on all education programs and their additional NUS-code. In the visualization, the professions are gathered from [utdanning.no](http://utdanning.no), which again uses the information from DBH. The connection to which professions are relevant for the profession is gathered from [utdanning.no](http://utdanning.no), with the additional education level requirements. The dataset for the basis of the visualization can be seen in Appendix 14.

## Strengths and weaknesses

The visualization uses known mechanics for the youths, so navigating in the visualization is something the youths can comprehend rather well. There are many options for each education to a profession, and the visualization is intended to display all possible jobs from [utanning.no](http://utanning.no)'s database, which can be achieved from the educational program. In some areas, the possible professions from an educational program may amount to a long list. Therefore further grouping of similar professions will need to be considered to prevent cognitive overload.

## The overall value of visualization

The visualization can show possible career choices from an intended educational program. Today much of this information is on the various websites, e. g. on the different websites of the universities, making the young adults have to maneuver several websites to gather information at once. Since [utdanning.no](http://utdanning.no) does not entail all job titles possible to achieve, the visualization will be somewhat limited.

Søk yrke eller utdanning

Biologi X

## Fagområder ▾

Alle

Infotekniske fag

Landbruk

Idrett

Historie

Språk

Estetisk

Helsefag

Pedagogiske fag

Resieliv

Lærer

Samfunn

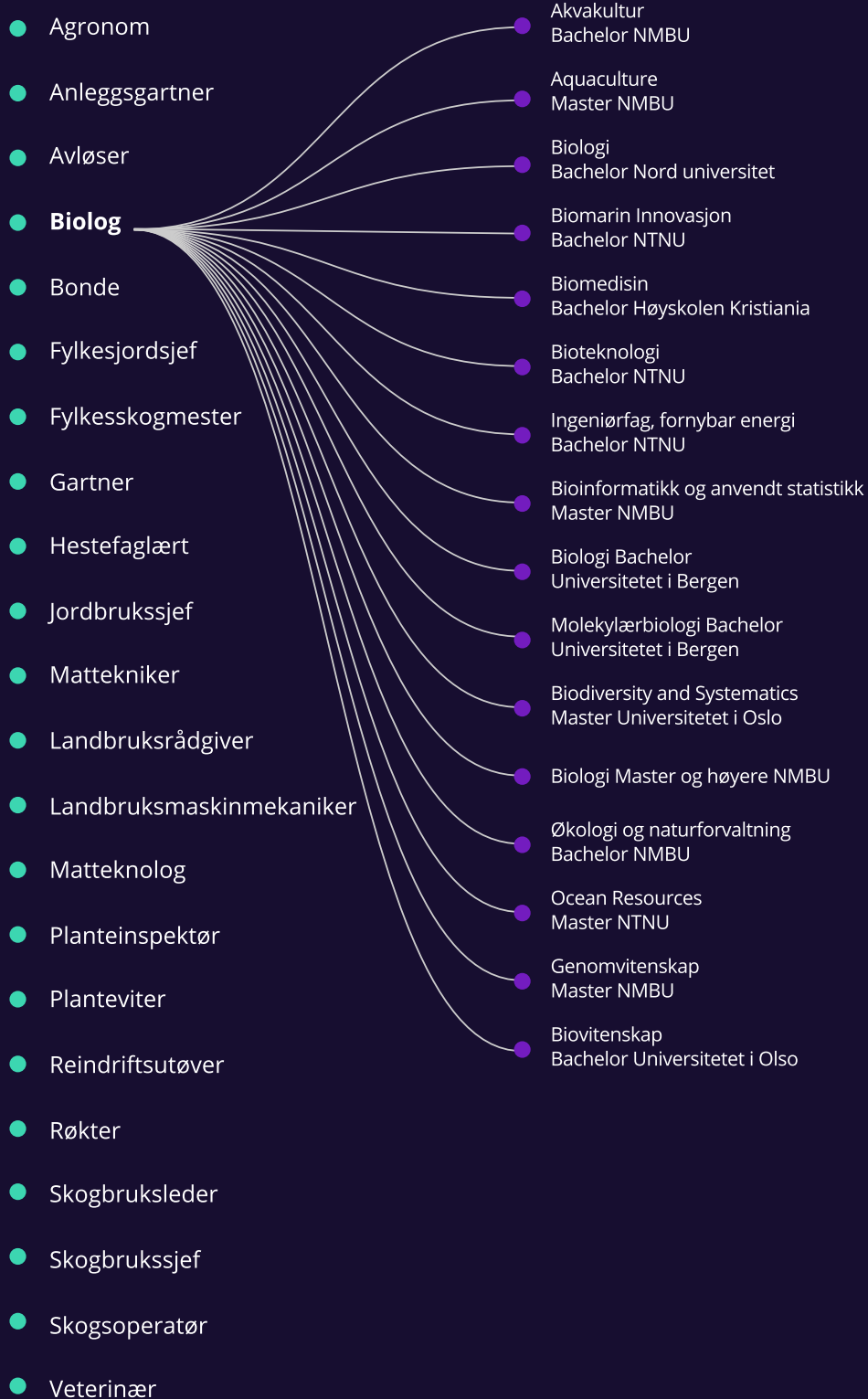
Realfag

Mediefag

Teknologiske fag

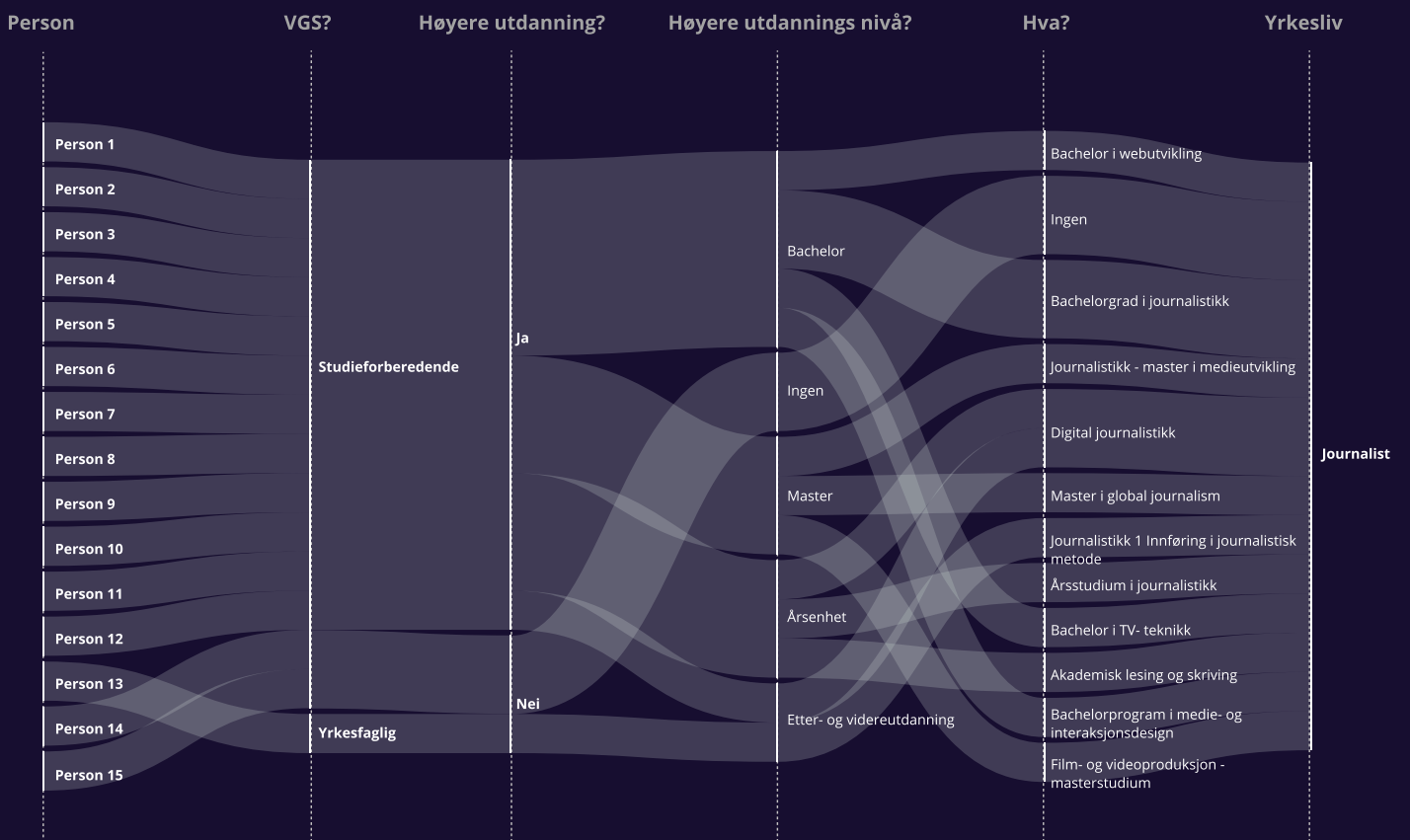
Økonomi og administrasjon

Jus



# Different paths to an education or career

## CONCEPT 4



\*Data gathered from utdanning.no



## Why this visualization?

The goal of the visualization is to show some individual paths taken through the education system to a specific job, to inspire, so the young adults encountering the visualization can recognize alternative roads one can take to a profession or career. These roads follow a selection of people who have attained their way to a specific profession or education and how they got there. From the tests of the visualization, one participant was positively surprised that someone had become the chosen profession with a vocational degree, with additional further courses. For her, it opened up some more possibilities, as she herself is taking a vocational education program. The visualization uses a diagram display called an alluvial diagram to indicate the changes in the path taken by each individual with the possibility to see the larger picture and how the flow changes over time (Kirk, 2019, p. 169). A more detailed picture of the visualizations can be seen in Appendix 10.

## How?

The visualization is made in RawGraphs, with overlapping filters for detail made in Figma.

## Data

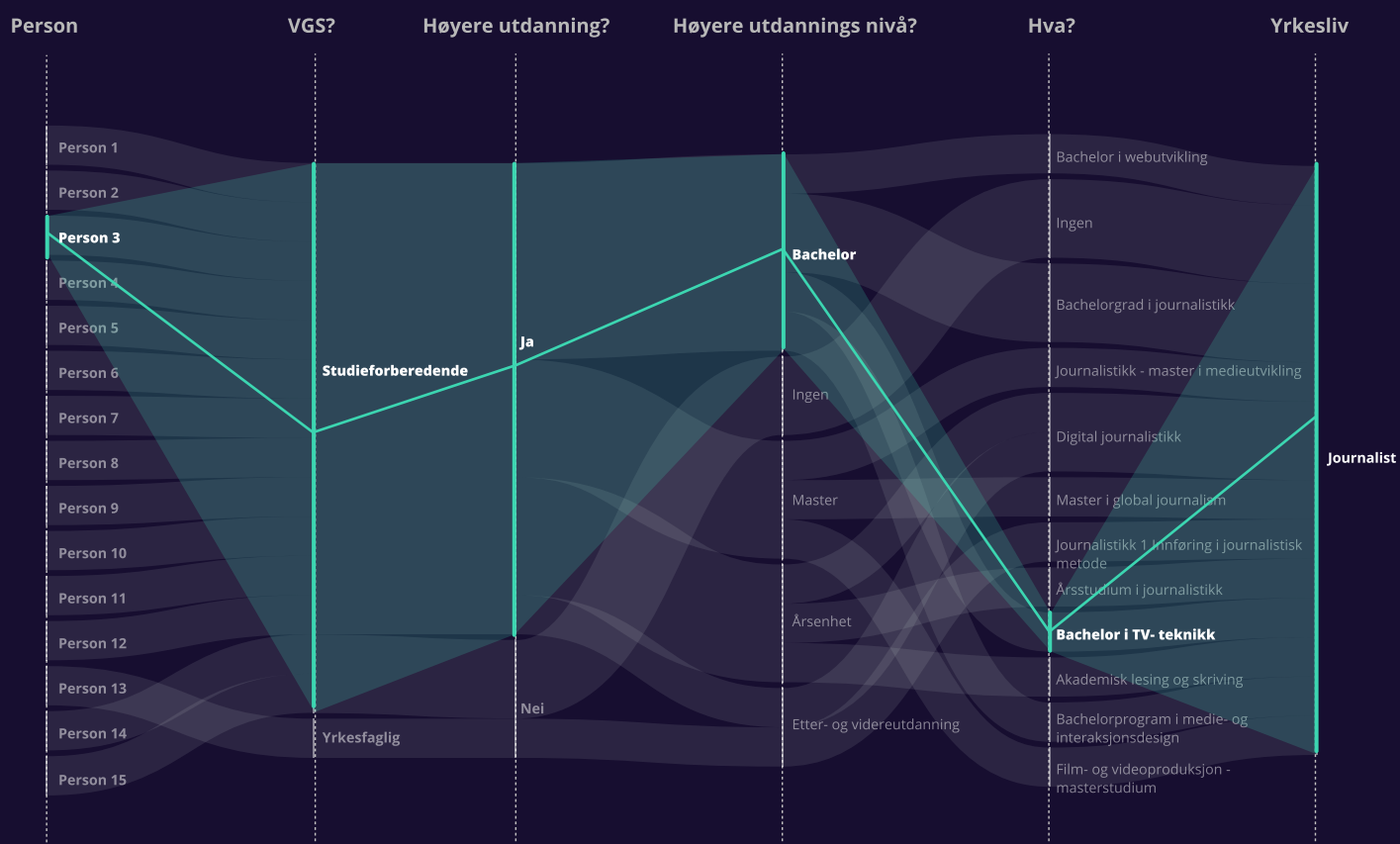
The fifteen different paths in the visualization are intended to follow the personal stories of people. Today, utdannin.no has various job interviews for each profession, which could be used as a basis for the visualization and add more stories to each profession, especially the professions that are the most popular. Additional data is qualitative data gathered from utdanning.no to gather information about which education can lead to a profession. The dataset for the basis of the visualization can be seen in Appendix 15.

## Strengths and weaknesses

To get more accurate information, information needs to be gathered from people who more recently graduated from school. In addition, the visualization is somewhat unclear in how the path follows from each person to the end profession. However, this is highlighted by an additional layer on top of the visualization to be interacted with.

## The overall value of visualization

The visualization can open up for looking at alternative paths to take to a specific line of work or education. Many young adults today only get information about the most obvious paths to take to a specific profession. In reality, they know that one can maneuver in various directions to end up in a field, but how this can be done is lacking from the digital services they use today.





## CHAPTER 6

# EVALUATION & REFLECTION

The final chapter of the thesis is dedicated to reflect on what has been accomplished and evaluate how the solution and process have been carried out. The part will first outline which further developments could be of value for the project before evaluating the solution as a whole. In addition, the part will span over the design process and discuss how the approach and the design methodologies were carried out, connecting it with how it managed to answer approach, user involvement and testing and results. Finally, the part considers how the thesis may contribute to the design field.

# The future of the project

Four data visualizations have been explored and could give young adults valuable information when choosing schools and careers by using principles and techniques for making data visualization. Further, there is still some way to realize the project into a platform. The concepts must go through more iterations and quality controls to make a secure and functioning platform.

## Possible future developments

The first and most apparent development is implementing the design of a functioning user interface for young adults to interact with. Here, transfer the intended datasets of use to a computing algorithm to develop the intended visual representations. In addition, expanding the service to include more aspects of the educational sphere could be useful.

## What happens next?

The project will be presented to Sikt, and after the project's due date, it can be used as inspiration for further development at Sikt. Hopefully, they will see the need for allocating more power to develop services for young adults struggling to make a career choice, as information on the subject can today be seen as fragmented and overwhelming. The concepts build on areas of need for young people, which can be valuable information to bring into further development.



# Evaluation of solution

## How does the solution take in use data visualization theory in practice?

Data visualization can communicate information, but it can also entangle information. The visualizations made build on the knowledge gained from the readings on theory concerning data visualization. The visualizations explore how to visualize elements trying to preserve only the essentials needed to communicate. However, we saw from the guerilla testing that specific visual displays were more challenging for the participants to understand. This can be seen in line with Prof. Tønnessens's research on how she has experienced the general public failing to understand data visualizations correctly (Tønnesen, 2020). Data visualization requires both training on how to read visualizations, more exposure to visualizations, and skills needed to interpret the visualizations. We also see a critique of data visualizations, as they can be used to manipulate or communicate information falsely, as Tufte's lie factor represents.

Much time also went to understanding the various datasets and how one can extract what is meaningful from each of them. In retrospect, my lacking competence in this field became a limitation slowing down the process, being too fixated on how to fathom the datasets, where in this case, I could have focused more on the visual aspect of the visualizations. The digital programs used to carry out some of the visualizations were limited in their output, which shaped the output of the visualizations to some degree. Ideally, a solution

like this should be developed closely with a computer scientist and statistician. These roles sit on competencies a designer does not master to the same degree, and therefore, expertise in all three areas is needed to develop a solid service like "VeienVidere."

In evaluating the quality of the visualizations, we need to consider the data used. How to use data and the quality of the data was a profound part of the theory section because this part is crucial. Transferring this knowledge to creating the visualizations was not as easy, where the use of high-quality and complete data was not as evident as first imagined. Some of the data used for the visualizations were quality data I extracted from various platforms, making the data incomplete. Even though the visualizations were made with the intention of using existing quality data, further development and more critical handling of the data are needed to make a good product. It is critical to have complete and quality data to make truthful visualizations. Data visualization can bring new information to a given context, but the pitfalls must be considered. Therefore one should handle the visualizations critically in terms of the data used and the visual representation. In addition, we must also consider the choices of what one has decided to exclude in the visualizations.



## How does the solution meet the needs of young adults?

The solution portrays four different areas young adults feel the information is lacking today and communicates possible omitted information by visualizing the information. In evaluating the solution, we can take into account Sless's methodology in how to go forward in making a visualization (Sless, 1994). We have defined the problem and involved stakeholders in the project. We have observed and measured the current state of things, developed prototypes based on the insights, and carried out iterative developments. What has not been carried out is the implementation and monitoring of the solution in use.

The solution works with ways of decoding information in different layers. From the tests, we saw that some participants explored all three steps of decoding the visualizations, from understanding the visual elements to reflecting on how this is relevant for them in their situation and what they can do with the information. Here some time and effort may be needed to achieve the last step of reflection. The intended goal was for the young adults to allocate time to get immersed in exploring the different aspects of the visualization to uncover more information relevant to themselves. From the feedback from the young adults, they expressed that in the given setting, and with a tool like this, they would spend time exploring more possibilities. While the solution is not thoroughly tested enough, we can see that some of the information found from the visualizations affect the

people encountering the visualizations. These could be times when they were surprised by the possibilities or more critical to their own first chosen path now that they encounter new information. Further, what could be evident to explore is how introducing a tool like this or such visualizations can contribute to how choosing a career and education can be affected over time.

# Evaluation of process

Looking back on the process, I see the path consisted of more switching between divergent and convergent thinking and exploring than previously expressed. Going back and forth between prototyping, sketching, and seeing if the developed sketches preserve the needs of the young adults, became a time-consuming part in the last section of the process.

Evaluating the research, some methods used in the design process could be replicable in their isolated form. Here there are still weaknesses in statistics basis on the gathered insights. However, design practices are context-specific, and various choices taken throughout the design process contribute to shaping the result. These choices become visible in the design sketches and the chosen focus areas. The discussion of strengths and weaknesses are concluded in three main parts; approach, user involvement, and testing and result, to highlight transparency in the research.

## Approach

The focus of the thesis as research to enable design has led to design practices to gain insights that can contribute to developing a concept. To reference Fallman again, within the field of research for design, it is the knowledge gained from the process of bringing a product into existence that is the primary contributor to the field, while the product in itself can be seen as an artifact and a means to the contribution (Fallman, 2004). This knowledge is gained from understanding the field from secondary research and by understanding the primary people designing for by actively involving them in the design process. The design process uses techniques of scoping in and out, and in the process, going further with some selected insights. In retrospect, some of these selected insights could be reiterated, e. g. focusing on specific parts to move forward with from the section regarding data visualization in society. Nevertheless, my knowledge of how data visualization is practiced in society today enhanced my overall understanding of the topic. More profound case studies could have been carried out to highlight the pitfalls of data visualization. As for research through design uncovering, some theoretical guidelines became more ambiguous. Looking at the fusion of data visualization for facilitating decision-making, we can see how communicating possibilities and facilitating decisions can be done actively by allowing to show information in a format that evokes curiosity, exploration, and maybe some fascination.

## User involvement

Various methods for user involvement were used to gain insight from understanding the end-users needs and from testing prototypes. Throughout the thesis, interviews were carried out for secondary insights and in-depth interviews, questionnaires, testing for concept development, and further iterations of the concepts. Getting insights and feedback from young adults also highlighted areas of interest, I have not taken into account, e. g. their strong wish to see other people's educational choices. From carrying out a design process from understanding the user, scoping the focus area, and translating insights to testing various prototypes, we see the importance of the process. A good design process allows for the involvement of the people using the service, being *human-centered*, not only user-centered. This can be seeing the young adults' needs, meeting them when they are vulnerable, and working to give them support. By actively involving the young adults, I uncovered areas of unclarity in the visualizations, which I found intuitive, but the young adults did not. In making visualizations, we see the need to weigh user involvement as valuable, as Sless argues (Sless, 1994), and not only the strong contours of the visualization itself as Tufte theoreticize (Tufte, 2001).

## Result and Testing

Additionally, the service could be strengthened with further testing. The last iteration of the concept is not tested with intended end-users, and since the guerilla method is quick and does not provide much quality time with each participant a more thorough usability test should be held to get more valuable feedback. The service could also benefit from performing a test monitoring feelings of confidence or self-esteem before and after use to see if some of the visualizations could affect their relationship towards the choice of choosing careers.

# Contribution to the field

The need to visualize statistics is a drastically increasing demand across sectors and disciplines. More sectors see the need to enable their data and communicate it efficiently to people. In this thesis, the focus has been on educational statistics and how one might visualize critical information for young adults. As the thesis takes primarily the approach of researching for enabling design, the project will firstly contribute to ways of looking into how to display information about education and careers to young adults in upper secondary school. The research builds on existing knowledge in the design field, of which the research and the solution are a small contribution to the field. The theory of having access to more information at one's fingertips has shown to be of value. We see that there is a need for communicating information, and how this can be done has been explored and tested. Hopefully, this thesis can contribute to the design field by exploring data visualization practices to look at issues regarding people in society.



# Conclusion

The thesis has researched areas of how data visualization is applied and practiced in society and understanding the context of how young adults make career and educational choices. Further, the thesis has explored how to use data visualization methods and techniques to facilitate a better understanding of possible choices for young adults. The thesis investigates the complex topic of communicating information to make choices for a young and uncertain audience. Using data visualization to uncover information and facilitate decision-making is and will be challenging. However, communication is a key driver for people, and mastering different ways of communicating information can be of great value in various contexts, and it can allow for meeting people at different levels. Today, sharing data from the knowledge sector with people affected by it is limited. When done responsibly, allowing to communicate this information by visualizing it can meet some of the societal challenges young adults face today.

At last, looking back on the choice of topic and process, I am glad to be able to work with two fields I find important. The first allowed me to explore and gain knowledge on a topic I am fascinated and intrigued by; visualizing data. The second is trying to help and empower young adults to make a meaningful choice in a time and place in life where they may struggle to feel inadequate. Together, the journey has been insightful, challenging, and fun, and I am inspired as a designer to continue to work with meaningful topics in the years to come.

A handwritten signature in black ink that reads "Meredith Bontheim". The signature is written in a cursive, flowing style.







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# Appendix 1

## Consent form

### Informasjon om og samtykkeskjema til deltakelse i prosjekt Hvordan kommunisere muligheter gjennom datavisualisering

#### **Bakgrunn og formål**

Prosjektet er en del av masteroppgaven skrevet av Merete Lunde Bertheau ved Institutt for Design, NTNU, og i samarbeid med Sikt - kunnskapssektorens tjenesteleverandør. Hensikten med prosjektet er å utforske ulike typer datavisualiseringer, knyttet til et overordnet statistisk emne: utdanning, og spesielt høyere utdanning, med det formål å hjelpe unge voksne ta bedre valg i utdanningsløpene sine. Dette undersøkes blant annet ved å samle innsikt fra eksperter innenfor datavisualisering, studieveiledere, og unge voksne selv.

#### **Om studien**

Studien består av semistrukturerte intervjuer, der intervjuene omhandler din ekspertise på design eller datavisualisering, eller din rolle som studieveileder/rådgiver. Dersom du er elev selv ved videregående skole vil intervjuene omhandle ditt forhold til valg av studieretning og høyere utdanning, og dine tanker rundt dette. Data samles via notater og lydopptak. Lydopptak fra samtalen vil kun benyttes for å analysere innholdet.

#### **Om informasjon du gir fra deg**

Innholdet fra intervjuene vil kunne publiseres i studentens masteroppgave, der all personinformasjon fra studien vil bli behandlet konfidensielt, dersom ikke annet er avtalt. Dersom innhold vil kunne kobles til enkeltpersoner, som navn eller stilling, vil direkte sitater bli sendt til deltaker av intervjuet for sitatsjekk.

#### **Frivillig deltakelse**

Det er frivillig å delta i prosjektet, og du kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet.

Dersom du har noen spørsmål knyttet til studien kontakt  
Merete Lunde Bertheau på [meretlb@stud.ntnu.no](mailto:meretlb@stud.ntnu.no) eller på tlf: +47 980 89 214

Jeg har mottatt informasjon om undersøkelsen og samtykker til å delta:

Dato/sted:

Signatur:

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# Appendix 2

## Excerpt from interviews with career advisors

### Dialog with a career advisor at a private institution:

The dialogue was with a career advisor at a private institution, Sonans, who mainly handles people between ages 19 to 26. At Sonans, the students or parents must actively come to the company for guidance, which can give a more thorough picture of which inquiries they need guidance in. The company handles a range of people from students with very high ambitions, who often need help to enroll in education with high admission requirements. They also handle students and pupils who struggle with finishing upper secondary school, may have complex backgrounds, and are in situations that make it harder for them to complete their schooling.

### Interview with a career advisor upper secondary school

The interview was with two career advisors at an upper secondary school with various educational programs, both study preparation and vocational education programs, where the general studies program is the most prominent. The school has, in general, a somewhat high average grade point to be accepted, so a large portion of the pupils are very diligent with their school work. The two counselors work holistically, including different parts of the career guidance service into one overall service. They work more generally, directed at a whole class or grade level.

### Interview with career advisor lower secondary school

The last interview was with a career advisor from a lower secondary school. Here the pupils are younger, more unsure about what to do, and maybe lack even more information about what choices to make. The counselor works at a school with a high variance of people from different backgrounds. The school is also a reception school, which receives young people who may be refugees, asylum seekers, or immigrants who may only have been in Norway a week, as well as a broad spectrum of young Norwegians well-rooted in the Norwegian system. The counselor encounters young teens with high expectations within the family, where popularity amongst friends is very important, and each individual has a high degree of uncertainty because they are at a vulnerable age of 13 to 15.

# Appendix 3

## Summary from interviews with career advisors

### Holistically versus a specialized approach

The guidance at the private institution is directed at each individual and their situation and is very specialized. The guidance is a combination of mapping out the pupil's wishes and desires, competence, ambitions, and current situation. Work with tailoring their guidance to each individual because they get varied inquiries. Map out the person and the person's desires and thoughts about their own skills and their future. Work with the expectations of the people that come to them; "Is this feasible for you?" trying to adjust expectations and skills individually to get to a solution and a path that suits that person and that goal. Some schools tend to split up the career advice service that the schools offer, where they split the guidance into three main parts:

- Social pedagogical guidance - aiming at adapting the general public to society
- Specialized pedagogical guidance - for people with special learning needs
- Career counseling as its own instance

The upper secondary schools visited have decided to have a more holistic approach, including all the services in the same guidance. They believe all three parts are closely connected, highlighting career guidance as part of something that affects everything in life. An example is when facilitating for people who need a specific kind of learning will also affect their career choices further in life.

### Individual versus general guidance

The upper secondary school visited had moved beyond traditional one-on-one guidance and focused more on facilitating whole classes or whole school levels. The holistic approach is something they have experienced as a preferred approach because much detailed information about specific universities or careers is information that changes rapidly and is something the pupils will be able to gather more correctly online. They also offer one-on-one guidance, but the experience is that most people who come to them are pupils who are already very active and already have many available opportunities. Those who may need a push in a direction do not actively ask for guidance to the same degree. Therefore it varies how they reach the students; some are very active, and some have no idea what they want, and neither get the help they need. The guidance at the private institution is more directed towards the individual working closely with splitting up the overall goal into subgoals, making it more comprehensible. Sometimes, the goals or sub-goals are reiterated if they see the students are far from reaching their goals. They also ask the students to find other study programs online and to find programs that may seem attractive, allowing them to look beyond their one goal and open up more possibilities.

# Appendix 4

## Nettskjema questionnaire - 1 / 5

### Hvordan elever ved videregående skole forholder seg til høyere utdanning og karrierevalg

Masteroppgave ved Institutt for Design NTNU Trondheim

Spørreskjemaet er en del av masteroppgaven skrevet av Merete Lunde Bertheau ved Institutt for Design, NTNU. Spørreundersøkelsen er anonym og har som formål å få mer innsikt i hvordan videregående elever opplever egne utdannings- og karrierevalg. Spørsmålene er en blanding av avmerkingsbokser og tekstfelt, der elevene kan svare så mye eller så lite de vil på hvert spørsmål. Spørreundersøkelsen er tenkt å ta rundt 10 min.

Hvis du har spørsmål til skjema eller forskningsprosjektet ta kontakt med Merete Lunde Bertheau, meretlb@stud.ntnu.no eller på tlf: +47 980 89 214

#### Om deg

Hvilket trinn går du på videregående skole?

- 3. klasse VGS
- 2. klasse VGS
- 1. klasse VGS
- Påbygg

I hvilket fylke går du på videregående skole?

Velg ...

Hvilket utdanningsprogram går du på videregående skole?

Videregående opplæring består av 15 forskjellige utdanningsprogram, 5 studieforbereende og 10 yrkesfaglige utdanningsprogram.

- Studiespesialisering (Studieforbereende)
- Kunst, design og arkitektur (Studieforbereende)
- Medier og kommunikasjon (Studieforbereende)
- Musikk, dans og drama (Studieforbereende)
- Idrettsfag (Studieforbereende)
- Bygg- og anleggsteknikk (Yrkesfag)
- Elektro og datateknologi (Yrkesfag)
- Frisør, blomster, interiør og eksponeringsdesign (Yrkesfag)
- Håndverk, design og produktutvikling (Yrkesfag)
- Helse- og oppvekstfag (Yrkesfag)
- Informasjonsteknologi og medieproduksjon (Yrkesfag)
- Naturbruk (Yrkesfag)
- Restaurant- og matfag (Yrkesfag)
- Salg, service og reiseliv (Yrkesfag)
- Teknologi- og industrifag (Yrkesfag)
- Yrkeskompetanse med påbygg til generell studiekompetanse

Hvorfor valgte du å gå på utdanningsprogrammet du går på nå?

## Nettskjema questionnaire - 2 / 5

### Om karriere og utdanning

Har du noen tanker om hva du vil gjøre det første året etter at du er ferdig med VGS?

For eksempel militære, folkehøyskole, friår, studere, jobbe eller annet

- Militære
- Folkehøyskole
- Friår
- Studere
- Jobbe
- Annet

Hvorfor vil du gjøre nettopp dette året etter du er ferdig på VGS?

Hvor sikker er du på det du vil gjøre det første året etter at du er ferdig med VGS?

- Veldig sikker
- Litt sikker
- Noe usikker
- Ganske så usikker

Vil du ta høyere utdanning? I så fall hva da?

Har du noen tanker om hva du har lyst til å jobbe som? Hvis ja hva da?

Er det noen du kjenner/vet om som har studert det du tenker å studere eller har den karrieren du kunne tenkt deg?

- Ja, et nært familie medlem
- Ja, et fjernt familie medlem
- Ja, en venn
- Ja, en fjern venn
- Nei
- Vet ikke hva jeg vil studere eller jobbe med

## Nettskjema questionnaire - 3 / 5

Hvor sikker er du på at det er den utdanning eller karriereveien du ønsker å ta?

- Veldig sikker
- Litt sikker
- Noe usikker
- Ganske så usikker

Hva er det som er viktig for deg når du skal velge studieretning eller karriere?

Fokuserer du mer på en utdanningsretning du vil studere eller fokuserer du heller på et yrke du vil jobbe i?

- Heller fokus på utdanningsretning
- Heller fokus på karriere/jobb-retning
- Ingen av delene
- Vet ikke

Ser du for deg å jobbe med et valgt yrke resten av livet ditt?

- Ja
- Tror det
- Usikker
- Nei

### Informasjon rundt karriere og utdanning

Jeg synes informasjon rundt utdannings- og karrierevalg er:

- Svært dårlig
- Dårlig
- Helt grei
- God
- Veldig god

## Nettskjema questionnaire - 4 / 5

Hvor er det du innhenter informasjon om utdanning og karrierevalg?

- Snakke med venner/bekjente
- Snakke med familie
- Internett
- Fra lærere/veiledere ved VGS
- Direkte kontakt med universiteter/høyskoler/jobb
- Ingen av delene

Har du opplevd at du ikke har fått informasjon nok ang. studiekrav/andre krav til høyere utdanning eller karrierevei?

- Ja
- Likegyldig
- Nei

Føler du at du har forståelse for sammenhengen mellom de ulike utdanningsvalgene du kunne interessert deg for og jobbmarkedet for disse utdanningsvalgene?

- God forståelse
- Grei forståelse
- Verken god eller dårlig forståelse
- Lite forståelse
- Ingen forståelse

### Holdninger til karriere og utdanning

Er du bekymret for utdanning og karrierevalg?

- Ja, veldig
- Ja, litt
- Likegyldig
- Nei, ikke særlig
- Nei, ikke i det hele tatt

Hvis ja på forrige spørsmål: Hvorfor det?

## Nettskjema questionnaire - 5 / 5

Har du kjent på tanken at du er redd for å velge "feil" når du skal velge hva du skal gjøre etter VGS?

- Ja, mye
- Ja, litt
- Likegyldig
- Ikke særlig
- Nei

Vil du si du er mer redd for å velge "feil" yrke/studieretning, eller er du mer åpen for å prøve og feile på veien?

- Mer redd for å velge feil
- Mer åpen for å prøve og feile
- Likegyldig
- Ingen av delene

## Karriere/utdanning og Covid-19

Har tankene dine rundt karriere og utdanning endret seg etter Covid?

- Ja, veldig
- Ja, noe
- Likegyldig
- Nei, ikke særlig
- Nei, ikke i det hele tatt

Hvis ja på forrige spørsmål: hvorfor har tankene dine endret seg etter Covid?

Føler du at har blitt mer sikker eller usikker på eget utdanning og/eller karrierevalg etter Covid?

- Mer usikker
- Mer sikker
- Ingen av delene

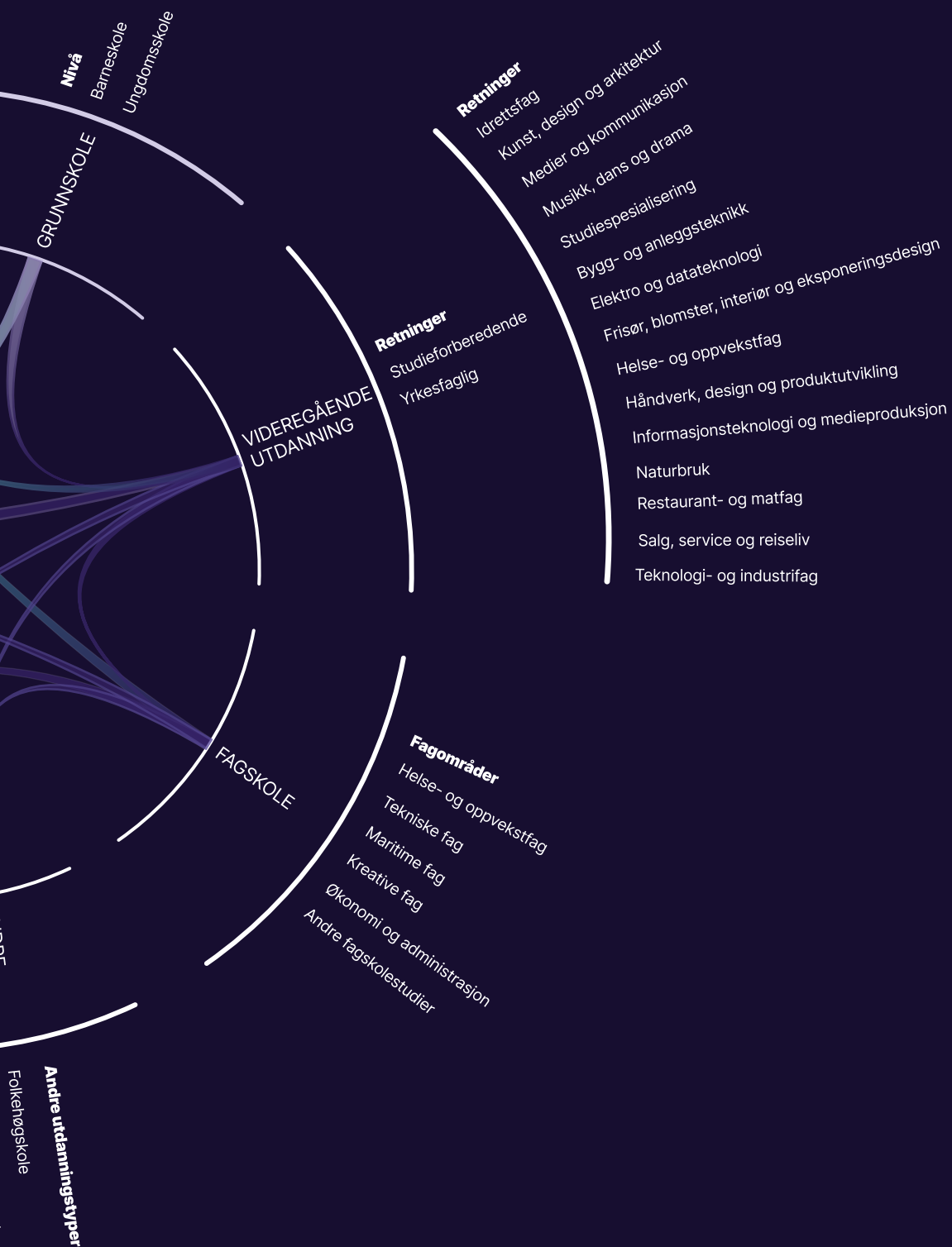
# Appendix 5

## Concept 1

### The education system and its connections\*







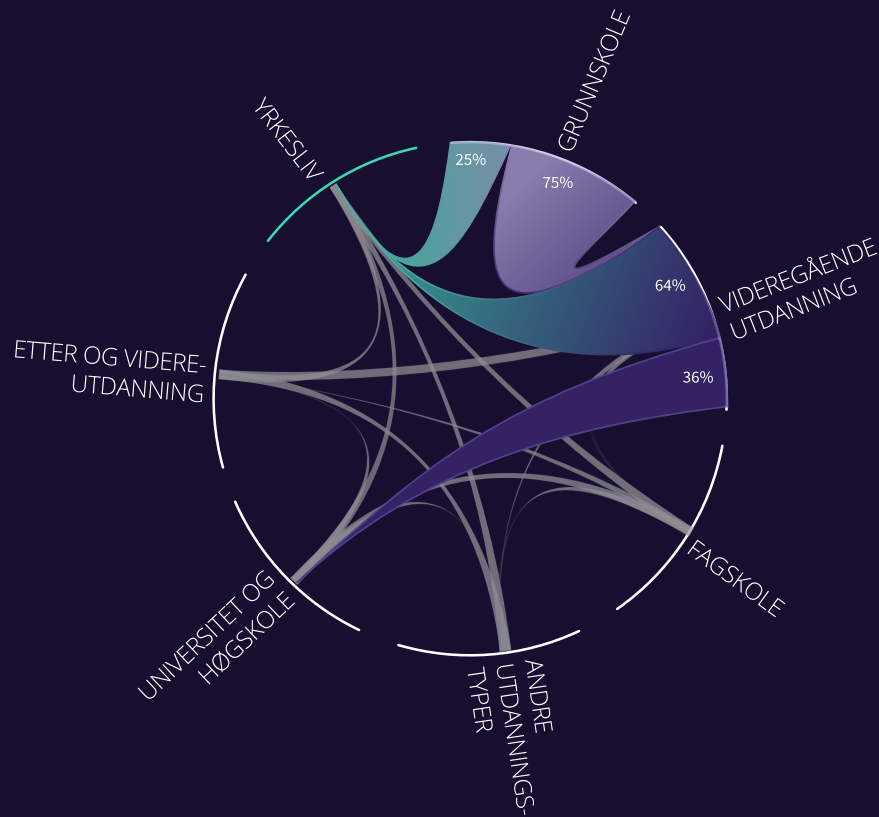
\*Data gathered from utdanning.no and Statistics Norway (SSB).

# Appendix 6

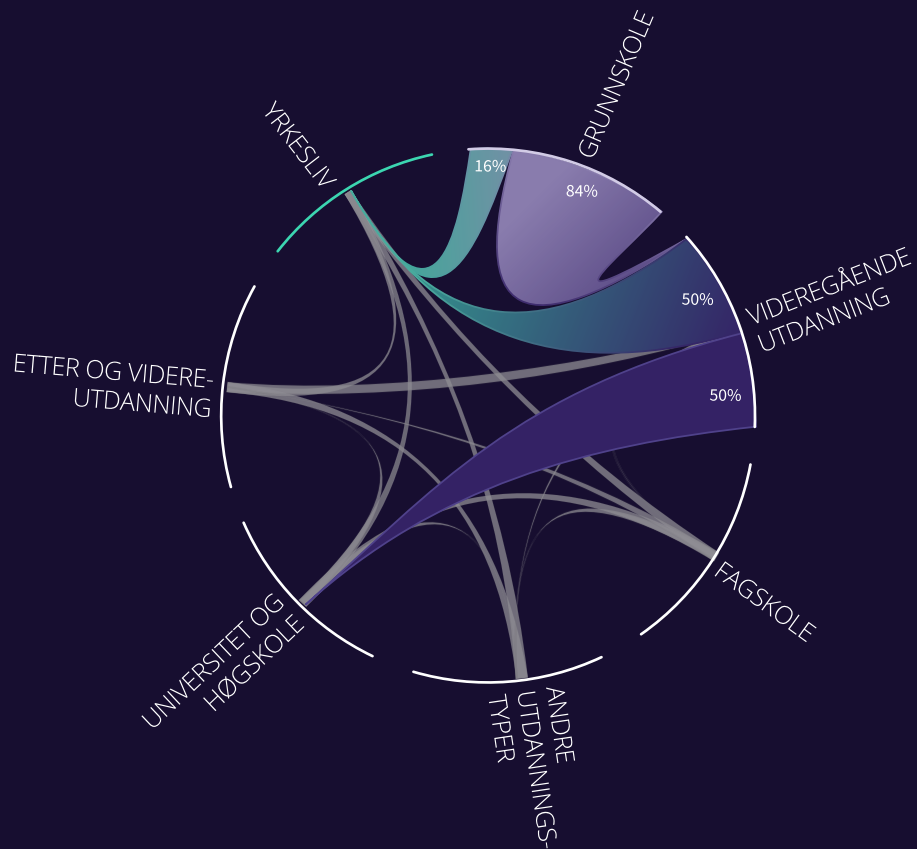
Concept 1

Flow of people

## 2022



## 2040

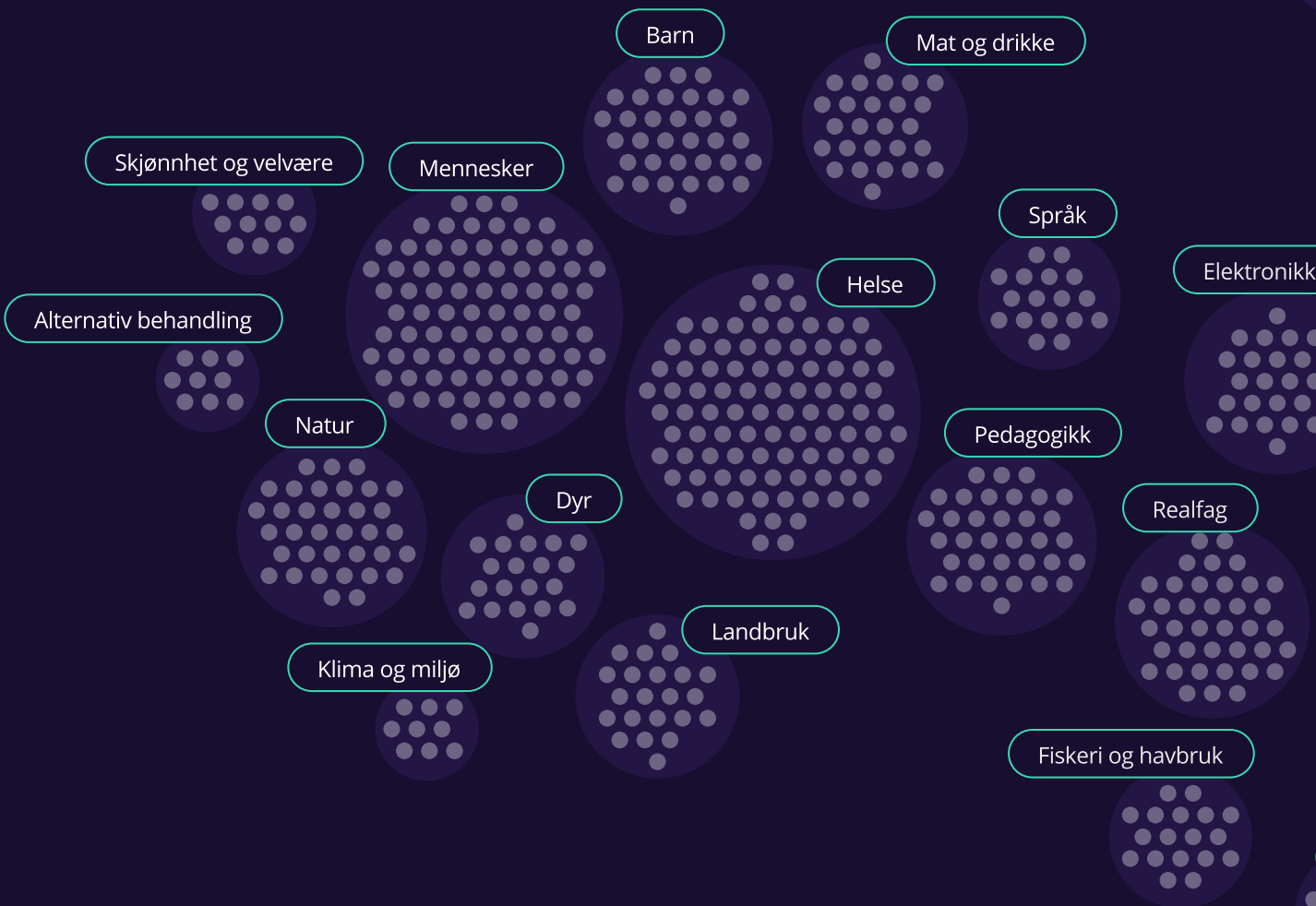


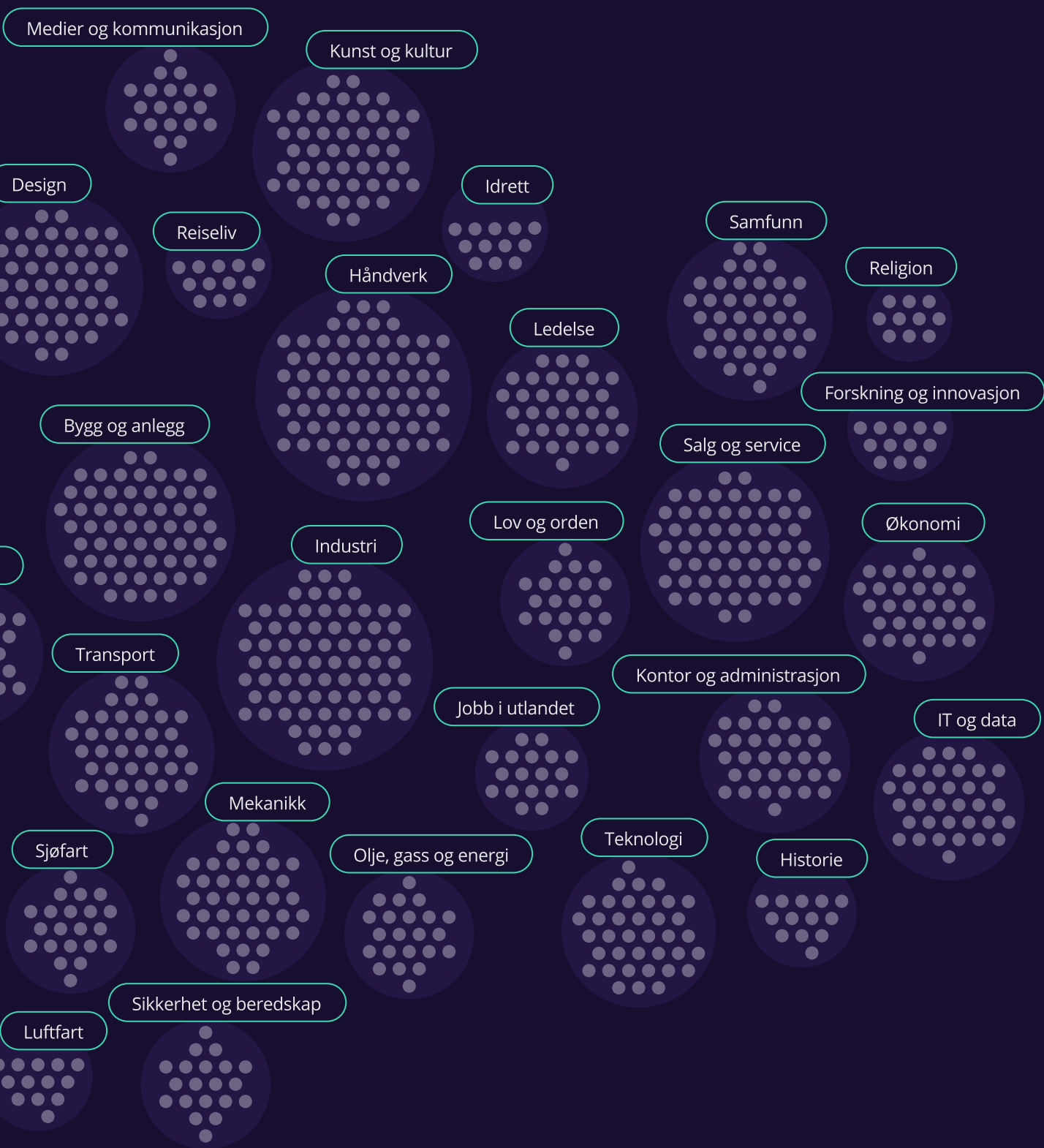


# Appendix 7

## Concept 2

A categorical terrain of different professions\*



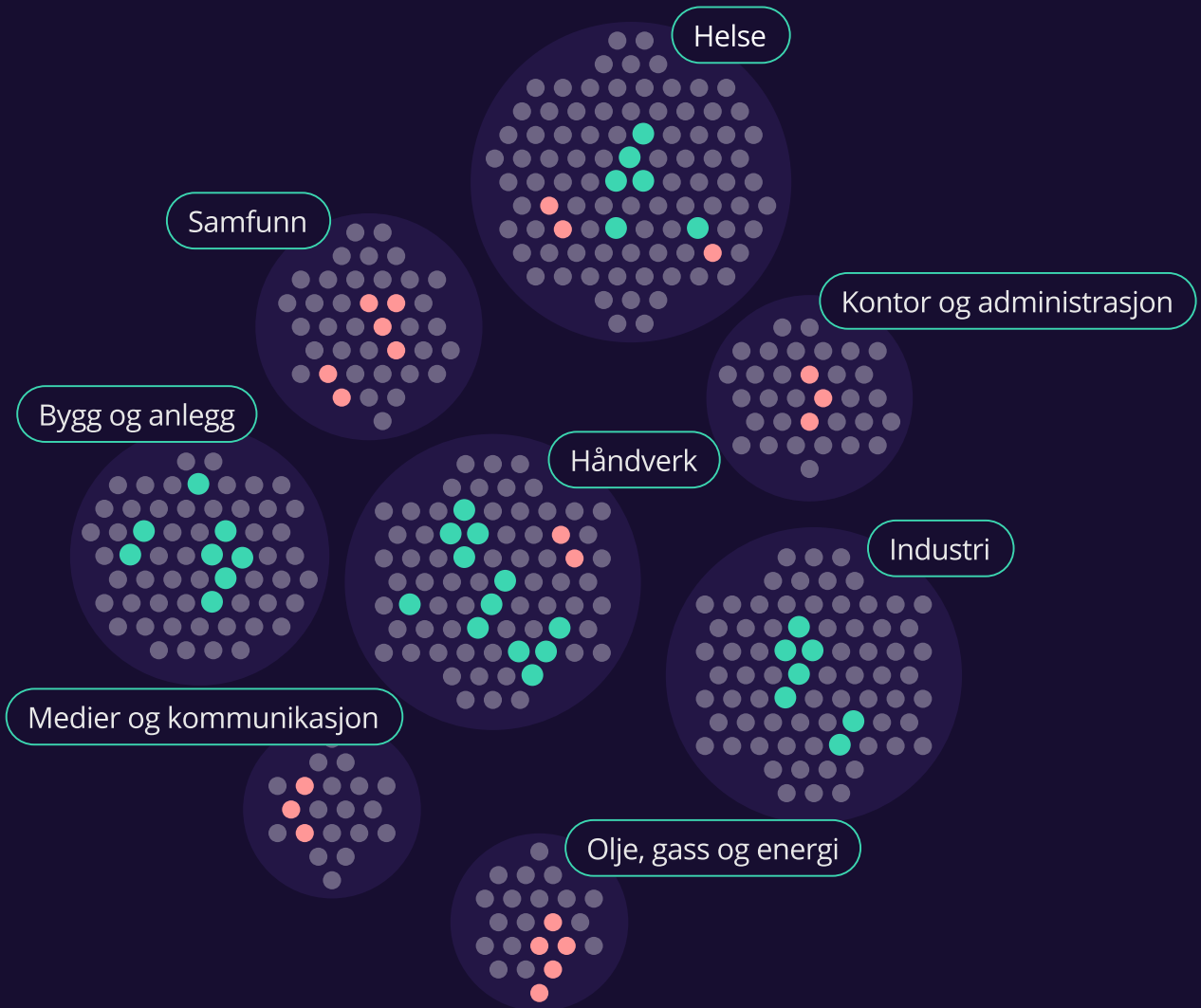


\*Data gathered from [utdanning.no](http://utdanning.no) and Statistics Norway (SSB).

# Appendix 8

## Concept 2

### Projections of needs in the labor force in 2040\*

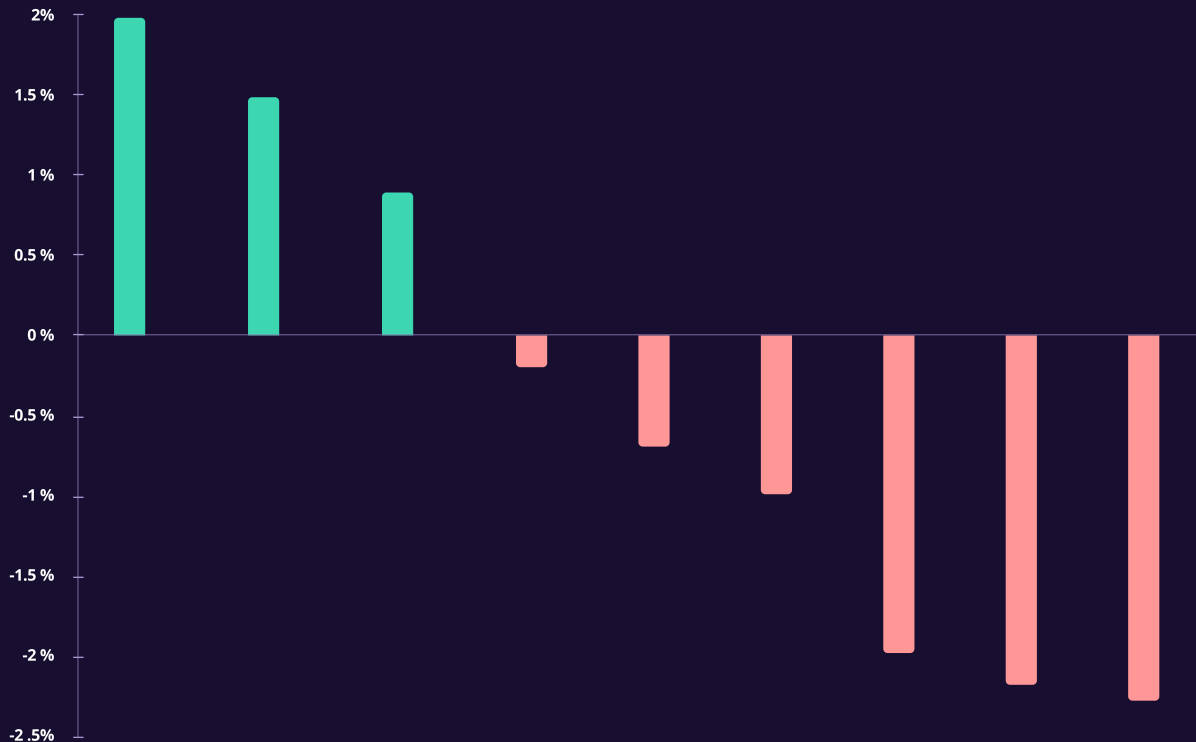


## Concept 2

### Projections of needs in the labor force in 2040\*

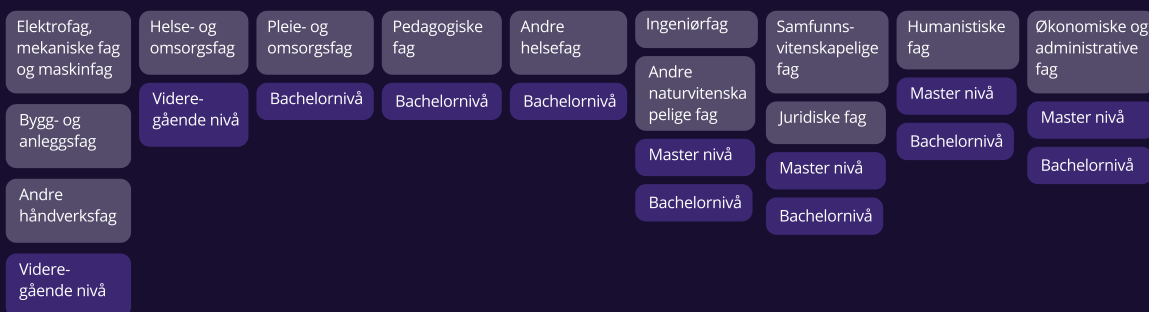
#### Stort behov for i 2040

Færre som utdanner seg i forhold til det samfunnet trenger



#### Ikke stort behov for i 2040

Langt flere som utdanner seg i forhold til det samfunnet trenger



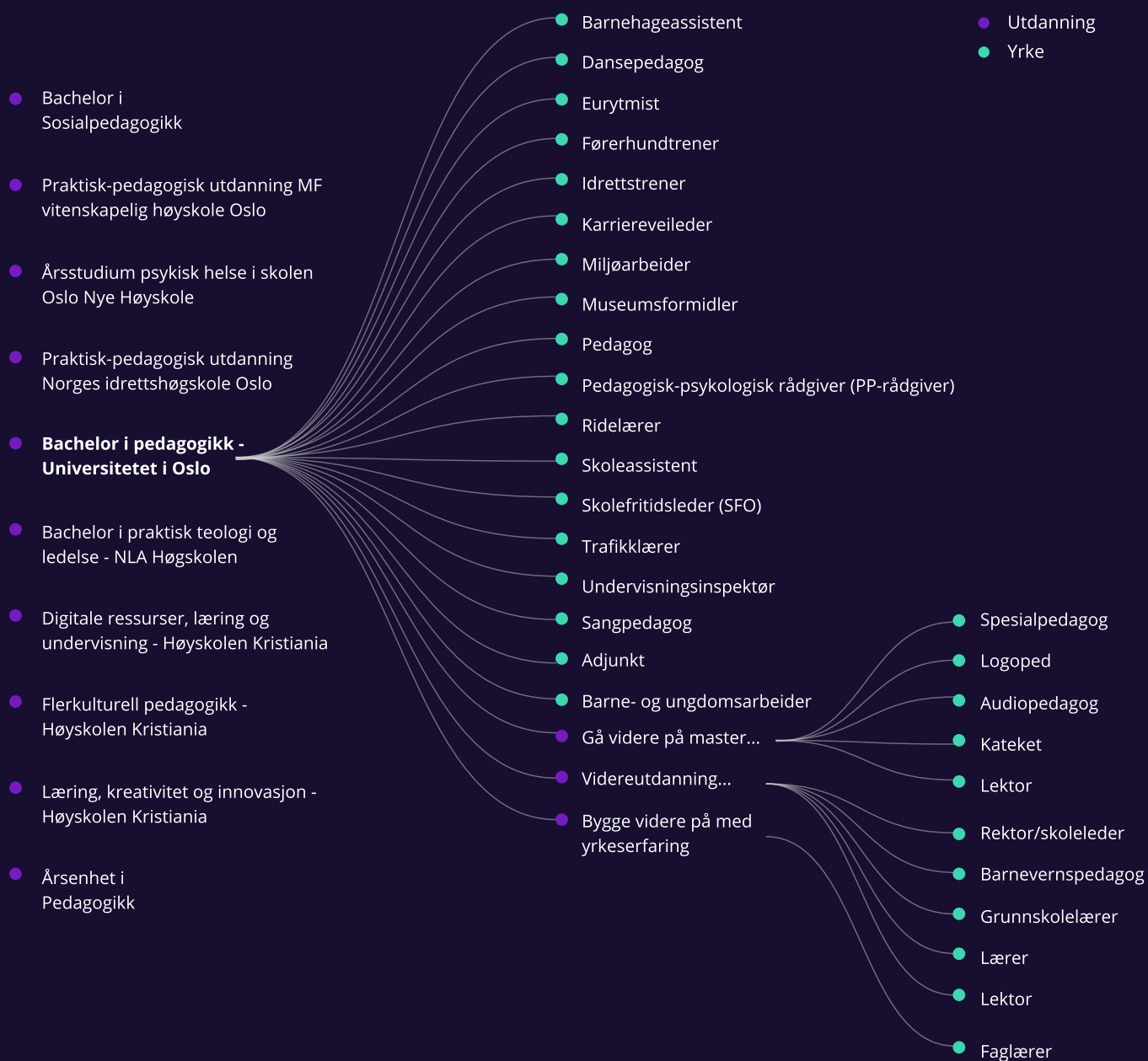
**\*Projection of labor force and employment for people with education on upper secondary level, bachelor level and masterlevel from share of total workforce:**

The graph shows the difference between the populations labor force in the chosen educational area and the need for employment of people in that area projected in 2040.

# Appendix 9

## Concept 3

### Connections between educations and different professions \*





## Fagområder ▾

Alle

Infotekniske fag

Landbruk

Idrett

Historie

Språk

Estetisk

Helsefag

Pedagogiske fag

Resieliv

Lærer

Samfunn

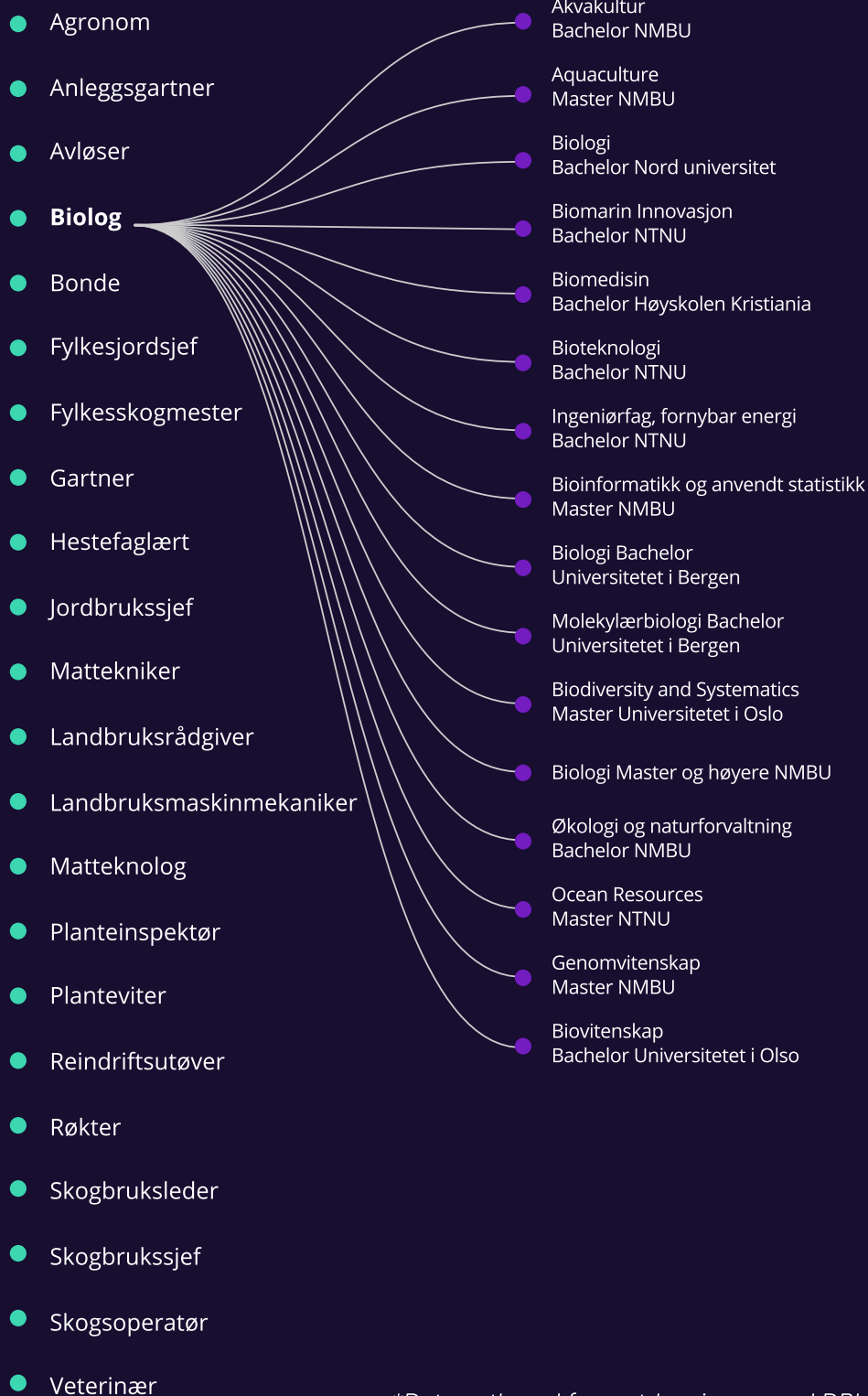
Realfag

Mediefag

Teknologiske fag

Økonomi og administrasjon

Jus

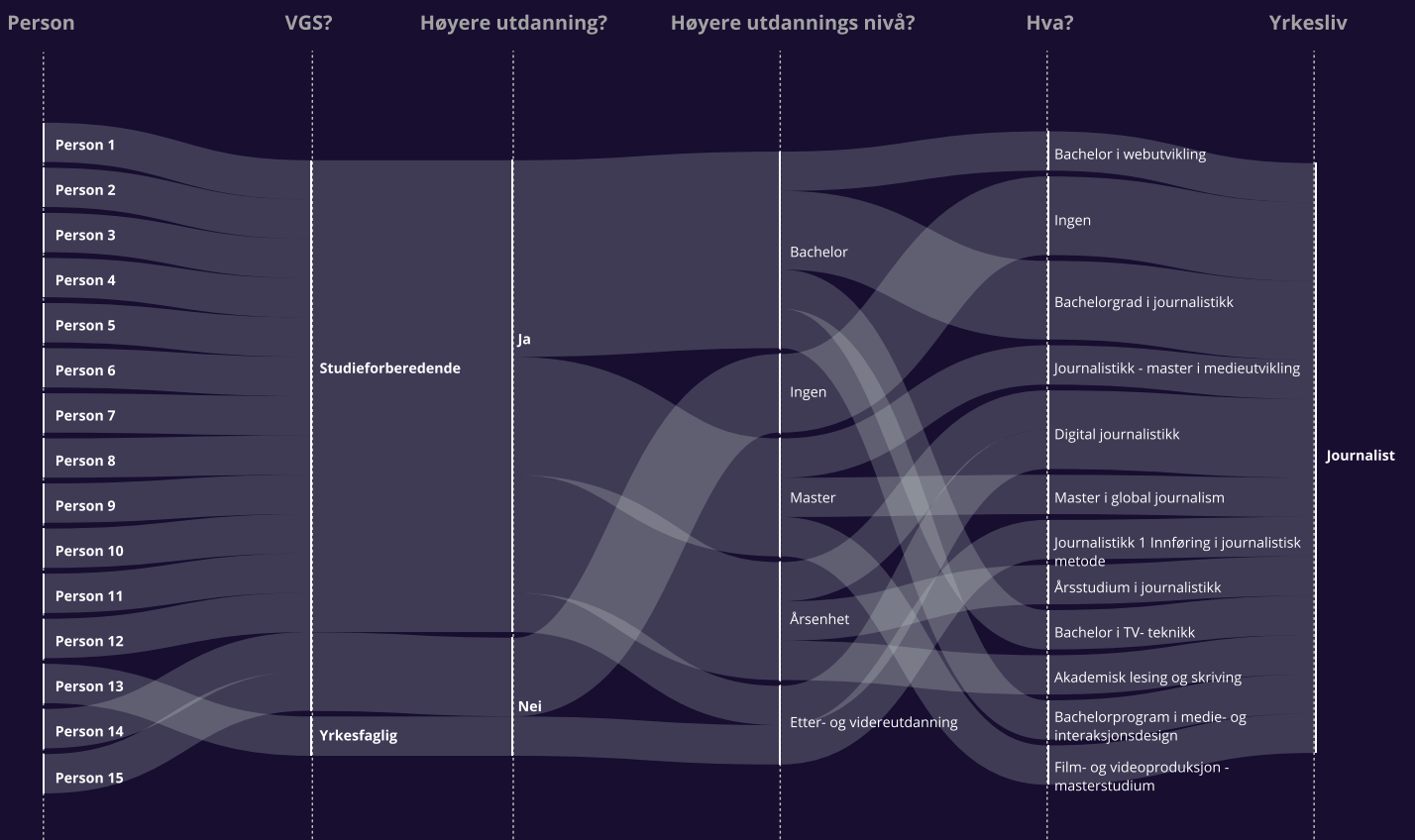


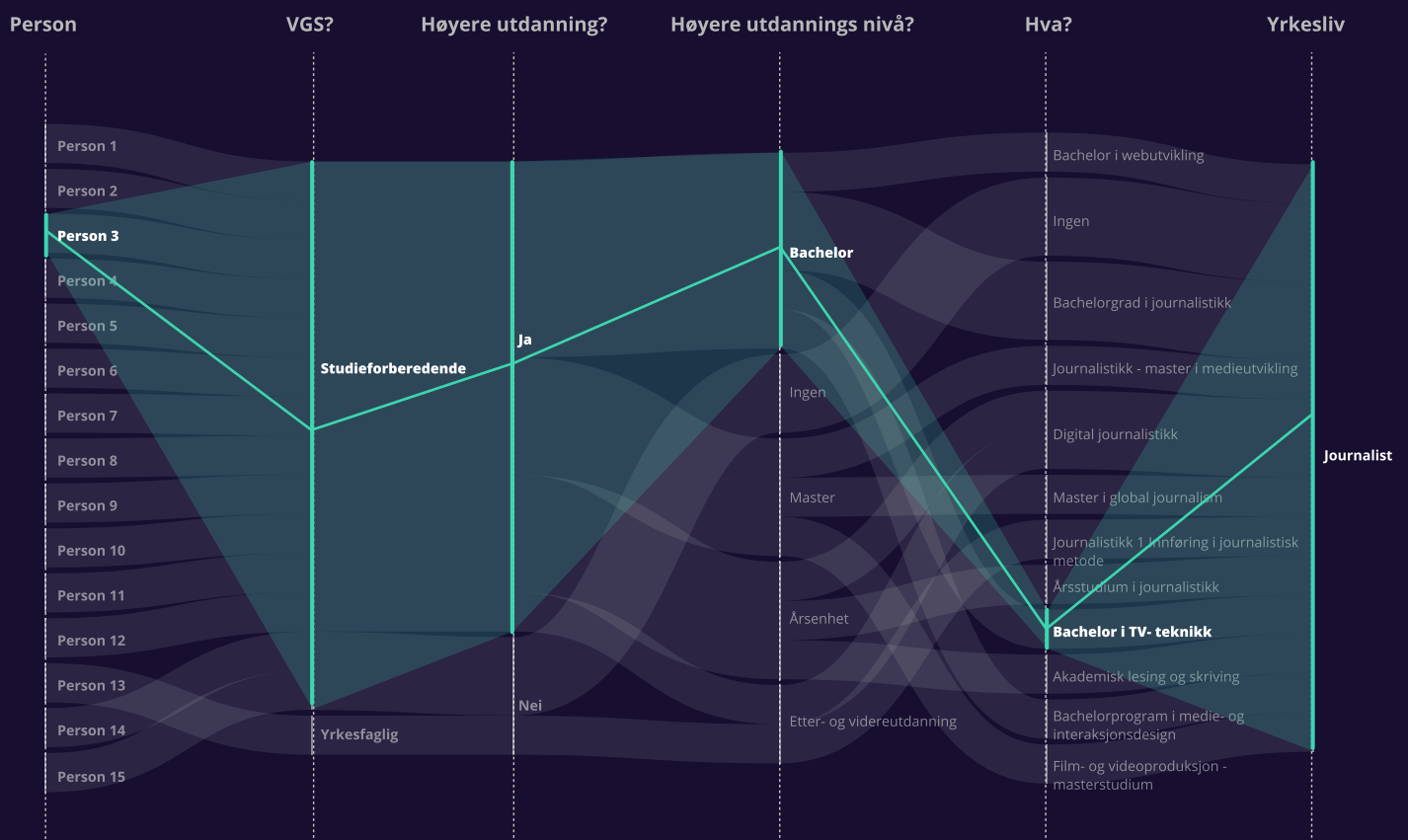
\*Data gathered from utdanning.no and DBH

# Appendix 10

## Concept 4

### Different paths to an education or career \*





\*Data gathered from utdanning.no

# Appendix 11

## Dataset 1

Data gathered from (utdanning.no, 2022), (Statistics Norway (SSB) Cappelen, 2020, Framskrivinger av arbeidsstyrken og sysselsettingen etter utdanning mot 2040) and (Statistics Norway (SSB) 2020 Fakta om utdanning 2021)

Dimensjon	Grunnskole	Videregående	Fagskole	Annet	Universitet og høyskole	Etter- og videreutdanning	Yrkesliv
Grunnskole	0	1	0	0	0	1	1
Videregående	0	0	1	1	1	0	1
Fagskole	0	0	0	1	1	0	1
Annet	0	0	1	0	1	0	1
Universitet og høyskole	0	0	0	1	0	1	1
Etter- og videreutdanning	0	1	1	0	1	0	1
Yrkesliv	0	0	1	1	1	1	0

## Dataset 2

Fra	Til	år 2022	år 2040
Grunnskolen	Videregående	0,75	0,84
Grunnskolen	Yrkesliv	0,25	0,16
Videregående	Universitet og høyskole	0,36	0,50
Videregående	Yrkesliv	0,64	0,50

## Dataset 3

Institusjon	Nivå 1 kategori	Nivå 1 navn	Nivå 2 kategori	Nivå 2 navn
Grunnskole	Nivå	Barneskole		
Grunnskole	Nivå	Ungdomsskole		
Videregående	Retninger	Studieforberedende	Retninger	Idrettsfag
Videregående	Retninger	Studieforberedende	Retninger	Kunst, design og arkitektur
Videregående	Retninger	Studieforberedende	Retninger	Medier og kommunikasjon
Videregående	Retninger	Studieforberedende	Retninger	Musikk, dans og drama
Videregående	Retninger	Studieforberedende	Retninger	Studiespesialisering
Videregående	Retninger	Yrkesfag	Retninger	Bygg- og anleggsteknikk
Videregående	Retninger	Yrkesfag	Retninger	Elektro og datateknologi
Videregående	Retninger	Yrkesfag	Retninger	Frisør, blomster, interiør og eksponeringsdesign
Videregående	Retninger	Yrkesfag	Retninger	Håndverk, design og produktutvikling
Videregående	Retninger	Yrkesfag	Retninger	Helse- og oppvekstfag
Videregående	Retninger	Yrkesfag	Retninger	Informasjonsteknologi og medieproduksjon
Videregående	Retninger	Yrkesfag	Retninger	Naturbruk (med mulighet for studieforberedende Vg3)
Videregående	Retninger	Yrkesfag	Retninger	Restaurant- og matfag
Videregående	Retninger	Yrkesfag	Retninger	Salg, service og reiseliv
Videregående	Retninger	Yrkesfag	Retninger	Teknologi- og industrifag
Fagskole	Fagområder	Helse- og oppvekstfag		
Fagskole	Fagområder	Tekniske fag		
Fagskole	Fagområder	Maritime fag		
Fagskole	Fagområder	Kreative fag		
Fagskole	Fagområder	Økonomi og administrasjon		
Fagskole	Fagområder	Andre fagskolestudier		
Andre utdanningstyper	Andre utdanningst	Folkehøgskole		
Andre utdanningstyper	Andre utdanningst	Utdanning i Forsvaret		
Andre utdanningstyper	Andre utdanningst	Utdanning i bedrift		
Universitet og høyskole	Nivå	Doktorgrad (ph.d)	Fagområder	Humanistiske og estetiske fag
Universitet og høyskole	Nivå	Profesjonsstudium	Fagområder	Naturvitenskapelige fag, håndverksfag og tekniske fag
Universitet og høyskole	Nivå	Master	Fagområder	Helse-, sosial- og idrettsfag
Universitet og høyskole	Nivå	Bachelor	Fagområder	Lærerutdanninger og utdanninger i pedagogikk
Universitet og høyskole	Nivå	Høgskolekandidat	Fagområder	Økonomiske og administrative fag
Universitet og høyskole	Nivå	Årsstudium	Fagområder	Samfunnsfag og juridiske fag
Universitet og høyskole			Fagområder	Samferdsels- og sikkerhetsfag og andre servicefag
Universitet og høyskole			Fagområder	Primærnæringsfag
Universitet og høyskole			Fagområder	Andre fagfelt
Etter- og videreutdanning	Nivå	Årsenhet og kortere		
Etter- og videreutdanning	Nivå	Master og høyere		
Etter- og videreutdanning	Nivå	Fagskolegrad		
Etter- og videreutdanning	Nivå	Fagskolestudium		
Etter- og videreutdanning	Nivå	Bachelor og høyskolekandidat		
Etter- og videreutdanning	Nivå	Videregående (privat)		
Etter- og videreutdanning	Nivå	Etterutdanning		
Etter- og videreutdanning	Nivå	Annen utdanning		
Yrkesliv	Yrkesnæringer	Jordbruk, skogbruk, fiske og fangst		
Yrkesliv	Yrkesnæringer	Bergverksdrift		
Yrkesliv	Yrkesnæringer	Industri		
Yrkesliv	Yrkesnæringer	Kraft- og vannforsyning		
Yrkesliv	Yrkesnæringer	Bygge- og anleggsvirksomhet		
Yrkesliv	Yrkesnæringer	Varehandel, hotell- og restaurantvirksomhet		
Yrkesliv	Yrkesnæringer	Transport, lagring, post og telekommunikasjoner		
Yrkesliv	Yrkesnæringer	Bank- og finansieringsvirksomhet og flere tjenesteytinger		
Yrkesliv	Yrkesnæringer	Offentlig, sosial og privat tjenesteyting		

# Appendix 12

## Dataset 4 - 1 / 7

Hovedområde	Interesseområde	Yker
Mennesker, helse, mat og natur	Helse	Aktivitet
Mennesker, helse, mat og natur	Helse	Allmennøye
Mennesker, helse, mat og natur	Helse	Ambulansarbeider
Mennesker, helse, mat og natur	Helse	Anestesiøye
Mennesker, helse, mat og natur	Helse	Anestesiøyepleier
Mennesker, helse, mat og natur	Helse	Apoteker
Mennesker, helse, mat og natur	Helse	Apotektekniker
Mennesker, helse, mat og natur	Helse	Arbeidsmedisiner
Mennesker, helse, mat og natur	Helse	Audiograf
Mennesker, helse, mat og natur	Helse	Audiopedagog
Mennesker, helse, mat og natur	Helse	Barne- og ungdomspsykiater
Mennesker, helse, mat og natur	Helse	Barne- og ungdomspsykolog
Mennesker, helse, mat og natur	Helse	Barnekirurg
Mennesker, helse, mat og natur	Helse	Barnelege
Mennesker, helse, mat og natur	Helse	Barneøyepleier
Mennesker, helse, mat og natur	Helse	Bioingeniør
Mennesker, helse, mat og natur	Helse	Blokjeniker
Mennesker, helse, mat og natur	Helse	Bioteknolog
Mennesker, helse, mat og natur	Helse	Bryst- og endokrinologi
Mennesker, helse, mat og natur	Helse	Ergoterapeut
Mennesker, helse, mat og natur	Helse	Farmasøyt
Mennesker, helse, mat og natur	Helse	Fotterapeut
Mennesker, helse, mat og natur	Helse	Fysioterapeut
Mennesker, helse, mat og natur	Helse	Geriatr
Mennesker, helse, mat og natur	Helse	Gyneløse
Mennesker, helse, mat og natur	Helse	HMS-ingeniør
Mennesker, helse, mat og natur	Helse	Helsefagarbeider
Mennesker, helse, mat og natur	Helse	Helsesekretær
Mennesker, helse, mat og natur	Helse	Helseøyepleier
Mennesker, helse, mat og natur	Helse	Hematolog
Mennesker, helse, mat og natur	Helse	Hudlege
Mennesker, helse, mat og natur	Helse	Indremedisiner
Mennesker, helse, mat og natur	Helse	Intensivøyepleier
Mennesker, helse, mat og natur	Helse	Jordmor
Mennesker, helse, mat og natur	Helse	Kardiolog
Mennesker, helse, mat og natur	Helse	Kiropraktor
Mennesker, helse, mat og natur	Helse	Kirurg
Mennesker, helse, mat og natur	Helse	Kjøvortoped
Mennesker, helse, mat og natur	Helse	Klinisk ernæringsfysiolog
Mennesker, helse, mat og natur	Helse	Klinisk sosionom
Mennesker, helse, mat og natur	Helse	Kreftøyepleier
Mennesker, helse, mat og natur	Helse	Lege
Mennesker, helse, mat og natur	Helse	Legemiddelkonsulent
Mennesker, helse, mat og natur	Helse	Lungespesialist
Mennesker, helse, mat og natur	Helse	Manuellterapeut
Mennesker, helse, mat og natur	Helse	Mattekniker
Mennesker, helse, mat og natur	Helse	Matteknolog
Mennesker, helse, mat og natur	Helse	Mikrobiolog
Mennesker, helse, mat og natur	Helse	Musikterapeut
Mennesker, helse, mat og natur	Helse	Naprapat
Mennesker, helse, mat og natur	Helse	Nevrokirurg
Mennesker, helse, mat og natur	Helse	Nevrolog
Mennesker, helse, mat og natur	Helse	Nevrosøyepleier
Mennesker, helse, mat og natur	Helse	Nuklearmedisiner
Mennesker, helse, mat og natur	Helse	Nyreløse
Mennesker, helse, mat og natur	Helse	Obduksjonstekniker
Mennesker, helse, mat og natur	Helse	Onkolog
Mennesker, helse, mat og natur	Helse	Operasjonssøyepleier
Mennesker, helse, mat og natur	Helse	Optiker
Mennesker, helse, mat og natur	Helse	Ortoped
Mennesker, helse, mat og natur	Helse	Ortopedingeniør
Mennesker, helse, mat og natur	Helse	Ortopedtekniker
Mennesker, helse, mat og natur	Helse	Ortopst
Mennesker, helse, mat og natur	Helse	Patolog
Mennesker, helse, mat og natur	Helse	Perfusjonist
Mennesker, helse, mat og natur	Helse	Personlig assistent
Mennesker, helse, mat og natur	Helse	Plastikkirurg
Mennesker, helse, mat og natur	Helse	Pleiedarbeider
Mennesker, helse, mat og natur	Helse	Porter
Mennesker, helse, mat og natur	Helse	Provisorfarmasøyt
Mennesker, helse, mat og natur	Helse	Psykiater
Mennesker, helse, mat og natur	Helse	Psykolog
Mennesker, helse, mat og natur	Helse	Psykoterapeut
Mennesker, helse, mat og natur	Helse	Radiograf
Mennesker, helse, mat og natur	Helse	Radiolog
Mennesker, helse, mat og natur	Helse	Reseptfarmasøyt
Mennesker, helse, mat og natur	Helse	Revmatolog
Mennesker, helse, mat og natur	Helse	Samfunnsmedisiner
Mennesker, helse, mat og natur	Helse	Sexolog
Mennesker, helse, mat og natur	Helse	Sosionom
Mennesker, helse, mat og natur	Helse	Spesialist i ferdighetspsykiatri
Mennesker, helse, mat og natur	Helse	Spesialist i fysisk medisin og rehabilitering
Mennesker, helse, mat og natur	Helse	Spesialøyepleier innen psykisk helse og rus
Mennesker, helse, mat og natur	Helse	Sykepleier
Mennesker, helse, mat og natur	Helse	Tannhelsesekretær
Mennesker, helse, mat og natur	Helse	Tannlege
Mennesker, helse, mat og natur	Helse	Tannpleier
Mennesker, helse, mat og natur	Helse	Tanntekniker
Mennesker, helse, mat og natur	Helse	Thoraxkirurg
Mennesker, helse, mat og natur	Helse	Urolog
Mennesker, helse, mat og natur	Helse	Vernepåseier
Mennesker, helse, mat og natur	Helse	Veterinar
Mennesker, helse, mat og natur	Helse	Øre-nese-hals-spesialist
Mennesker, helse, mat og natur	Helse	Øylege
Mennesker, helse, mat og natur	Barn	Adjunkt
Mennesker, helse, mat og natur	Barn	Aktivitet
Mennesker, helse, mat og natur	Barn	Au pair
Mennesker, helse, mat og natur	Barn	Barne- og ungdomsarbeider
Mennesker, helse, mat og natur	Barn	Barne- og ungdomspsykiater

Mennesker, helse, mat og natur	Barn	Barne- og ungdomspsykolog
Mennesker, helse, mat og natur	Barn	Barnehageassistent
Mennesker, helse, mat og natur	Barn	Barnehageleier
Mennesker, helse, mat og natur	Barn	Barnehagestyrer
Mennesker, helse, mat og natur	Barn	Barnekirurg
Mennesker, helse, mat og natur	Barn	Barnelege
Mennesker, helse, mat og natur	Barn	Barneøyepleier
Mennesker, helse, mat og natur	Barn	Barnevernspedagog
Mennesker, helse, mat og natur	Barn	Faglærer
Mennesker, helse, mat og natur	Barn	Grunnskolelærer
Mennesker, helse, mat og natur	Barn	Helseøyepleier
Mennesker, helse, mat og natur	Barn	Idrettstrener
Mennesker, helse, mat og natur	Barn	Jordmor
Mennesker, helse, mat og natur	Barn	Kateket
Mennesker, helse, mat og natur	Barn	Lektor
Mennesker, helse, mat og natur	Barn	Logoped
Mennesker, helse, mat og natur	Barn	Lærer
Mennesker, helse, mat og natur	Barn	Menighetspedagog
Mennesker, helse, mat og natur	Barn	Miljøarbeider
Mennesker, helse, mat og natur	Barn	Museumsformidler
Mennesker, helse, mat og natur	Barn	Musikkpedagog
Mennesker, helse, mat og natur	Barn	Pedagog
Mennesker, helse, mat og natur	Barn	Pedagogisk-psykologisk rådgiver (PP-rådgiver)
Mennesker, helse, mat og natur	Barn	Rektor/skoleleder
Mennesker, helse, mat og natur	Barn	Rideliær
Mennesker, helse, mat og natur	Barn	Skoleassistent
Mennesker, helse, mat og natur	Barn	Skolefridsløder (SFO)
Mennesker, helse, mat og natur	Barn	Spesialpedagog
Mennesker, helse, mat og natur	Barn	Undervisningsinspektør
Mennesker, helse, mat og natur	Dyr	Agronom
Mennesker, helse, mat og natur	Dyr	Avløser
Mennesker, helse, mat og natur	Dyr	Biolog
Mennesker, helse, mat og natur	Dyr	Bonde
Mennesker, helse, mat og natur	Dyr	Dyrefagarbeider
Mennesker, helse, mat og natur	Dyr	Dyrepasser
Mennesker, helse, mat og natur	Dyr	Dyrepleier
Mennesker, helse, mat og natur	Dyr	Fiskehelsebiolog
Mennesker, helse, mat og natur	Dyr	Førerhundtrener
Mennesker, helse, mat og natur	Dyr	Hestefaglært
Mennesker, helse, mat og natur	Dyr	Hovslager
Mennesker, helse, mat og natur	Dyr	Naturforvalter
Mennesker, helse, mat og natur	Dyr	Ornitolog
Mennesker, helse, mat og natur	Dyr	Paleontolog
Mennesker, helse, mat og natur	Dyr	Produktutvikler fiskerfor
Mennesker, helse, mat og natur	Dyr	Reindriftsutøver
Mennesker, helse, mat og natur	Dyr	Rideliær
Mennesker, helse, mat og natur	Dyr	Røtter
Mennesker, helse, mat og natur	Dyr	Takidermist
Mennesker, helse, mat og natur	Dyr	Veterinar
Mennesker, helse, mat og natur	Klima og miljø	Agronom
Mennesker, helse, mat og natur	Klima og miljø	Gjenvinningsoperatør
Mennesker, helse, mat og natur	Klima og miljø	Ingeniør i energi og miljø i bygg
Mennesker, helse, mat og natur	Klima og miljø	Jordbrukssef
Mennesker, helse, mat og natur	Klima og miljø	Meteorolog
Mennesker, helse, mat og natur	Klima og miljø	Miljørådgiver
Mennesker, helse, mat og natur	Klima og miljø	Naturforvalter
Mennesker, helse, mat og natur	Klima og miljø	Oseanograf
Mennesker, helse, mat og natur	Klima og miljø	Utmarkskonsulent
Mennesker, helse, mat og natur	Landbruk	Agronom
Mennesker, helse, mat og natur	Landbruk	Anleggsgartner
Mennesker, helse, mat og natur	Landbruk	Avløser
Mennesker, helse, mat og natur	Landbruk	Biolog
Mennesker, helse, mat og natur	Landbruk	Bonde
Mennesker, helse, mat og natur	Landbruk	Fylkesjordf
Mennesker, helse, mat og natur	Landbruk	Fylkeskogmester
Mennesker, helse, mat og natur	Landbruk	Gartner
Mennesker, helse, mat og natur	Landbruk	Hestefaglært
Mennesker, helse, mat og natur	Landbruk	Jordbrukssef
Mennesker, helse, mat og natur	Landbruk	Landbruksmaskinmekaniker
Mennesker, helse, mat og natur	Landbruk	Landbruksrådgiver
Mennesker, helse, mat og natur	Landbruk	Mattekniker
Mennesker, helse, mat og natur	Landbruk	Matteknolog
Mennesker, helse, mat og natur	Landbruk	Planteinspektør
Mennesker, helse, mat og natur	Landbruk	Planteviter
Mennesker, helse, mat og natur	Landbruk	Reindriftsutøver
Mennesker, helse, mat og natur	Landbruk	Røtter
Mennesker, helse, mat og natur	Landbruk	Skogbruksleder
Mennesker, helse, mat og natur	Landbruk	Skogbrukssef
Mennesker, helse, mat og natur	Landbruk	Skogoperatør
Mennesker, helse, mat og natur	Landbruk	Veterinar
Mennesker, helse, mat og natur	Mat og drikk	Baker
Mennesker, helse, mat og natur	Mat og drikk	Barista
Mennesker, helse, mat og natur	Mat og drikk	Bartender
Mennesker, helse, mat og natur	Mat og drikk	Ernæringskokk
Mennesker, helse, mat og natur	Mat og drikk	Fagarbeider industriell matproduksjon
Mennesker, helse, mat og natur	Mat og drikk	Fagarbeider sjømatproduksjon
Mennesker, helse, mat og natur	Mat og drikk	Fagoperatør akvakultur (fiskeoppdretter)
Mennesker, helse, mat og natur	Mat og drikk	Ferskvarehandler
Mennesker, helse, mat og natur	Mat og drikk	Fisker
Mennesker, helse, mat og natur	Mat og drikk	Homstere
Mennesker, helse, mat og natur	Mat og drikk	Kantinedarbeider
Mennesker, helse, mat og natur	Mat og drikk	Kjøkkensef
Mennesker, helse, mat og natur	Mat og drikk	Kjøttkjøper
Mennesker, helse, mat og natur	Mat og drikk	Kjøttkjøper
Mennesker, helse, mat og natur	Mat og drikk	Klinisk ernæringsfysiolog
Mennesker, helse, mat og natur	Mat og drikk	Kokk
Mennesker, helse, mat og natur	Mat og drikk	Konditor
Mennesker, helse, mat og natur	Mat og drikk	Kostelonom
Mennesker, helse, mat og natur	Mat og drikk	Mattekniker
Mennesker, helse, mat og natur	Mat og drikk	Matteknolog
Mennesker, helse, mat og natur	Mat og drikk	Mikrobiolog

# Dataset 4 - 2 / 7

Mennesker, helse, mat og natur	Mat og drikke	Planteinspektør
Mennesker, helse, mat og natur	Mat og drikke	Produktutvikler fiskefôr
Mennesker, helse, mat og natur	Mat og drikke	Pølsemaker
Mennesker, helse, mat og natur	Mat og drikke	Servitør
Mennesker, helse, mat og natur	Mat og drikke	Slakter
Mennesker, helse, mat og natur	Mat og drikke	Vinkelier
Mennesker, helse, mat og natur	Mennesker	Aktivist
Mennesker, helse, mat og natur	Mennesker	Allmennlege
Mennesker, helse, mat og natur	Mennesker	Anestesilege
Mennesker, helse, mat og natur	Mennesker	Anestesiyepleier
Mennesker, helse, mat og natur	Mennesker	Arbeidsmedisiner
Mennesker, helse, mat og natur	Mennesker	Audiograf
Mennesker, helse, mat og natur	Mennesker	Bistandsarbeider
Mennesker, helse, mat og natur	Mennesker	Bryst- og endokrinkirurg
Mennesker, helse, mat og natur	Mennesker	Diakon
Mennesker, helse, mat og natur	Mennesker	Diakonimedarbeider
Mennesker, helse, mat og natur	Mennesker	Ergoterapeut
Mennesker, helse, mat og natur	Mennesker	Familierådgiver
Mennesker, helse, mat og natur	Mennesker	Flyktningkonsulent
Mennesker, helse, mat og natur	Mennesker	Fotterapeut
Mennesker, helse, mat og natur	Mennesker	Fysioterapeut
Mennesker, helse, mat og natur	Mennesker	Geriatric
Mennesker, helse, mat og natur	Mennesker	Gestaltterapeut
Mennesker, helse, mat og natur	Mennesker	Gravferdskonsulent
Mennesker, helse, mat og natur	Mennesker	Gynekolog
Mennesker, helse, mat og natur	Mennesker	Helsefagarbeider
Mennesker, helse, mat og natur	Mennesker	Hematolog
Mennesker, helse, mat og natur	Mennesker	Hjernesjelp
Mennesker, helse, mat og natur	Mennesker	Hudlege
Mennesker, helse, mat og natur	Mennesker	Indremedisiner
Mennesker, helse, mat og natur	Mennesker	Intensivsykepleier
Mennesker, helse, mat og natur	Mennesker	Jobbveileder
Mennesker, helse, mat og natur	Mennesker	Jordmor
Mennesker, helse, mat og natur	Mennesker	Kardiolog
Mennesker, helse, mat og natur	Mennesker	Karriereveileder
Mennesker, helse, mat og natur	Mennesker	Kiropraktor
Mennesker, helse, mat og natur	Mennesker	Kirurg
Mennesker, helse, mat og natur	Mennesker	Kjøvevtopped
Mennesker, helse, mat og natur	Mennesker	Klinisk sosionom
Mennesker, helse, mat og natur	Mennesker	Kreftsykepleier
Mennesker, helse, mat og natur	Mennesker	Lege
Mennesker, helse, mat og natur	Mennesker	Lektor
Mennesker, helse, mat og natur	Mennesker	Lungespesialist
Mennesker, helse, mat og natur	Mennesker	Manuellterapeut
Mennesker, helse, mat og natur	Mennesker	Miljøterapeut
Mennesker, helse, mat og natur	Mennesker	Musikkpedagog
Mennesker, helse, mat og natur	Mennesker	Musikterapeut
Mennesker, helse, mat og natur	Mennesker	Nevrolog
Mennesker, helse, mat og natur	Mennesker	Nevrosykepleier
Mennesker, helse, mat og natur	Mennesker	Nuklearmedisiner
Mennesker, helse, mat og natur	Mennesker	Nyrellege
Mennesker, helse, mat og natur	Mennesker	Onkolog
Mennesker, helse, mat og natur	Mennesker	Operasjonsykepleier
Mennesker, helse, mat og natur	Mennesker	Optiker
Mennesker, helse, mat og natur	Mennesker	Ortoped
Mennesker, helse, mat og natur	Mennesker	Ortopst
Mennesker, helse, mat og natur	Mennesker	Pedagog
Mennesker, helse, mat og natur	Mennesker	Pedagogisk-psykologisk rådgiver (PP-rådgiver)
Mennesker, helse, mat og natur	Mennesker	Personlrådgiver
Mennesker, helse, mat og natur	Mennesker	Personlig assistent
Mennesker, helse, mat og natur	Mennesker	Plastikkirurg
Mennesker, helse, mat og natur	Mennesker	Pleiemedarbeider
Mennesker, helse, mat og natur	Mennesker	Politiker
Mennesker, helse, mat og natur	Mennesker	Portør
Mennesker, helse, mat og natur	Mennesker	Prest
Mennesker, helse, mat og natur	Mennesker	Psykater
Mennesker, helse, mat og natur	Mennesker	Psykolog
Mennesker, helse, mat og natur	Mennesker	Psykoterapeut
Mennesker, helse, mat og natur	Mennesker	Radiolog
Mennesker, helse, mat og natur	Mennesker	Revmatolog
Mennesker, helse, mat og natur	Mennesker	Seolog
Mennesker, helse, mat og natur	Mennesker	Sosialantropolog
Mennesker, helse, mat og natur	Mennesker	Sosiolog
Mennesker, helse, mat og natur	Mennesker	Sosionom
Mennesker, helse, mat og natur	Mennesker	Spesialist i fordøyelsessykdommer
Mennesker, helse, mat og natur	Mennesker	Spesialist i fysisk og rehabilitering
Mennesker, helse, mat og natur	Mennesker	Spesialsykepleier innen psykisk helse og rus
Mennesker, helse, mat og natur	Mennesker	Støttekontakt
Mennesker, helse, mat og natur	Mennesker	Suppokoordinator
Mennesker, helse, mat og natur	Mennesker	Sykepleier
Mennesker, helse, mat og natur	Mennesker	Tannlege
Mennesker, helse, mat og natur	Mennesker	Tanngleier
Mennesker, helse, mat og natur	Mennesker	Tantrådgiver
Mennesker, helse, mat og natur	Mennesker	Terapeut
Mennesker, helse, mat og natur	Mennesker	Thoraxkirurg
Mennesker, helse, mat og natur	Mennesker	Urolog
Mennesker, helse, mat og natur	Mennesker	Vernepleier
Mennesker, helse, mat og natur	Mennesker	Øre-nese-hals spesialist
Mennesker, helse, mat og natur	Mennesker	Øylege
Mennesker, helse, mat og natur	Natur	Agronom
Mennesker, helse, mat og natur	Natur	Arbeidsgratner
Mennesker, helse, mat og natur	Natur	Arealplanlegger
Mennesker, helse, mat og natur	Natur	Avløser
Mennesker, helse, mat og natur	Natur	Biokjemiker
Mennesker, helse, mat og natur	Natur	Biolog
Mennesker, helse, mat og natur	Natur	Bioteknolog
Mennesker, helse, mat og natur	Natur	Biomsterdekoratør
Mennesker, helse, mat og natur	Natur	Bønde
Mennesker, helse, mat og natur	Natur	Dyrepasser

Mennesker, helse, mat og natur	Natur	Dyrepleier
Mennesker, helse, mat og natur	Natur	Energiomtar
Mennesker, helse, mat og natur	Natur	Fisker
Mennesker, helse, mat og natur	Natur	Gartner
Mennesker, helse, mat og natur	Natur	Geofysiker
Mennesker, helse, mat og natur	Natur	Geograf
Mennesker, helse, mat og natur	Natur	Havforsker
Mennesker, helse, mat og natur	Natur	Hydrolog
Mennesker, helse, mat og natur	Natur	Landmåler
Mennesker, helse, mat og natur	Natur	Landskapsarkitekt
Mennesker, helse, mat og natur	Natur	Los
Mennesker, helse, mat og natur	Natur	Marin bioteknolog
Mennesker, helse, mat og natur	Natur	Marinbiolog
Mennesker, helse, mat og natur	Natur	Naturforvalter
Mennesker, helse, mat og natur	Natur	Oritolog
Mennesker, helse, mat og natur	Natur	Oseanograf
Mennesker, helse, mat og natur	Natur	Paleontolog
Mennesker, helse, mat og natur	Natur	Plantesykepleier
Mennesker, helse, mat og natur	Natur	Planteviter
Mennesker, helse, mat og natur	Natur	Produktutvikler fiskefôr
Mennesker, helse, mat og natur	Natur	Reindriftsutøver
Mennesker, helse, mat og natur	Natur	Skipper på fiskefartøy
Mennesker, helse, mat og natur	Natur	Skogbruksjef
Mennesker, helse, mat og natur	Natur	Skogoperatør
Mennesker, helse, mat og natur	Natur	Utmarksinspektør
Mennesker, helse, mat og natur	Pedagogikk	Adjunkt
Mennesker, helse, mat og natur	Pedagogikk	Audiopedagog
Mennesker, helse, mat og natur	Pedagogikk	Barn- og ungdomsarbeider
Mennesker, helse, mat og natur	Pedagogikk	Barnhagessistent
Mennesker, helse, mat og natur	Pedagogikk	Barnhagelærer
Mennesker, helse, mat og natur	Pedagogikk	Barnhagetyrer
Mennesker, helse, mat og natur	Pedagogikk	Barnvernepedagog
Mennesker, helse, mat og natur	Pedagogikk	Dansopedagog
Mennesker, helse, mat og natur	Pedagogikk	Eurytmist
Mennesker, helse, mat og natur	Pedagogikk	Faglærer
Mennesker, helse, mat og natur	Pedagogikk	Førerhundtrener
Mennesker, helse, mat og natur	Pedagogikk	Grunnskolelærer
Mennesker, helse, mat og natur	Pedagogikk	Idrettrener
Mennesker, helse, mat og natur	Pedagogikk	Instrumentalpedagog
Mennesker, helse, mat og natur	Pedagogikk	Karriereveileder
Mennesker, helse, mat og natur	Pedagogikk	Kateket
Mennesker, helse, mat og natur	Pedagogikk	Lektor
Mennesker, helse, mat og natur	Pedagogikk	Logoped
Mennesker, helse, mat og natur	Pedagogikk	Lærer
Mennesker, helse, mat og natur	Pedagogikk	Menghetspedagog
Mennesker, helse, mat og natur	Pedagogikk	Miljøarbeider
Mennesker, helse, mat og natur	Pedagogikk	Museumsformidler
Mennesker, helse, mat og natur	Pedagogikk	Musikkpedagog
Mennesker, helse, mat og natur	Pedagogikk	Pedagog
Mennesker, helse, mat og natur	Pedagogikk	Pedagogisk-psykologisk rådgiver (PP-rådgiver)
Mennesker, helse, mat og natur	Pedagogikk	Professor
Mennesker, helse, mat og natur	Pedagogikk	Rektor/skoleleder
Mennesker, helse, mat og natur	Pedagogikk	Ridelerer
Mennesker, helse, mat og natur	Pedagogikk	Sangpedagog
Mennesker, helse, mat og natur	Pedagogikk	Skoelærer
Mennesker, helse, mat og natur	Pedagogikk	Skoelæringsleder (SFO)
Mennesker, helse, mat og natur	Pedagogikk	Spesialpedagog
Mennesker, helse, mat og natur	Pedagogikk	Trafikklærer
Mennesker, helse, mat og natur	Pedagogikk	Utdanningsinspektør
Mennesker, helse, mat og natur	Skjønnhet og velvære	Frisør
Mennesker, helse, mat og natur	Skjønnhet og velvære	Hudpleier
Mennesker, helse, mat og natur	Skjønnhet og velvære	Kosmetolog
Mennesker, helse, mat og natur	Skjønnhet og velvære	Måler- og parykkmaker
Mennesker, helse, mat og natur	Skjønnhet og velvære	Massasjeterapeut
Mennesker, helse, mat og natur	Skjønnhet og velvære	Modell
Mennesker, helse, mat og natur	Skjønnhet og velvære	Naprapat
Mennesker, helse, mat og natur	Skjønnhet og velvære	Negledesigner
Mennesker, helse, mat og natur	Skjønnhet og velvære	Personlig trener
Mennesker, helse, mat og natur	Skjønnhet og velvære	Sminker
Mennesker, helse, mat og natur	Skjønnhet og velvære	Tatover
Mennesker, helse, mat og natur	Språk	Au pair
Mennesker, helse, mat og natur	Språk	Bibliotekar
Mennesker, helse, mat og natur	Språk	Bokhandler
Mennesker, helse, mat og natur	Språk	Diplomat
Mennesker, helse, mat og natur	Språk	Filolog
Mennesker, helse, mat og natur	Språk	Forfatter
Mennesker, helse, mat og natur	Språk	Kommunikasjonsrådgiver
Mennesker, helse, mat og natur	Språk	Lektor
Mennesker, helse, mat og natur	Språk	Litteraturlærer
Mennesker, helse, mat og natur	Språk	Logoped
Mennesker, helse, mat og natur	Språk	Øversetter
Mennesker, helse, mat og natur	Språk	Politiker
Mennesker, helse, mat og natur	Språk	Redaktør
Mennesker, helse, mat og natur	Språk	Tegnspråktolk
Mennesker, helse, mat og natur	Språk	Teknisk forfatter
Mennesker, helse, mat og natur	Språk	Tekstforfatter
Mennesker, helse, mat og natur	Språk	Tolk
Mennesker, helse, mat og natur	Alternativ behandling	Akupunktør
Mennesker, helse, mat og natur	Alternativ behandling	Aromaterapeut
Mennesker, helse, mat og natur	Alternativ behandling	Biopat
Mennesker, helse, mat og natur	Alternativ behandling	Eurytmist
Mennesker, helse, mat og natur	Alternativ behandling	Gestaltterapeut
Mennesker, helse, mat og natur	Alternativ behandling	Homeopat
Mennesker, helse, mat og natur	Alternativ behandling	Massasjeterapeut
Mennesker, helse, mat og natur	Alternativ behandling	Østeopat
Mennesker, helse, mat og natur	Alternativ behandling	Sonoterapeut
Industri, elektronikk, transport og sikkerhet	Bygg og anlegg	Aluminiumkonstruktør
Industri, elektronikk, transport og sikkerhet	Bygg og anlegg	Anleggsgratner
Industri, elektronikk, transport og sikkerhet	Bygg og anlegg	Anleggsinspektør
Industri, elektronikk, transport og sikkerhet	Bygg og anlegg	Anleggsinspektør





# Dataset 4 - 4 / 7

Industri, elektronikk, transport og sikkerhet	Mekanikk	Dimensjonskontroller
Industri, elektronikk, transport og sikkerhet	Mekanikk	Fagoperatør i plastfaget
Industri, elektronikk, transport og sikkerhet	Mekanikk	Fagoperatør i produksjonsteknikk
Industri, elektronikk, transport og sikkerhet	Mekanikk	Finnmekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Flymotormekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Flystrukturmekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Fysystemmekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Flytekniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Hjulstrutningsreparatør
Industri, elektronikk, transport og sikkerhet	Mekanikk	Industrimekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Industrimontør
Industri, elektronikk, transport og sikkerhet	Mekanikk	Landbruksmaskinmekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Låsesmed
Industri, elektronikk, transport og sikkerhet	Mekanikk	Maskiningeniør
Industri, elektronikk, transport og sikkerhet	Mekanikk	Maskinist
Industri, elektronikk, transport og sikkerhet	Mekanikk	Maskinist
Industri, elektronikk, transport og sikkerhet	Mekanikk	Maskinist
Industri, elektronikk, transport og sikkerhet	Mekanikk	Mekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Modelbygger
Industri, elektronikk, transport og sikkerhet	Mekanikk	Motormekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Motorskjemmekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Optroniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Orgelbygger
Industri, elektronikk, transport og sikkerhet	Mekanikk	Reserveledelsespediør
Industri, elektronikk, transport og sikkerhet	Mekanikk	Støper
Industri, elektronikk, transport og sikkerhet	Mekanikk	Tilkosttekniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Truck- og liftmekaniker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Urmaker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Verktøymaker
Industri, elektronikk, transport og sikkerhet	Mekanikk	Våler
Industri, elektronikk, transport og sikkerhet	Mekanikk	Bioteknolog
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Bore- og vedlikeholdsoperatør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør for elektriske kabeloperasjoner
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør for mekaniske kabeloperasjoner
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør havbunnsinstallasjoner
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør komplettering
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør kveilerer
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Brannoperatør sementering
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Dykker
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Energioperatør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Energioperatør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	FU-operatør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Fagoperatør i kjemisk prosessindustri (Prosesstekniker)
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Geokjemiker
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Geolog
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Ingeniør i energi og miljø i bygg
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Kjemingeniør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Kjemiker
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	NDT-kontrollør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Petroleumsingeniør
Industri, elektronikk, transport og sikkerhet	Olje, gass og energi	Prosessingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Astronaut
Industri, elektronikk, transport og sikkerhet	Realfag	Astronom
Industri, elektronikk, transport og sikkerhet	Realfag	Bioingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Biokjemiker
Industri, elektronikk, transport og sikkerhet	Realfag	Biolog
Industri, elektronikk, transport og sikkerhet	Realfag	Bioteknolog
Industri, elektronikk, transport og sikkerhet	Realfag	Farmasøyt
Industri, elektronikk, transport og sikkerhet	Realfag	Fiskehelsebiolog
Industri, elektronikk, transport og sikkerhet	Realfag	Forsker
Industri, elektronikk, transport og sikkerhet	Realfag	Fysiker
Industri, elektronikk, transport og sikkerhet	Realfag	Geofysiker
Industri, elektronikk, transport og sikkerhet	Realfag	Geokjemiker
Industri, elektronikk, transport og sikkerhet	Realfag	Geolog
Industri, elektronikk, transport og sikkerhet	Realfag	Havforsker
Industri, elektronikk, transport og sikkerhet	Realfag	Hydrolog
Industri, elektronikk, transport og sikkerhet	Realfag	Ingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Ingeniør i energi og miljø i bygg
Industri, elektronikk, transport og sikkerhet	Realfag	Kjemingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Kjemiker
Industri, elektronikk, transport og sikkerhet	Realfag	Laborant
Industri, elektronikk, transport og sikkerhet	Realfag	Lektor
Industri, elektronikk, transport og sikkerhet	Realfag	Lærer
Industri, elektronikk, transport og sikkerhet	Realfag	Marin bioteknolog
Industri, elektronikk, transport og sikkerhet	Realfag	Marinbiolog
Industri, elektronikk, transport og sikkerhet	Realfag	Maskiningeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Matematiker
Industri, elektronikk, transport og sikkerhet	Realfag	Mattekniker
Industri, elektronikk, transport og sikkerhet	Realfag	Matteknolog
Industri, elektronikk, transport og sikkerhet	Realfag	Meteorolog
Industri, elektronikk, transport og sikkerhet	Realfag	Mikrobiolog
Industri, elektronikk, transport og sikkerhet	Realfag	Obduksjonstekniker
Industri, elektronikk, transport og sikkerhet	Realfag	Oseanograf
Industri, elektronikk, transport og sikkerhet	Realfag	Petroleumsingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Professor
Industri, elektronikk, transport og sikkerhet	Realfag	Prosessingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Romteknolog
Industri, elektronikk, transport og sikkerhet	Realfag	Sivilingeniør
Industri, elektronikk, transport og sikkerhet	Realfag	Statistiker
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Ambulansarbeider
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Ansatt i Forsvaret
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Badevakt
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Branningeniør
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Brannkonstabel
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Dykker
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Etterforsker
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Fengselsbetjent
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	HMS-ingeniør
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Los
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Luftambetjent

Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Låsesmed
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Politi
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Politibetjent
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Røykdykker
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Signalmontør
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Sikkerhetsrådgiver (IT)
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Togleder
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Toller
Industri, elektronikk, transport og sikkerhet	Sikkerhet og beredskap	Vekter
Industri, elektronikk, transport og sikkerhet	Sjåfør	Ansatt i Forsvaret
Industri, elektronikk, transport og sikkerhet	Sjåfør	Bas/Nettmann
Industri, elektronikk, transport og sikkerhet	Sjåfør	Båtbygger
Industri, elektronikk, transport og sikkerhet	Sjåfør	Fisker
Industri, elektronikk, transport og sikkerhet	Sjåfør	Havnesejef
Industri, elektronikk, transport og sikkerhet	Sjåfør	Industrimontør
Industri, elektronikk, transport og sikkerhet	Sjåfør	Kaptein
Industri, elektronikk, transport og sikkerhet	Sjåfør	Komposittbåtbygger
Industri, elektronikk, transport og sikkerhet	Sjåfør	Kystkøpper
Industri, elektronikk, transport og sikkerhet	Sjåfør	Los
Industri, elektronikk, transport og sikkerhet	Sjåfør	Maritim elektriker
Industri, elektronikk, transport og sikkerhet	Sjåfør	Maskinist
Industri, elektronikk, transport og sikkerhet	Sjåfør	Maskinist
Industri, elektronikk, transport og sikkerhet	Sjåfør	Matros
Industri, elektronikk, transport og sikkerhet	Sjåfør	Motormekaniker
Industri, elektronikk, transport og sikkerhet	Sjåfør	Oversvrymann
Industri, elektronikk, transport og sikkerhet	Sjåfør	Selmlaker
Industri, elektronikk, transport og sikkerhet	Sjåfør	Skipper på fiskefartøy
Industri, elektronikk, transport og sikkerhet	Sjåfør	Skipspengler
Industri, elektronikk, transport og sikkerhet	Sjåfør	Slyrmann
Industri, elektronikk, transport og sikkerhet	Sjåfør	Trebåtbygger
Industri, elektronikk, transport og sikkerhet	Transport	AFIS-fulmektig
Industri, elektronikk, transport og sikkerhet	Transport	Ambulansarbeider
Industri, elektronikk, transport og sikkerhet	Transport	Anleggsmaskinfører
Industri, elektronikk, transport og sikkerhet	Transport	Anleggsmaskinmekaniker
Industri, elektronikk, transport og sikkerhet	Transport	Asfaltør
Industri, elektronikk, transport og sikkerhet	Transport	Avioniker
Industri, elektronikk, transport og sikkerhet	Transport	Banemontør
Industri, elektronikk, transport og sikkerhet	Transport	Billakerer
Industri, elektronikk, transport og sikkerhet	Transport	Bilmekaniker (lette kjøretøy)
Industri, elektronikk, transport og sikkerhet	Transport	Bilmekaniker (tunge kjøretøy)
Industri, elektronikk, transport og sikkerhet	Transport	Bilpleier
Industri, elektronikk, transport og sikkerhet	Transport	Bilsejer
Industri, elektronikk, transport og sikkerhet	Transport	Bilskadereparatør
Industri, elektronikk, transport og sikkerhet	Transport	Busjsjåfør
Industri, elektronikk, transport og sikkerhet	Transport	Fagoperatør kran- og løfteoperasjoner (Kranfører)
Industri, elektronikk, transport og sikkerhet	Transport	Flygeleder
Industri, elektronikk, transport og sikkerhet	Transport	Flyinstruktør
Industri, elektronikk, transport og sikkerhet	Transport	Flymekaniker
Industri, elektronikk, transport og sikkerhet	Transport	Havnesejef
Industri, elektronikk, transport og sikkerhet	Transport	Hjulstrutningsreparatør
Industri, elektronikk, transport og sikkerhet	Transport	Kabinpersonale fly
Industri, elektronikk, transport og sikkerhet	Transport	Kaptein
Industri, elektronikk, transport og sikkerhet	Transport	Konduktør
Industri, elektronikk, transport og sikkerhet	Transport	Logistikoperatør
Industri, elektronikk, transport og sikkerhet	Transport	Lokomotivfører
Industri, elektronikk, transport og sikkerhet	Transport	Matros
Industri, elektronikk, transport og sikkerhet	Transport	Motorskjemmekaniker
Industri, elektronikk, transport og sikkerhet	Transport	Pilot
Industri, elektronikk, transport og sikkerhet	Transport	Postbud
Industri, elektronikk, transport og sikkerhet	Transport	Signalmontør
Industri, elektronikk, transport og sikkerhet	Transport	Sjåfør
Industri, elektronikk, transport og sikkerhet	Transport	Speditør
Industri, elektronikk, transport og sikkerhet	Transport	Taxisjåfør
Industri, elektronikk, transport og sikkerhet	Transport	Togkspeditør
Industri, elektronikk, transport og sikkerhet	Transport	Togelektriker
Industri, elektronikk, transport og sikkerhet	Transport	Togleder
Industri, elektronikk, transport og sikkerhet	Transport	Trafikkalører
Industri, elektronikk, transport og sikkerhet	Transport	Trikkefører
Industri, elektronikk, transport og sikkerhet	Transport	Yrkesjåfør
Industri, elektronikk, transport og sikkerhet	Design	Animatør
Design, kultur, sport og reiseliv	Design	Arealplanlegger
Design, kultur, sport og reiseliv	Design	Arkitekt
Design, kultur, sport og reiseliv	Design	Blomstedelegatør
Design, kultur, sport og reiseliv	Design	Blyglasshåndverker
Design, kultur, sport og reiseliv	Design	Bunadtilvirket
Design, kultur, sport og reiseliv	Design	Buntnaker
Design, kultur, sport og reiseliv	Design	Bakker
Design, kultur, sport og reiseliv	Design	Design
Design, kultur, sport og reiseliv	Design	Duojar
Design, kultur, sport og reiseliv	Design	Eksponeeringsdesigner
Design, kultur, sport og reiseliv	Design	Fagoperatør i farging, trykking og etterbehandling
Design, kultur, sport og reiseliv	Design	Fagoperatør i grafisk produksjonsteknikk
Design, kultur, sport og reiseliv	Design	Fagoperatør i trikotasje
Design, kultur, sport og reiseliv	Design	Fagoperatør i veving
Design, kultur, sport og reiseliv	Design	Filigransavslusmed
Design, kultur, sport og reiseliv	Design	Forgylter
Design, kultur, sport og reiseliv	Design	Gipsmaker
Design, kultur, sport og reiseliv	Design	Glassblåser
Design, kultur, sport og reiseliv	Design	Grafisk designer
Design, kultur, sport og reiseliv	Design	Gravør
Design, kultur, sport og reiseliv	Design	Gullismed
Design, kultur, sport og reiseliv	Design	Herreskredder
Design, kultur, sport og reiseliv	Design	Håndvever
Design, kultur, sport og reiseliv	Design	Illustratør
Design, kultur, sport og reiseliv	Design	Industridesigner
Design, kultur, sport og reiseliv	Design	Interaksjonsdesigner
Design, kultur, sport og reiseliv	Design	Interiørarkitekt
Design, kultur, sport og reiseliv	Design	Interiørkonsulent
Design, kultur, sport og reiseliv	Design	Keramiker
Design, kultur, sport og reiseliv	Design	Kjole- og draktøyer

# Dataset 4 - 5 / 7

Design, kultur, sport og reiseliv	Design	Klodeesigner
Design, kultur, sport og reiseliv	Design	Kostymeyer
Design, kultur, sport og reiseliv	Design	Kunsthåndverker
Design, kultur, sport og reiseliv	Design	Kurvmaker
Design, kultur, sport og reiseliv	Design	Medieesigner
Design, kultur, sport og reiseliv	Design	Modist
Design, kultur, sport og reiseliv	Design	Møbeltepesener
Design, kultur, sport og reiseliv	Design	Nagleesigner
Design, kultur, sport og reiseliv	Design	Orgebygger
Design, kultur, sport og reiseliv	Design	Profileringdesigner
Design, kultur, sport og reiseliv	Design	Rekvisitar
Design, kultur, sport og reiseliv	Design	Salmaker
Design, kultur, sport og reiseliv	Design	Scenograf
Design, kultur, sport og reiseliv	Design	Spilledesigner
Design, kultur, sport og reiseliv	Design	Strikkeshåndverker
Design, kultur, sport og reiseliv	Design	Sølvsmed
Design, kultur, sport og reiseliv	Design	Tatover
Design, kultur, sport og reiseliv	Design	Tredrier
Design, kultur, sport og reiseliv	Design	Treskjærer
Design, kultur, sport og reiseliv	Design	Webdesigner
Design, kultur, sport og reiseliv	Håndverk	Billsalmaker
Design, kultur, sport og reiseliv	Håndverk	Bilkemslager
Design, kultur, sport og reiseliv	Håndverk	Blomsterdekoratør
Design, kultur, sport og reiseliv	Håndverk	Blyglasshåndverker
Design, kultur, sport og reiseliv	Håndverk	Bunadtvirker
Design, kultur, sport og reiseliv	Håndverk	Buntmaker
Design, kultur, sport og reiseliv	Håndverk	Båtbygger
Design, kultur, sport og reiseliv	Håndverk	Bøkker
Design, kultur, sport og reiseliv	Håndverk	Børsmaker
Design, kultur, sport og reiseliv	Håndverk	Design
Design, kultur, sport og reiseliv	Håndverk	Dusjår
Design, kultur, sport og reiseliv	Håndverk	Fagoperatør i grafisk produksjonsteknikk
Design, kultur, sport og reiseliv	Håndverk	Fagoperatør i limtreproduksjonsfaget
Design, kultur, sport og reiseliv	Håndverk	Fagoperatør i trelest- og limtreproduksjon
Design, kultur, sport og reiseliv	Håndverk	Fagoperatør i veving
Design, kultur, sport og reiseliv	Håndverk	Filigransalsvomed
Design, kultur, sport og reiseliv	Håndverk	Finmekaniker
Design, kultur, sport og reiseliv	Håndverk	Forgyller
Design, kultur, sport og reiseliv	Håndverk	Garnframskille
Design, kultur, sport og reiseliv	Håndverk	Garver
Design, kultur, sport og reiseliv	Håndverk	Gjennomaker
Design, kultur, sport og reiseliv	Håndverk	Gjertler
Design, kultur, sport og reiseliv	Håndverk	Glassblåser
Design, kultur, sport og reiseliv	Håndverk	Glassfagarbeider
Design, kultur, sport og reiseliv	Håndverk	Graver
Design, kultur, sport og reiseliv	Håndverk	Gullsmed
Design, kultur, sport og reiseliv	Håndverk	Herreskredder
Design, kultur, sport og reiseliv	Håndverk	Hovslager
Design, kultur, sport og reiseliv	Håndverk	Håndbokbinder
Design, kultur, sport og reiseliv	Håndverk	Håndvever
Design, kultur, sport og reiseliv	Håndverk	Keramiker
Design, kultur, sport og reiseliv	Håndverk	Kjole- og drakttyer
Design, kultur, sport og reiseliv	Håndverk	Klodeesigner
Design, kultur, sport og reiseliv	Håndverk	Komposittbåtbygger
Design, kultur, sport og reiseliv	Håndverk	Kostymeyer
Design, kultur, sport og reiseliv	Håndverk	Kunsthåndverker
Design, kultur, sport og reiseliv	Håndverk	Kurvmaker
Design, kultur, sport og reiseliv	Håndverk	Maler
Design, kultur, sport og reiseliv	Håndverk	Mekaniker
Design, kultur, sport og reiseliv	Håndverk	Modist
Design, kultur, sport og reiseliv	Håndverk	Mur- og flislegger
Design, kultur, sport og reiseliv	Håndverk	Møbeldesigner
Design, kultur, sport og reiseliv	Håndverk	Møbelsnekker
Design, kultur, sport og reiseliv	Håndverk	Møbeltepesener
Design, kultur, sport og reiseliv	Håndverk	Optroniker
Design, kultur, sport og reiseliv	Håndverk	Orgebygger
Design, kultur, sport og reiseliv	Håndverk	Ortopedtekniker
Design, kultur, sport og reiseliv	Håndverk	Pianostemmer
Design, kultur, sport og reiseliv	Håndverk	Platearbeider
Design, kultur, sport og reiseliv	Håndverk	Rekvisitar
Design, kultur, sport og reiseliv	Håndverk	Replisjer
Design, kultur, sport og reiseliv	Håndverk	Rørlegger
Design, kultur, sport og reiseliv	Håndverk	Salmaker
Design, kultur, sport og reiseliv	Håndverk	Sellmaker
Design, kultur, sport og reiseliv	Håndverk	Serigraf
Design, kultur, sport og reiseliv	Håndverk	Skofagoperatør
Design, kultur, sport og reiseliv	Håndverk	Skomaker
Design, kultur, sport og reiseliv	Håndverk	Smed
Design, kultur, sport og reiseliv	Håndverk	Snekker
Design, kultur, sport og reiseliv	Håndverk	Steinfigurarbeider
Design, kultur, sport og reiseliv	Håndverk	Strikkeshåndverker
Design, kultur, sport og reiseliv	Håndverk	Sipper
Design, kultur, sport og reiseliv	Håndverk	Sveiser
Design, kultur, sport og reiseliv	Håndverk	Sølvsmed
Design, kultur, sport og reiseliv	Håndverk	Tak- og membrantekker
Design, kultur, sport og reiseliv	Håndverk	Taksidermist
Design, kultur, sport og reiseliv	Håndverk	Tanttekniker
Design, kultur, sport og reiseliv	Håndverk	Treblåbygger
Design, kultur, sport og reiseliv	Håndverk	Tredrier
Design, kultur, sport og reiseliv	Håndverk	Treskjærer
Design, kultur, sport og reiseliv	Håndverk	Tømmer
Design, kultur, sport og reiseliv	Håndverk	Urmaker
Design, kultur, sport og reiseliv	Håndverk	Verktøymaker
Design, kultur, sport og reiseliv	Idrett	Badevakt
Design, kultur, sport og reiseliv	Idrett	Danser
Design, kultur, sport og reiseliv	Idrett	Driftsoperatør i idrettsanlegg
Design, kultur, sport og reiseliv	Idrett	E-sportutøver
Design, kultur, sport og reiseliv	Idrett	Footballdommer

Design, kultur, sport og reiseliv	Idrett	Footballspiller
Design, kultur, sport og reiseliv	Idrett	Footballtrener
Design, kultur, sport og reiseliv	Idrett	Idrettskonsulent
Design, kultur, sport og reiseliv	Idrett	Idrettsstrener
Design, kultur, sport og reiseliv	Idrett	Idrettsutøver
Design, kultur, sport og reiseliv	Idrett	Personlig trener
Design, kultur, sport og reiseliv	Idrett	Sportsdommer
Design, kultur, sport og reiseliv	Kunst og kultur	Animatør
Design, kultur, sport og reiseliv	Kunst og kultur	Antikvar
Design, kultur, sport og reiseliv	Kunst og kultur	Arrangementsplanlegger
Design, kultur, sport og reiseliv	Kunst og kultur	Bibliotekar
Design, kultur, sport og reiseliv	Kunst og kultur	Billedkunstner
Design, kultur, sport og reiseliv	Kunst og kultur	Bokhandler
Design, kultur, sport og reiseliv	Kunst og kultur	Bunadtvirker
Design, kultur, sport og reiseliv	Kunst og kultur	Dansapedagog
Design, kultur, sport og reiseliv	Kunst og kultur	Danser
Design, kultur, sport og reiseliv	Kunst og kultur	Dirigent
Design, kultur, sport og reiseliv	Kunst og kultur	Dramaturg
Design, kultur, sport og reiseliv	Kunst og kultur	Duogår
Design, kultur, sport og reiseliv	Kunst og kultur	Eurymist
Design, kultur, sport og reiseliv	Kunst og kultur	Forfatter
Design, kultur, sport og reiseliv	Kunst og kultur	Forlagsmedarbeider
Design, kultur, sport og reiseliv	Kunst og kultur	Fotograf
Design, kultur, sport og reiseliv	Kunst og kultur	Historiker
Design, kultur, sport og reiseliv	Kunst og kultur	Illustratør
Design, kultur, sport og reiseliv	Kunst og kultur	Insipient
Design, kultur, sport og reiseliv	Kunst og kultur	Instrumentpedagog
Design, kultur, sport og reiseliv	Kunst og kultur	Komponist
Design, kultur, sport og reiseliv	Kunst og kultur	Konservator
Design, kultur, sport og reiseliv	Kunst og kultur	Koreograf
Design, kultur, sport og reiseliv	Kunst og kultur	Kostymeyer
Design, kultur, sport og reiseliv	Kunst og kultur	Kulturhistoriker / kulturviter
Design, kultur, sport og reiseliv	Kunst og kultur	Kunst- og kulturformidler
Design, kultur, sport og reiseliv	Kunst og kultur	Kunsthistoriker
Design, kultur, sport og reiseliv	Kunst og kultur	Kunstner
Design, kultur, sport og reiseliv	Kunst og kultur	Kurator
Design, kultur, sport og reiseliv	Kunst og kultur	Litteratuviter
Design, kultur, sport og reiseliv	Kunst og kultur	Lydkunstner
Design, kultur, sport og reiseliv	Kunst og kultur	Lydtekniker
Design, kultur, sport og reiseliv	Kunst og kultur	Lydtekniker
Design, kultur, sport og reiseliv	Kunst og kultur	Maskin- og parykkemaker
Design, kultur, sport og reiseliv	Kunst og kultur	Museumformidler
Design, kultur, sport og reiseliv	Kunst og kultur	Musiker
Design, kultur, sport og reiseliv	Kunst og kultur	Musikkpedagog
Design, kultur, sport og reiseliv	Kunst og kultur	Musikkprodusent
Design, kultur, sport og reiseliv	Kunst og kultur	Musikkterapeut
Design, kultur, sport og reiseliv	Kunst og kultur	Organist/Kantor
Design, kultur, sport og reiseliv	Kunst og kultur	Oversetter
Design, kultur, sport og reiseliv	Kunst og kultur	Pianostemmer
Design, kultur, sport og reiseliv	Kunst og kultur	Regissør
Design, kultur, sport og reiseliv	Kunst og kultur	Rekvisitar
Design, kultur, sport og reiseliv	Kunst og kultur	Sanger
Design, kultur, sport og reiseliv	Kunst og kultur	Sangpedagog
Design, kultur, sport og reiseliv	Kunst og kultur	Scenograf
Design, kultur, sport og reiseliv	Kunst og kultur	Skuespiller
Design, kultur, sport og reiseliv	Kunst og kultur	Sosialantropolog
Design, kultur, sport og reiseliv	Kunst og kultur	Videokunstner
Design, kultur, sport og reiseliv	Media og kommunikasjon	Art director
Design, kultur, sport og reiseliv	Media og kommunikasjon	Forlagsmedarbeider
Design, kultur, sport og reiseliv	Media og kommunikasjon	Fotograf
Design, kultur, sport og reiseliv	Media og kommunikasjon	Fotografjournalist
Design, kultur, sport og reiseliv	Media og kommunikasjon	Grafisk designer
Design, kultur, sport og reiseliv	Media og kommunikasjon	Illustratør
Design, kultur, sport og reiseliv	Media og kommunikasjon	Influencer
Design, kultur, sport og reiseliv	Media og kommunikasjon	Innholdsprodusent
Design, kultur, sport og reiseliv	Media og kommunikasjon	Interaksjonsdesigner
Design, kultur, sport og reiseliv	Media og kommunikasjon	Journalist
Design, kultur, sport og reiseliv	Media og kommunikasjon	Kommunikasjonsrådgiver
Design, kultur, sport og reiseliv	Media og kommunikasjon	Markedsføringskonsulent
Design, kultur, sport og reiseliv	Media og kommunikasjon	Medieesigner
Design, kultur, sport og reiseliv	Media og kommunikasjon	Medietekniker
Design, kultur, sport og reiseliv	Media og kommunikasjon	Profileringdesigner
Design, kultur, sport og reiseliv	Media og kommunikasjon	Redaktør
Design, kultur, sport og reiseliv	Media og kommunikasjon	TV-fotograf
Design, kultur, sport og reiseliv	Media og kommunikasjon	Teknisk forfatter
Design, kultur, sport og reiseliv	Media og kommunikasjon	Tekstforfatter
Design, kultur, sport og reiseliv	Media og kommunikasjon	Videokunstner
Design, kultur, sport og reiseliv	Reiseliv	Barista
Design, kultur, sport og reiseliv	Reiseliv	Barvender
Design, kultur, sport og reiseliv	Reiseliv	Guide
Design, kultur, sport og reiseliv	Reiseliv	Hotellmedisitar
Design, kultur, sport og reiseliv	Reiseliv	Hotellmedarbeider
Design, kultur, sport og reiseliv	Reiseliv	Husøkonom
Design, kultur, sport og reiseliv	Reiseliv	Kabinpersonale fly
Design, kultur, sport og reiseliv	Reiseliv	Lokomotivfører
Design, kultur, sport og reiseliv	Reiseliv	Pilot
Design, kultur, sport og reiseliv	Reiseliv	Reiseleder
Design, kultur, sport og reiseliv	Reiseliv	Reiselivsmedarbeider
Design, kultur, sport og reiseliv	Reiseliv	Reisejansist
Design, kultur, sport og reiseliv	Reiseliv	Forretningsutvikler
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Forsker
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Fysiker
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Førsteamanuensis
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Gründer
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Labrant
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Palæontolog
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Planteviter
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Professor
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Samfunnsmedisiner
Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Samfunnsøkonom

# Dataset 4 - 6 / 7

Teknologi, samfunn, handel og økonomi	Forskning og innovasjon	Stipendiat
Teknologi, samfunn, handel og økonomi	Historie	Antikvar
Teknologi, samfunn, handel og økonomi	Historie	Arkeolog
Teknologi, samfunn, handel og økonomi	Historie	Arkivar
Teknologi, samfunn, handel og økonomi	Historie	Filolog
Teknologi, samfunn, handel og økonomi	Historie	Filosof
Teknologi, samfunn, handel og økonomi	Historie	Historiker
Teknologi, samfunn, handel og økonomi	Historie	Konservator
Teknologi, samfunn, handel og økonomi	Historie	Kulturhistoriker / kulturviter
Teknologi, samfunn, handel og økonomi	Historie	Kunsthistoriker
Teknologi, samfunn, handel og økonomi	Historie	Kurator
Teknologi, samfunn, handel og økonomi	Historie	Lektor
Teknologi, samfunn, handel og økonomi	Historie	Litteraturviter
Teknologi, samfunn, handel og økonomi	Historie	Museumformidler
Teknologi, samfunn, handel og økonomi	IT og data	Animatør
Teknologi, samfunn, handel og økonomi	IT og data	Datatekniker
Teknologi, samfunn, handel og økonomi	IT og data	Datageniør
Teknologi, samfunn, handel og økonomi	IT og data	Datanalytiker (data scientist)
Teknologi, samfunn, handel og økonomi	IT og data	E-sportstøver
Teknologi, samfunn, handel og økonomi	IT og data	Fysiker
Teknologi, samfunn, handel og økonomi	IT og data	Geofysiker
Teknologi, samfunn, handel og økonomi	IT og data	Geokjemiker
Teknologi, samfunn, handel og økonomi	IT og data	Grafisk designer
Teknologi, samfunn, handel og økonomi	IT og data	IKT-servicemedarbeider
Teknologi, samfunn, handel og økonomi	IT og data	IT-administratør
Teknologi, samfunn, handel og økonomi	IT og data	IT-arkitekt
Teknologi, samfunn, handel og økonomi	IT og data	IT-driftstekniker
Teknologi, samfunn, handel og økonomi	IT og data	IT-konsulent
Teknologi, samfunn, handel og økonomi	IT og data	IT-leder
Teknologi, samfunn, handel og økonomi	IT og data	IT-prosjektleder
Teknologi, samfunn, handel og økonomi	IT og data	IT-utvikler (fagbrev)
Teknologi, samfunn, handel og økonomi	IT og data	Interaksjonsdesigner
Teknologi, samfunn, handel og økonomi	IT og data	Kjemingeniør
Teknologi, samfunn, handel og økonomi	IT og data	Kjemiker
Teknologi, samfunn, handel og økonomi	IT og data	Konsulent
Teknologi, samfunn, handel og økonomi	IT og data	Meteorolog
Teknologi, samfunn, handel og økonomi	IT og data	Nettverkstekniker
Teknologi, samfunn, handel og økonomi	IT og data	Romteknolog
Teknologi, samfunn, handel og økonomi	IT og data	Sikkerhetsrådgiver (IT)
Teknologi, samfunn, handel og økonomi	IT og data	Spilldesigner
Teknologi, samfunn, handel og økonomi	IT og data	Spillprogrammerer
Teknologi, samfunn, handel og økonomi	IT og data	Statistiker
Teknologi, samfunn, handel og økonomi	IT og data	Supportkonsulent
Teknologi, samfunn, handel og økonomi	IT og data	Systemutvikler
Teknologi, samfunn, handel og økonomi	IT og data	Tavlemontør
Teknologi, samfunn, handel og økonomi	IT og data	Teknisk tegner
Teknologi, samfunn, handel og økonomi	IT og data	Telekommunikasjonsmontør
Teknologi, samfunn, handel og økonomi	IT og data	Webdesigner
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Ambassadør
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Ansatt i Forsvaret
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Au pair
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Bistandsarbeider
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Diplomat
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Forsker
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Guide
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Kabipersonale fly
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Kaptein
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Maskinsjef
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Matros
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Misjonær
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Modell
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	NOT-kontrollør
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Petroleumsingeniør
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Pilot
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Professor
Teknologi, samfunn, handel og økonomi	Jobb i utlandet	Tolk
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Advokatassistent
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Advokatsekretær
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Apoteker
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Arkivar
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Forsikringsrådgiver
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Fylkesjordsjef
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Fylkeskogmester
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Helsesekretær
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	IT-prosjektleder
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Jurist
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Kirkegjener
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Kirkeverge
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Konsulent i offentlig sektor
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Kunderådgiver i bank
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Landbruksrådgiver
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Landsmåler
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Leder
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Personnrådgiver
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Personalsjef
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Prosjektleder
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Regnskapsfører
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Rådgiver i offentlig sektor
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Saksbehandler
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Sekretær
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Service- og administrasjonsmedarbeider
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Siviløkonom
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Statistiker
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Studiekonsulent
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Tannhelsesekretær
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Utmarkskonsulent
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Økonom
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Økonomikonsulent
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Økonomisjef
Teknologi, samfunn, handel og økonomi	Kontor og administrasjon	Økonom
Teknologi, samfunn, handel og økonomi	Ledelse	Ansatt i Forsvaret

Teknologi, samfunn, handel og økonomi	Ledelse	Apoteker
Teknologi, samfunn, handel og økonomi	Ledelse	Bas/Nettmann
Teknologi, samfunn, handel og økonomi	Ledelse	Dirigent
Teknologi, samfunn, handel og økonomi	Ledelse	Fabrikkisjef, fiske
Teknologi, samfunn, handel og økonomi	Ledelse	Gründer
Teknologi, samfunn, handel og økonomi	Ledelse	Havnesjef
Teknologi, samfunn, handel og økonomi	Ledelse	Hotelldirektør
Teknologi, samfunn, handel og økonomi	Ledelse	IT-leder
Teknologi, samfunn, handel og økonomi	Ledelse	IT-prosjektleder
Teknologi, samfunn, handel og økonomi	Ledelse	Jurist
Teknologi, samfunn, handel og økonomi	Ledelse	Leder
Teknologi, samfunn, handel og økonomi	Ledelse	Masksjef
Teknologi, samfunn, handel og økonomi	Ledelse	Organist/Kantor
Teknologi, samfunn, handel og økonomi	Ledelse	Overstyrmann
Teknologi, samfunn, handel og økonomi	Ledelse	Personalsjef
Teknologi, samfunn, handel og økonomi	Ledelse	Politijurist
Teknologi, samfunn, handel og økonomi	Ledelse	Politiker
Teknologi, samfunn, handel og økonomi	Ledelse	Prosjektleder
Teknologi, samfunn, handel og økonomi	Ledelse	Redaktør
Teknologi, samfunn, handel og økonomi	Ledelse	Regisjør
Teknologi, samfunn, handel og økonomi	Ledelse	Reiseleder
Teknologi, samfunn, handel og økonomi	Ledelse	Rektor/skoleleder
Teknologi, samfunn, handel og økonomi	Ledelse	Salgsjef
Teknologi, samfunn, handel og økonomi	Ledelse	Samfunnsplanlegger
Teknologi, samfunn, handel og økonomi	Ledelse	Siviløkonom
Teknologi, samfunn, handel og økonomi	Ledelse	Skipper på fiskefartøy
Teknologi, samfunn, handel og økonomi	Ledelse	Skogbruksleder
Teknologi, samfunn, handel og økonomi	Ledelse	Skogbruksisjef
Teknologi, samfunn, handel og økonomi	Ledelse	Skolefritidsleder (SFO)
Teknologi, samfunn, handel og økonomi	Ledelse	Statistiker
Teknologi, samfunn, handel og økonomi	Ledelse	Undervisningsinspektør
Teknologi, samfunn, handel og økonomi	Økonom	Økonom
Teknologi, samfunn, handel og økonomi	Økonomisjef	Økonomisjef
Teknologi, samfunn, handel og økonomi	Low og orden	Advokat
Teknologi, samfunn, handel og økonomi	Low og orden	Advokatassistent
Teknologi, samfunn, handel og økonomi	Low og orden	Advokatsekretær
Teknologi, samfunn, handel og økonomi	Low og orden	Ansatt i Forsvaret
Teknologi, samfunn, handel og økonomi	Low og orden	Arbeidsplanlegger
Teknologi, samfunn, handel og økonomi	Low og orden	Brannkonstabel
Teknologi, samfunn, handel og økonomi	Low og orden	Dommer
Teknologi, samfunn, handel og økonomi	Low og orden	Etterforsker
Teknologi, samfunn, handel og økonomi	Low og orden	Fengselsbetjent
Teknologi, samfunn, handel og økonomi	Low og orden	Jurist
Teknologi, samfunn, handel og økonomi	Low og orden	Kriminolog
Teknologi, samfunn, handel og økonomi	Low og orden	Politi
Teknologi, samfunn, handel og økonomi	Low og orden	Politibetjent
Teknologi, samfunn, handel og økonomi	Low og orden	Politijurist
Teknologi, samfunn, handel og økonomi	Low og orden	Politiker
Teknologi, samfunn, handel og økonomi	Low og orden	Revisor
Teknologi, samfunn, handel og økonomi	Low og orden	Røydokker
Teknologi, samfunn, handel og økonomi	Low og orden	Skriftgransker
Teknologi, samfunn, handel og økonomi	Low og orden	Speditør
Teknologi, samfunn, handel og økonomi	Low og orden	Teller
Teknologi, samfunn, handel og økonomi	Low og orden	Trafikketjent (parkering)
Teknologi, samfunn, handel og økonomi	Low og orden	Vektor
Teknologi, samfunn, handel og økonomi	Religion	Diakon
Teknologi, samfunn, handel og økonomi	Religion	Diakonmedarbeider
Teknologi, samfunn, handel og økonomi	Religion	Gravferdskonsulent
Teknologi, samfunn, handel og økonomi	Religion	Kateket
Teknologi, samfunn, handel og økonomi	Religion	Kirkegjener
Teknologi, samfunn, handel og økonomi	Religion	Kirkeverge
Teknologi, samfunn, handel og økonomi	Religion	Menighetspedagog
Teknologi, samfunn, handel og økonomi	Religion	Misjonær
Teknologi, samfunn, handel og økonomi	Religion	Organist/Kantor
Teknologi, samfunn, handel og økonomi	Religion	Prest
Teknologi, samfunn, handel og økonomi	Salg og service	Apoteker
Teknologi, samfunn, handel og økonomi	Salg og service	Arbøytetekniker
Teknologi, samfunn, handel og økonomi	Salg og service	Arrangementsplanlegger
Teknologi, samfunn, handel og økonomi	Salg og service	Avistud
Teknologi, samfunn, handel og økonomi	Salg og service	Baker
Teknologi, samfunn, handel og økonomi	Salg og service	Barista
Teknologi, samfunn, handel og økonomi	Salg og service	Bartender
Teknologi, samfunn, handel og økonomi	Salg og service	Bibliotekar
Teknologi, samfunn, handel og økonomi	Salg og service	Billakerer
Teknologi, samfunn, handel og økonomi	Salg og service	Billedkunstner
Teknologi, samfunn, handel og økonomi	Salg og service	Bilpleier
Teknologi, samfunn, handel og økonomi	Salg og service	Bilselger
Teknologi, samfunn, handel og økonomi	Salg og service	Blomsterdekoratør
Teknologi, samfunn, handel og økonomi	Salg og service	Bokhandler
Teknologi, samfunn, handel og økonomi	Salg og service	Bussjåfør
Teknologi, samfunn, handel og økonomi	Salg og service	Butikksmedarbeider
Teknologi, samfunn, handel og økonomi	Salg og service	Elendomsregler
Teknologi, samfunn, handel og økonomi	Salg og service	Eksponeringsdesigner
Teknologi, samfunn, handel og økonomi	Salg og service	Ferskvarerhandler
Teknologi, samfunn, handel og økonomi	Salg og service	Føringsutvikler
Teknologi, samfunn, handel og økonomi	Salg og service	Forsikringsrådgiver
Teknologi, samfunn, handel og økonomi	Salg og service	Frisar
Teknologi, samfunn, handel og økonomi	Salg og service	Gravferdskonsulent
Teknologi, samfunn, handel og økonomi	Salg og service	Gründer
Teknologi, samfunn, handel og økonomi	Salg og service	Guide
Teknologi, samfunn, handel og økonomi	Salg og service	Hjemmehjelp
Teknologi, samfunn, handel og økonomi	Salg og service	Hotellmedarbeider
Teknologi, samfunn, handel og økonomi	Salg og service	Influencer
Teknologi, samfunn, handel og økonomi	Salg og service	Imnkjøper
Teknologi, samfunn, handel og økonomi	Salg og service	Kabipersonale fly
Teknologi, samfunn, handel og økonomi	Salg og service	Kantinemedarbeider
Teknologi, samfunn, handel og økonomi	Salg og service	Kjettgjæner
Teknologi, samfunn, handel og økonomi	Salg og service	Konduktør
Teknologi, samfunn, handel og økonomi	Salg og service	Konsulent
Teknologi, samfunn, handel og økonomi	Salg og service	Kundeansvarlig (salg)

# Dataset 4 - 7 / 7

Teknologi, samfunn, handel og økonomi	Salg og service	Legemiddelkonsulent
Teknologi, samfunn, handel og økonomi	Salg og service	Markedsføringskonsulent
Teknologi, samfunn, handel og økonomi	Salg og service	Markedsjef
Teknologi, samfunn, handel og økonomi	Salg og service	Megler
Teknologi, samfunn, handel og økonomi	Salg og service	Negledesigner
Teknologi, samfunn, handel og økonomi	Salg og service	Personlig trener
Teknologi, samfunn, handel og økonomi	Salg og service	Postbud
Teknologi, samfunn, handel og økonomi	Salg og service	Provisorfarmasøyt
Teknologi, samfunn, handel og økonomi	Salg og service	Reiseleder
Teknologi, samfunn, handel og økonomi	Salg og service	Reiselivsmedarbeider
Teknologi, samfunn, handel og økonomi	Salg og service	Renholdsoperatør
Teknologi, samfunn, handel og økonomi	Salg og service	Reseptjonist
Teknologi, samfunn, handel og økonomi	Salg og service	Reseptfarmasøyt
Teknologi, samfunn, handel og økonomi	Salg og service	Reserveveilekspediør
Teknologi, samfunn, handel og økonomi	Salg og service	Salgsmedarbeider
Teknologi, samfunn, handel og økonomi	Salg og service	Salgsjef
Teknologi, samfunn, handel og økonomi	Salg og service	Servitør
Teknologi, samfunn, handel og økonomi	Salg og service	Supportkonsulent
Teknologi, samfunn, handel og økonomi	Salg og service	Tekstlensner
Teknologi, samfunn, handel og økonomi	Salg og service	Telefonisjef
Teknologi, samfunn, handel og økonomi	Salg og service	Trafikkbetjent (parkering)
Teknologi, samfunn, handel og økonomi	Salg og service	Vaskerieroperatør
Teknologi, samfunn, handel og økonomi	Salg og service	Veikart
Teknologi, samfunn, handel og økonomi	Samfunn	Advokat
Teknologi, samfunn, handel og økonomi	Samfunn	Ambassadør
Teknologi, samfunn, handel og økonomi	Samfunn	Antikvar
Teknologi, samfunn, handel og økonomi	Samfunn	Arbeidsmedisiner
Teknologi, samfunn, handel og økonomi	Samfunn	Areallanlegger
Teknologi, samfunn, handel og økonomi	Samfunn	Arkeolog
Teknologi, samfunn, handel og økonomi	Samfunn	Arkivar
Teknologi, samfunn, handel og økonomi	Samfunn	Bistandsarbeider
Teknologi, samfunn, handel og økonomi	Samfunn	Diplomat
Teknologi, samfunn, handel og økonomi	Samfunn	Dommer
Teknologi, samfunn, handel og økonomi	Samfunn	Familierådgiver
Teknologi, samfunn, handel og økonomi	Samfunn	Filosof
Teknologi, samfunn, handel og økonomi	Samfunn	Flyktningkonsulent
Teknologi, samfunn, handel og økonomi	Samfunn	Forsker
Teknologi, samfunn, handel og økonomi	Samfunn	Geograf
Teknologi, samfunn, handel og økonomi	Samfunn	Gjenvinningsoperatør
Teknologi, samfunn, handel og økonomi	Samfunn	Idrettskonsulent
Teknologi, samfunn, handel og økonomi	Samfunn	Jobbveileder
Teknologi, samfunn, handel og økonomi	Samfunn	Journalist
Teknologi, samfunn, handel og økonomi	Samfunn	Kateket
Teknologi, samfunn, handel og økonomi	Samfunn	Konsulent
Teknologi, samfunn, handel og økonomi	Samfunn	Konsulent i offentlig sektor
Teknologi, samfunn, handel og økonomi	Samfunn	Kriminolog
Teknologi, samfunn, handel og økonomi	Samfunn	Kulturhistoriker / kulturviter
Teknologi, samfunn, handel og økonomi	Samfunn	Lektor
Teknologi, samfunn, handel og økonomi	Samfunn	Miljøarbeider
Teknologi, samfunn, handel og økonomi	Samfunn	Miljørådgiver
Teknologi, samfunn, handel og økonomi	Samfunn	Miljøterapeut
Teknologi, samfunn, handel og økonomi	Samfunn	Politjurist
Teknologi, samfunn, handel og økonomi	Samfunn	Politiker
Teknologi, samfunn, handel og økonomi	Samfunn	Redaktør
Teknologi, samfunn, handel og økonomi	Samfunn	Rådgiver i offentlig sektor
Teknologi, samfunn, handel og økonomi	Samfunn	Samfunnsgeograf
Teknologi, samfunn, handel og økonomi	Samfunn	Samfunnsmedisiner
Teknologi, samfunn, handel og økonomi	Samfunn	Samfunnsplanlegger
Teknologi, samfunn, handel og økonomi	Samfunn	Samfunnsøkonom
Teknologi, samfunn, handel og økonomi	Samfunn	Sosialantropolog
Teknologi, samfunn, handel og økonomi	Samfunn	Sosiolog
Teknologi, samfunn, handel og økonomi	Samfunn	Statsviter
Teknologi, samfunn, handel og økonomi	Teknologi	Animatør
Teknologi, samfunn, handel og økonomi	Teknologi	Astronaut
Teknologi, samfunn, handel og økonomi	Teknologi	Astronom
Teknologi, samfunn, handel og økonomi	Teknologi	Bioteknolog
Teknologi, samfunn, handel og økonomi	Teknologi	Brenningeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Brenningsoperatør havbunninstallasjoner
Teknologi, samfunn, handel og økonomi	Teknologi	CNC-operatør
Teknologi, samfunn, handel og økonomi	Teknologi	Datageniør
Teknologi, samfunn, handel og økonomi	Teknologi	FU-operatør
Teknologi, samfunn, handel og økonomi	Teknologi	Fagoperatør i kjemisk prosessindustri (Prosesstekniker)
Teknologi, samfunn, handel og økonomi	Teknologi	Forsker
Teknologi, samfunn, handel og økonomi	Teknologi	IT-administratør
Teknologi, samfunn, handel og økonomi	Teknologi	IT-arkitekt
Teknologi, samfunn, handel og økonomi	Teknologi	IT-konsulent
Teknologi, samfunn, handel og økonomi	Teknologi	IT-leder
Teknologi, samfunn, handel og økonomi	Teknologi	Ingeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Landmåler
Teknologi, samfunn, handel og økonomi	Teknologi	Marin bioteknolog
Teknologi, samfunn, handel og økonomi	Teknologi	Maskiningeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Matematiker
Teknologi, samfunn, handel og økonomi	Teknologi	NDF-kontrollør
Teknologi, samfunn, handel og økonomi	Teknologi	Nuklearmedisiner
Teknologi, samfunn, handel og økonomi	Teknologi	Optiker
Teknologi, samfunn, handel og økonomi	Teknologi	Ortopedingeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Ortopedtekniker
Teknologi, samfunn, handel og økonomi	Teknologi	Patolog
Teknologi, samfunn, handel og økonomi	Teknologi	Perfusjonist
Teknologi, samfunn, handel og økonomi	Teknologi	Petroleumsingeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Produksjonselektroniker
Teknologi, samfunn, handel og økonomi	Teknologi	Professor
Teknologi, samfunn, handel og økonomi	Teknologi	Prosessingeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Radiograf
Teknologi, samfunn, handel og økonomi	Teknologi	Romteknolog
Teknologi, samfunn, handel og økonomi	Teknologi	Sivillingeniør
Teknologi, samfunn, handel og økonomi	Teknologi	Spillprogrammerer
Teknologi, samfunn, handel og økonomi	Teknologi	Systemutvikler
Teknologi, samfunn, handel og økonomi	Teknologi	Ventilasjonstekniker
Teknologi, samfunn, handel og økonomi	Økonomi	Agonom

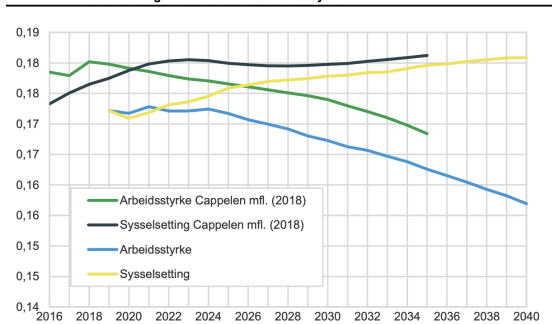
Teknologi, samfunn, handel og økonomi	Økonomi	Aksjemegler
Teknologi, samfunn, handel og økonomi	Økonomi	Aktuar
Teknologi, samfunn, handel og økonomi	Økonomi	Eiendomsmegler
Teknologi, samfunn, handel og økonomi	Økonomi	Finansanalytiker
Teknologi, samfunn, handel og økonomi	Økonomi	Førretningstutvikler
Teknologi, samfunn, handel og økonomi	Økonomi	Gründer
Teknologi, samfunn, handel og økonomi	Økonomi	Hotelldirektør
Teknologi, samfunn, handel og økonomi	Økonomi	Husekonom
Teknologi, samfunn, handel og økonomi	Økonomi	IT-prosjektleder
Teknologi, samfunn, handel og økonomi	Økonomi	Innkjøper
Teknologi, samfunn, handel og økonomi	Økonomi	Konsulent
Teknologi, samfunn, handel og økonomi	Økonomi	Konsulent i offentlig sektor
Teknologi, samfunn, handel og økonomi	Økonomi	Kostøkonom
Teknologi, samfunn, handel og økonomi	Økonomi	Kunderådgiver i bank
Teknologi, samfunn, handel og økonomi	Økonomi	Leder
Teknologi, samfunn, handel og økonomi	Økonomi	Markedsjef
Teknologi, samfunn, handel og økonomi	Økonomi	Personallrådgiver
Teknologi, samfunn, handel og økonomi	Økonomi	Personalfjef
Teknologi, samfunn, handel og økonomi	Økonomi	Politiker
Teknologi, samfunn, handel og økonomi	Økonomi	Regnskapsfører
Teknologi, samfunn, handel og økonomi	Økonomi	Rektor/skoleleder
Teknologi, samfunn, handel og økonomi	Økonomi	Revisor
Teknologi, samfunn, handel og økonomi	Økonomi	Saksbehandler
Teknologi, samfunn, handel og økonomi	Økonomi	Samfunnsøkonom
Teknologi, samfunn, handel og økonomi	Økonomi	Siviløkonom
Teknologi, samfunn, handel og økonomi	Økonomi	Skipsmegler
Teknologi, samfunn, handel og økonomi	Økonomi	Statistiker
Teknologi, samfunn, handel og økonomi	Økonomi	Takstmann
Teknologi, samfunn, handel og økonomi	Økonomi	Økonom
Teknologi, samfunn, handel og økonomi	Økonomi	Økonomikonsulent
Teknologi, samfunn, handel og økonomi	Økonomi	Økonomisjef



# Appendix 13

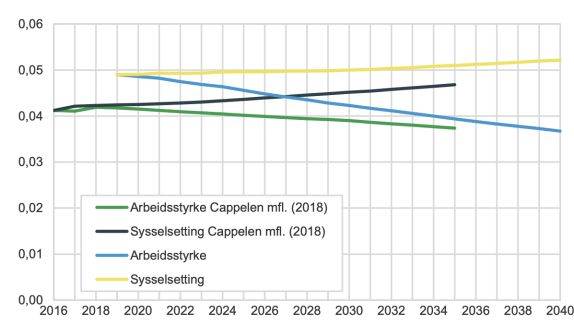
Figures gathered from: Cappelen, Å., Dapi, B., Gjefsen, H. M., Stølen, N. M. (2020) Framskrivninger av arbeidsstyrken og sysselsettingen etter utdanning mot 2040. (Statistics Norway, Report number 41) Oslo: Statistics Norway (SSB). Available at: [https://www.ssb.no/en/arbeid-og-lonn/artikler-og-publikasjoner/\\_attachment/436239?\\_ts=1758cde9da8](https://www.ssb.no/en/arbeid-og-lonn/artikler-og-publikasjoner/_attachment/436239?_ts=1758cde9da8) (Accessed: April 15th 2022)

Figur 5.6 Framskrivning av arbeidsstyrke og sysselsetting for personer med videregående yrkesfag innen elektrofag, maskinfag og mekaniske fag, bygg og anlegg og håndverksfag. Andel av samlet arbeidsstyrke



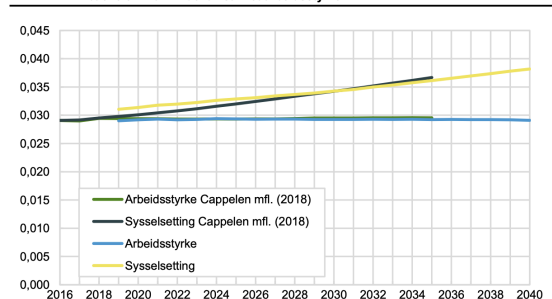
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

Figur 5.12 Framskrivning av arbeidsstyrke og sysselsetting for personer med videregående opplæring i helse- og omsorgsfag. Andel av samlet arbeidsstyrke



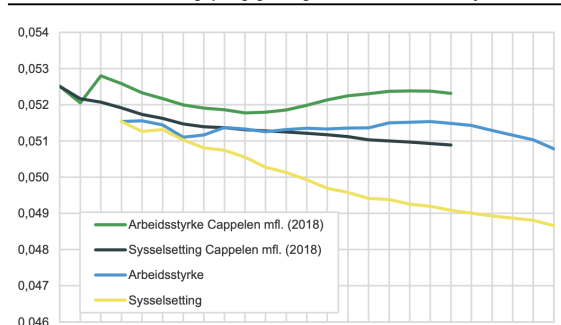
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

Figur 5.13 Framskrivning av arbeidsstyrke og sysselsetting for pleie- og omsorgsfag på bachelornivå. Andel av samlet arbeidsstyrke



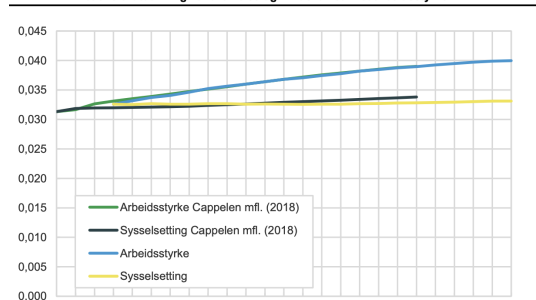
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

Figur 5.11 Framskrivning av arbeidsstyrke og sysselsetting for personer med bachelorutdanning i pedagogiske fag. Andel av samlet arbeidsstyrke



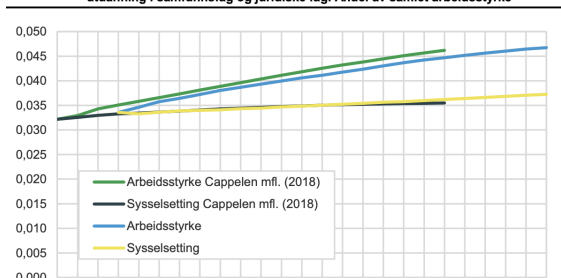
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

Figur 5.14 Framskrivning av arbeidsstyrke og sysselsetting for personer med bachelorutdanning i andre helsefag. Andel av samlet arbeidsstyrke



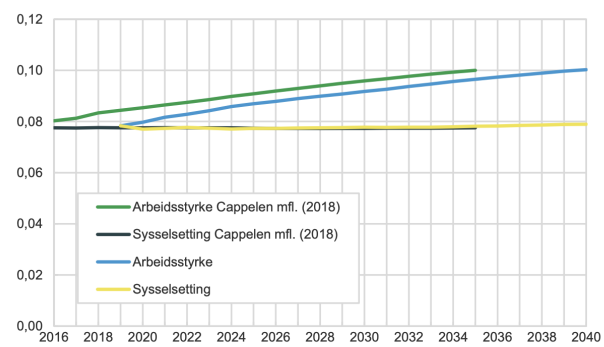
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

Figur 5.9 Framskrivning av arbeidsstyrke og sysselsetting for personer med høyere utdanning i samfunnsfag og juridiske fag. Andel av samlet arbeidsstyrke



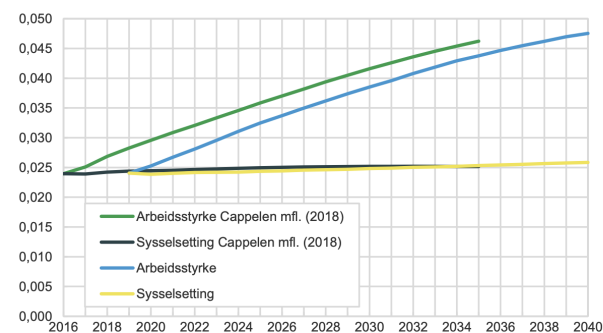
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

**Figur 5.7** Framskriving av arbeidsstyrke og sysselsetting for realister og teknologer med høyere utdanning. Andel av samlet arbeidsstyrke



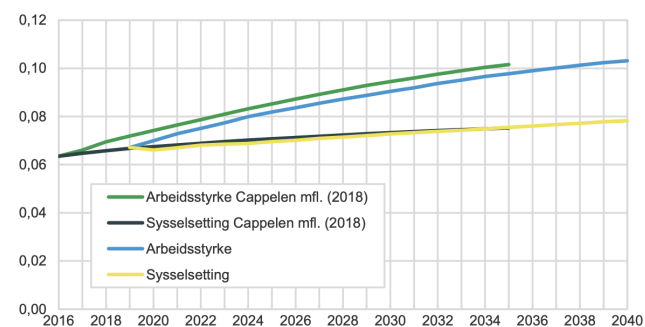
Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

**Figur 5.10** Framskriving av arbeidsstyrke og sysselsetting for personer med høyere utdanning innen humanistiske fag. Andel av samlet arbeidsstyrke



Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

**Figur 5.8** Framskriving av arbeidsstyrke og sysselsetting for personer med høyere utdanning i økonomi og administrasjon. Andel av samlet arbeidsstyrke



Kilde: KVARTS/ADMOD og MOSART, Statistisk sentralbyrå

## Summary

Projection of labor force and employment for people with education on upper secondary level, bachelor level and masterlevel from share of total workforce

Utdanningsområder	Utdanningsnivå	Utvikling frem mot 2040
Elektrofag, mekaniske fag og maskinfag	Videregående nivå	0,02
Bygg- og anleggsgfag	Videregående nivå	0,02
Andre håndverksfag	Videregående nivå	0,02
Helse- og omsorgsfag	Videregående nivå	0,015
Pleie- og omsorgsfag	Bachelornivå	0,009
Pedagogiske fag	Bachelornivå	- 0,002
Andre helsefag	Bachelornivå	- 0,007
Samfunnsvitenskapelige fag	Masternivå og Bachelornivå	- 0,01
Juridiske fag	Masternivå og Bachelornivå	- 0,01
Ingeniørfag	Masternivå og Bachelornivå	- 0,02
Andre naturvitenskapelige fag	Masternivå og Bachelornivå	- 0,02
Humanistiske fag	Masternivå og Bachelornivå	- 0,022
Økonomiske og administrative fag	Masternivå og Bachelornivå	- 0,023

# Appendix 14

Data gathered from utdanning.no and DBH

Fagområde	Utdanninger	Videre nivå 1	Videre nivå 2
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Barne- og ungdomsarbeider	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Barnehageassistent	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Dansepedagog	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Eurytmist	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Førerhundtrener	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Idrettstrener	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Karriereveileder	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Miljøarbeider	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Museumsformidler	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Barne- og ungdomsarbeider	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Pedagog	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Pedagogisk-psykologisk rådgiver (PP-	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Ridelærer	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Skoleassistent	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Skolefritidsleder (SFO)	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Trafikklærer	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Undervisningsinspektør	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Sangpedagog	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Adjunkt	-
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Grunnskolelærerutdanning 1.–7.	Grunnskolelærer
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Grunnskolelærerutdanning 5.-10.	Grunnskolelærer
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Videreutdanning for lærere	Grunnskolelærer
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	2-årig mastergrad i audiopedagogikk	Audiopedagog
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Deltids mastergrad i audiopedagogikk	Audiopedagog
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Barneverns utdannelse	Barnevernspedagog
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Yrkeserfaring	Faglærer
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	kandidatstudiet ved musikkhøgskole	Instrumentalpedagog
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Master i kateketikk/kirkelig undervis	Kateket
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Master i kristendomskunnskap	Kateket
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Mastergrad i skolerellevante fag	Lektor
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Master i logoped	Logoped
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Masterprogram i helsefag - Logopedi	Logoped
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Master Healthy ageing and rehabilita	Logoped
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Master i spesialpedagogikk	Logoped
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Mastergrad	Doktorgrad
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Videreutdanning for lærere	Lærer
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Videreutdanning innen ledelse	Rektor/skoleleder
Pedagogikk	Bachelor i pedagogikk - Universitetet i Oslo	Master i spesialpedagogikk	Spesialpedagog
Pedagogikk	Praktisk-pedagogisk utdanning MF vitenskapelig høyskole Oslo	-	-
Pedagogikk	Årsstudium psykisk helse i skolen Oslo Nye Høyskole	-	-
Pedagogikk	Praktisk-pedagogisk utdanning Norges idrettshøgskole Oslo	-	-
Pedagogikk	Bachelor i Sosialpedagogikk	-	-
Pedagogikk	Bachelor i praktisk teologi og ledelse - NLA Høgskolen	-	-
Pedagogikk	Digitale ressurser, læring og undervisning - Høgskolen Kristiania	-	-
Pedagogikk	Flerkulturell pedagogikk - Høgskolen Kristiania	-	-
Pedagogikk	Læring, kreativitet og innovasjon - Høgskolen Kristiania	-	-
Pedagogikk	Årsenhet i Pedagogikk	-	-



# Appendix 15

Data gathered from utdanning.no and DBH

Person	VGS?	Etter VGS?	Høyere utdanning	Høyere utdannings nivå?	Hva?	Yrke
Person 1	Studieforberedende	Studier	Ja	Bachelor	Bachelor i webutvikling	Journalist
Person 2	Studieforberedende	Yrkeslivet	Nei	Ingen	Ingen	Journalist
Person 3	Studieforberedende	Studier	Ja	Bachelor	Bachelorgrad i journalistikk	Journalist
Person 4	Studieforberedende	Studier	Ja	Master	Journalistikk - master i medieutvikling	Journalist
Person 5	Studieforberedende	Studier	Ja	Årsenhet	Digital journalistikk	Journalist
Person 6	Studieforberedende	Friår	Ja	Master	Master i global journalism	Journalist
Person 7	Studieforberedende	Folkehøyskole	Ja	Bachelor	achelorgrad i journalistikk	Journalist
Person 8	Studieforberedende	Studier	Nei	Etter- og videreutdanning	Journalistikk 1 Innføring i journalistisk metode	Journalist
Person 9	Studieforberedende	Studier	Ja	Årsenhet	Årsstudium i journalistikk	Journalist
Person 10	Studieforberedende	Studier	Ja	Bachelor	Bachelor i TV- teknikk	Journalist
Person 11	Studieforberedende	Studier	Ja	Årsenhet	Akademisk lesing og skriving	Journalist
Person 12	Studieforberedende	Friår	Ja	Etter- og videreutdanning	Digital journalistikk	Journalist
Person 13	Yrkesfaglig	Yrkeslivet	Nei	Ingen	Ingen	Journalist
Person 14	Studieforberedende	Folkehøyskole	Ja	Bachelor	Bachelorprogram i medie- og interaksjonsdesign	Journalist
Person 15	Studieforberedende	Friår	Ja	Master	Film- og videoproduksjon - masterstudium	Journalist





