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Do students meet their expectations?

A comparative analysis of employees' expectations, students' self-reported digital skills and their predictors

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ABSTRACT

This thesis focusses on the discrepancy between digital skills levels of students and the expectations of the skills levels from employees in the study and work fields of communication science, computer science, and economics. A digital skills framework was developed and tested in an online survey to see if there is a gap between the expectations of the employees' and the self-reported digital skills levels of the students and the influences of other variables. Skills and expectations are varying in the different subject areas, communication and computer science students do not meet the expectations in reflection skills, whereas economics students informing skills are lower than the expectations. Furthermore, the students' skill levels vary according to their subject area in the skills of utilization and information, while the employees' expectations remain steady. Students' skills are influenced through the number of hours the participant uses digital devices and except for the creation dimension through the perception of usefulness of the internet. Employees on the other hand are in all skill dimensions apart from utilization and information positively influenced through hours a day using devices and the age when the participant owned their first digital device. These results implicate a need for a change in education, with focus on how to learn the six dimensions of digital skills, but also how to extend and improve these skills, and how to implement these in the working and educating environment.

CONTENT

1. INTRODUCTION

Comparing students from today and from the beginning of the millennium, many things have changed through the spreading of the internet. Lectures have innovated as some of them are already broadcasted and saved online, so that the student can follow the lecture at home or watch it three weeks later. The materials from the lecture can nowadays also be found online, so that the students, while listening to the professor, can mark and work on the slides for a better understanding on their laptop or tablet. Instead of asking higher semester students for former exams, they have access to a Dropbox folder with all studying materials and exams from the past years, but also learning material from other students who are uploading it for everyone's use. And via WhatsApp, Snapchat and Facebook, students are communicating with each other and are helping with learning problems, materials and other things. Next to that, students are required to prepare assignments on their digital device and send them to the lecturer and search for information online. But aspects of entertainment and communication of course also play a role (Henderson, Finger, & Selwyn, 2016; Wang, Chen, & Chen, 2015).

This technological development continues in the next life stage, where the students are employed. Many companies have changed in the past years from producing goods to analysing information (Voogt & Roblin, 2012). Employees are required to be more flexible, better able to communicate and to be able to manage numerous kinds of information, as well as to work together in teams in order to produce new knowledge (Partnership for 21st century skills, 2008).

These developments in technology, society and economy, education and self-development (Punie & Ala-Mutka, 2007) are calling for new competencies and skills, and are often described as 21st century competencies and skills (Claro & Ananiadou, 2009) or digital skills. Then even if the access options of devices and the internet are nearly the same, the users skills might not be similar (van Deursen & van Dijk, 2008). People no longer only need the skills to operate technical devices, but also they need to be able to interpret the output of various applications (Zillien & Hargittai, 2009). To take an advantage out of the digital world, users must manage skills from traditional and digital media (van Dijk & van Deursen, 2014).

Many young people born in the age of the internet are estimated to have these skills and competences which the older generations do not have to this extend. This is one reason for the assumed gap between younger and older people, e.g. their parents, teachers and superiors (Zimic,

2009). This younger generation, people born after 1980, can be called “digital natives”, “millennials” or “net-generation” (Margaryan, Littlejohn, & Vojt, 2011).

As most of the students who are currently enrolled in university are born as ‘digital natives’ (statista.de, 2017), they are expected to possess high digital skills level, especially in order to succeed in their future working life. Furthermore, students of today will soon be working and are making up the workforce of the future. In contrast to the students growing up with digital technologies is the working population. Another question arising with the digitalisation of the education and workplace is, if there are discrepancies between different subject areas. For instance, if students from the areas of communication science, computer science or economics are learning and possessing different kinds of skills which are essential for being educated and later work with the digital world. The primary focus of this study is therefore, if there are discrepancies between expectations of students’ skill levels from the employees and the actual self-reported skill levels of the students, in consideration of the employees’ and students’ subject area of communication science, computer science or economics. Another research question is examining if the students and employees are differing in their digital skills levels and expectations of those because of their subject area. Furthermore, influences predicting the students’ digital skills level and employees’ expectations, such as the number of hours a person uses the internet are analysed. In detail, the research questions of this study are:

RQ1: Is there a discrepancy between the skills expectations of the employees and the students’ actual skills?

RQ2: Do students and employees differ from each other in their skills and expectations regarding their subject area?

RQ3: What predicts the actual level of students’ digital skills and employees’ skill expectations?

To investigate this question, this article will present three digital skills concepts from the literature which are used as a fundament for the framework in the current study. This framework will then be operationalized by translating the skills into survey questions. A survey will be administered to identify skill differences in student’s skill levels and employee’s skill expectations.

2. THEORETICAL BACKGROUND

2.1 Digital Skills – Concepts

In the literature of digital and 21st century skills, many diverging concepts can be found. At the core of many of them are information and communication technologies (ICTs), which are related to new skills and competencies, for instance how to efficiently use, evaluate, manage, and produce information (Voogt & Roblin, 2012). They often consist out of two parts, the domain part being able to use a medium (most often the internet), in combination with specific knowledge, in most cases named skills, competence or literacy (Hatlevik, Ottestad, & Throndsen, 2015). Hargittai and Shafer (2006) describe skills as the user's ability to effectively and efficiently locate content online. As there are myriad ways to use the internet, many activities are based on the user's ability to find the diverse types of content, e.g. information, software, or other people. Even if the interest of the user is to communicate with like-minded people on the internet, in chat-rooms or on social media platforms, they first need the know-how in order to find those sites. The concept of skills suggests a more active use of the medium as compared to literacy which is basically reading and writing texts. Skills also encompasses the interaction with programs and other users. In general, the internet is more active than the passive traditional media (van Dijk & van Deursen, 2014).

Digital skills on the one hand often do not only refer to the know-how, but also infer the understanding of the processes beneath it (Gui & Argentin, 2011). The definition of 21st century skills exceeds the digital context, as those skills are also important for the individual and organisations (van Laar, Deursen, van Dijk, & Haan, 2017). With the development of technology and society, the definitions have to be able to adapt to changes (Chinien & Boutin, 2010).

Digital skills are defined in this study as the skills which are required to effectively and efficiently use diverse digital devices and their programs or applications as well as to find and produce online content and information and being able to communicate with the help of these devices and applications. With the change in technology, digital skills no longer only include being able to use computers, but also other devices such as laptops, tablets, smartphones, smartwatches and other devices. The focus is furthermore not anymore on the hardware use, but on the countless software programs and opportunities the world wide web has to offer people to communicate, attain certain goals or to extend the own knowledge.

2.2 Digital Skills – Three Frameworks

As already discussed, there are many contrasting concepts of digital and 21st century skills in the literature. In the following, three frameworks will be presented, followed by a fourth, self-developed framework which is based on those three.

The first framework was developed by Binkley and colleagues (2012). They argue that with the use of digital technologies the need for new social practices arises. In this manner, ten divergent skills were developed which were grouped into four categories. The first of the four categories is called "ways of thinking", which conceptualizes thinking and includes by definition skills of higher order thinking or skills requiring greater focus and reflection. In more detail, this entails in total three skills, the first one being creativity and innovation, creativity as the cognitive part and innovation being an economic goal. Secondly comes the skills of critical thinking, problem solving and decision making and third learning to learn and metacognition. Part of the second category "ways of working" are two skills. This category describes the rapid change of the way people are working, for example through outsourcing or building teams with members across the world, accompanied by using emails and telephones to communicate. Hence, the skills in this category are communication, which is important considering the increasing amount of text messages sent or the growing of numerous social networks, together with collaboration and teamwork. Collaboration and teamwork is insofar included in this category as people are often fired because of their insufficient teamworking skills, their style of cooperation or their working approach, all of them skills which for the employers matter the most. "Tools of working" are defined as the third category, where the two skills of information and ICT literacy are essential for the people to handle the increasing amount of information to evaluate and access the new information through skills. Information literacy therefore focuses on the research of evidence, information, sources, and so on while ICT literacy is focussing on the digital aspect of ordinary skills in the digital context. The last of the four skills is named "living in the world" and descends from the necessity of growing job mobility with the skills of citizenship. This includes understanding democratic processes on a local but also global level. Life and career also play a role as skill, as they argue that management of life and career is crucial. The last one of the ten skills is called personal and social responsibility. Those skills are needed to life in the world, although some aspects can also be found in the skill of collaboration, but here the cultural awareness and competence is predominant.

Martin and Grudziecki (2006) developed the DigEuLit framework for a better understanding of digital literacy and how it can be associated with practice, personal development and education. Their definition of digital literacy includes the ability to process and use and create digital resources in order to facilitate actions and contemplation. Here, 13 processes are presented which constitute digital competence. These are: stating the problem, identification of the needed resources, location and obtaining of digital resources or accession, evaluation of resources, interpretation of resources, organisation, integration of digital resources, analysis of resources, synthesis or recombination of resources, creation of new objects and resources, communication, dissemination, and the reflection upon own work.

The third framework is developed by van Dijk and van Deursen (2014). Their framework consists out of six skill dimensions. Originally there were only four (van Deursen & van Dijk, 2011), with two skills being added later. The first group of skills in this framework are named operational skills and describe the skills needed to use an internet browser. This includes actions as to open websites, download information and being able to use search engines, e.g. google. Filling out online forms for example when ordering something on Amazon and filling out address and payment details is part of this skill dimension too. Secondly are formal skills which incorporate the ability to manoeuvre through the internet, with the ability to use hyperlinks and not getting disoriented whilst switching between numerous websites. Informational skills are indicating the abilities of being able to detect information by defining the place where to search and the keywords, but also selecting the information and evaluating the information and its source. Communication skills are those which are needed to communicate. This includes for instance using emails, being able to chat and to use instant messaging and other forms of social networking. This skill also includes to build online profiles. Next is the content creation skill which has become more and more important in the past decade. As the web 2.0 exists out of various types of user generated information, content creation skills are defining the skills a person needs to write texts for online purposes, produce and collect images, video and audio information as well as producing messages and images via profiles on social networking sites. The last of the six skills is called strategic skills. They include the ability to use the internet as a medium to reach a certain goal. This skill can be described as a process of four steps. It begins with being aware of a certain goal and then taking action towards this goal in order to make the right decisions and to finally gain benefits from this goal. The six skills proposed by van Dijk and van Deursen (2014) are ranked in difficulty;

operational and formal skills are required in order to reach information, communication, content creation skills, which in turn are required to perform on strategic skills.

When comparing the three frameworks, we first can see that Binkeley et al. described four overall factors, with each one consisting out of several individual skills. Martin and Grudziecki (2006) on the other hand are describing processes or skills, which are not very much related to each other. Van Deursen and van Dijk's framework is also divergent from the other ones, as they developed six skills with a clear description and with examples for each skill. But those six skills incorporate various abilities, such as searching for information and evaluation information. What all three frameworks have in common is the fact that they are widely known and accepted in the literature. Binkley et al. developed their framework as a part of an international project, while Martin and Grudziecki's framework was worked out as an European framework for digital literacy. Van Dijk and van Deursen's framework on the other hand is often cited in the literature of digital skills, which is the main reason for selecting these three frameworks in this study. Another argument for choosing these three presented frameworks is the mentioned fact that they all developed entirely different frameworks, with Binkley having four categories which centralises the ways people are working, while Martin and Grudziecki (2006) have single processes with no references to each other and then van Deursen and van Dijk, with six skill dimensions which are built on each other. The challenge in the next section of this study is therefore to find a way to assemble these different styles of skills, processes and ways.

2.3 Newly developed digital skills framework

Based on the three frameworks, a fourth framework was developed. It incorporates the discrepant skills and processes of the three authors into one. Following van Dijk and van Deursen (2014) , the developed framework consists out of six skill groups with a conditional character; the highest skills request lower skills.

Utilization skills are proving the user with the ability to use technical devices such as computers, smartphones and tablets, the internet and the basic applications. Those are for instance web browsers like Firefox and Chrome, word, excel and presentation programs, email programs and others. Getting access to information and managing the increasing amount of information with the help of technological devices is also playing a role in this skill. In detail, the utilization skill

gives the ability to use devices and software with turning the device on, opening software and applications and being able to use online forms and services. Downloading and saving content includes being able to save information on the device, e.g. text documents, voice recordings and pictures and downloading content as music, files and videos from the internet. Transferring information between devices encompasses moreover copying files, pictures and others from one device to another (from laptop to phone or tablet, between laptops with USB sticks). Navigating on the internet is the last ability of the utilization skill and includes navigation on the device between various software and application folders, on the internet between sites, search results and tabs and between hyperlinks, so that the user can navigate back and forth.

The informing skill dimension is defining the basic steps people need to find information, as what and where to search, with which keywords, the selection of search results, the evaluation and the organisation of found information. In detail, first, the needed information should be determined, what the user is searching for or wants to search for. Next, it has to be specified how and where to access the information. Where defines the place to search for the information, e.g. in online newspapers, videos, discussion forms, websites, emails or in files on the device. How implicates the keywords used to type into the various search fields, e.g. on the google webpage or into the browser's search bar. Then the displayed search results need to be selected according to what the user wants to process further or if the search results fit the defined keywords and needed information. After selecting search results, the information needs to be evaluated. The question here is, if the information fits into the definition of the needed information or not, and if it is valuable or not. In other words, the individual decides if the found information is relevant or if it can be dismissed as not irrelevant. Furthermore, the search results and the information are evaluated according to the criteria of objectivity, accuracy, and reliability of the information. The user therefore has to check if the information can be trusted or if it is for example contrary to the common sense or science. After evaluating the search result itself, the source is evaluated according to the criteria of reliability, correctness, and relevance of the results for reaching the goal. Reliability and correctness of the source can for example be checked through the address field of a site on google search. If the site is a reliable one, for instance a government site or a widely accepted newspaper like the "New York Times". Managing information also plays a role in this skill, as being part of information sharing networks and in order to be able to use aids like graphics and tables to better understand information and being able to organise information is essential.

Communication and Collaboration skills is the third dimension. The ability of communication means in this case for the person to understand the functions, style and vocabulary of language in the digital world. This can be in the form of written or spoken text or in combinations. This includes for example the ability to read a blog or online newspapers, reading messages and newsfeeds and be able to understand nonverbal content (videos and photos) and combination as a video with speech and text in it would be. Besides the ability to understand received information, communication is the ability to understand and communicate, e.g. listen, read, write and speak, different messages in particular situations and for various purposes in numerous styles and being able to formulate arguments. The person must know when it's their turn to communicate, e.g. they should know when it's their turn to speak to colleagues in skype or when they should answer with a text or a picture or should react otherwise. This includes the effective interaction via divergent technological devices. Additionally, this skill includes the knowledge of social norms and the culture, so that the person is aware that being rude is not seen as positive or knows how to behave in the real and in the digital world. Also, the people should know that they can have an impact on other people with their actions. This is especially important for communicating in the digital world, as the anonymization of the internet leads people to get ruder in those interactions. Furthermore, there are other abilities like gaining attention on the internet. As many people are seeking recognition and attention on the internet, they have or want to stand out to be recognized. In this manner, identity management and networking are also playing a role. Cooperation describes the ability to interact effectively with others. Knowing own strengths and weaknesses and being able to see the ones from other people plays a role here. Interpersonal skills for guiding and leading other people to reach a certain goal is also a key part, where a person is able to motivate other people, e.g. remind them of the work or organise workload and meetings. One specific task of cooperation is collective intelligence which requires online cooperation. To solve problems online, people need to work together over distances and cultures with their technical devices. Two other abilities are on one side negotiation, exchanging meaning to reach a decision and on the other side dissemination which outlines the presentation of solutions, information or outputs to others.

The fourth of the six skill is defined as creation. Creation of diverse types of information or content which contributes to the achievement of a goal or solution of a problem are key to this skill. As the internet requires content produced by the users in the form of blogs, videos, chat forums,

music, profiles, and others, people need a special ability to create specific content following a goal, structure, or design. In order to create attractive and effective or good content like text, music, videos, photo or images, multimedia or mixed content, specific skills are needed. The ability of creation includes the awareness of ideas and content for idea creation and the creation of attractive content itself. The recombination of information or content in new ways to achieve the goal or task is a factor as well as the awareness of ideas and content from other people, as it is about the own ideas and not copying from others. Evaluating the own ideas is important, as it is not only about the creation of new ideas but also about analysing and evaluating own ones in order to change or improve those ideas to maximize the own efforts and to be better or to reach the goal faster.

The (critical) reflection skill incorporates the goal of knowing or being aware of the strategies to get to a solution or reach a goal, even when someone is in an unknown part of the internet, e.g. on sites the user hasn't been before or with new or unknown applications. From the past four skills, this one is the highest ranked. It includes determination of a goal with the definition of the actions to take and then making the right choices to reach the predefined goal and to gain the benefits from it. The ability of reflection encompasses first the revision of own beliefs, when the individual is confronted with contradicting information to the own beliefs, they should revise upon those. Secondly, the evaluation of overall outcomes of complex systems plays a role, where the user analyses and evaluates contrastive views and sides with drawing a conclusion, explaining and correcting the own views and decisions. Third is comparing and combining of various information with the question of how the user can combine information to reach the goal. Fourth is the integration of disparate information or content to save the task and the last one reflection. Reflection is considering a process as success or failure with reflecting upon own developments and decisions.

Lifelong learning is the last of the six skills. It incorporates awareness of innovations and new technologies and the need for those to be learned or added into the daily life and being on track concerning the development of digital technologies and the digital environment (new apps and devices) with the support for this technological development. Lifelong learning includes the skills of being aware of opportunities, knowing the own skills and abilities and where gaps are. Being able to learn with new motivation for personal growth or when new technologies arise. Adapting to change and new opportunities is also an important factor here, as a person needs to be able to

manage several goals at the same time (e.g. long-term versus short-term goals) and the workload of those goals. And at last, staying on track of the technical developments and innovations.

2.4 Predictors of digital skills

Henderson et al. (2016) found that students studying math, sciences, technology, or engineering are making more use out of technology, with more content use and resources and higher levels of social media use than other students. Business students on the other hand used primarily media to collaborate with their peers while medicine students used social networks. This leads to the assumption that students from divergent subject areas are using the internet for particular purposes and are therefore having varying levels of digital skills.

H1: IT students are possessing different digital skills as communication science and economics students.

H2: IT students have higher levels of digital skills than communication and economics students.

Age can be seen as the most important predictor of usage frequency of the internet (Buchi, Just, & Latzer, 2015), and it has a direct positive influence on access and use of the internet, where older teenagers have a better quality of access and use the internet for longer (Livingstone & Helsper, 2010). Van Deursen and van Dijk (2008) found that age is one of the main predictors of operational and formal skills. Age therefore can be seen as another factor influencing the level of digital skills.

H3: Students age has a positive effect on their level of digital skills

Internet use can also play an important role with the level of digital skills of the students and the perception of the managers as what is important for the students. Hargittai (2010) examined digital skills of students and the influence of various determinants of those. The results of this study are that the time since when the student is using the internet mattered. Therefore, this study included the factor of age when the participant first started using the internet. Students who connected to the internet early in their life have higher digital skills than students who connected at a later life stage. For employees who connected to the internet early in their life, their rating of reflection skills for students are assumed to be more important than people who connected at a later life stage.

H4a: Internet experience has a positive effect on the students' digital skills level.

H4b: Employees' internet experience has a positive effect on the expectation of students' digital skills.

Similarly, to the just mentioned hypothesises, two more hypotheses can be formulated. As internet experience is expected to have an effect on the level of skills and expectations, so the age when the participant owned their first digital or device with internet connection might also play a role.

H5a: The age when students got their first device has a positive effect on their level of digital skills.

H5b: The age when employees got their first device has a positive effect on their expectations.

H6a: The age when students got their first digital device has a positive effect on their level of digital skills.

H6b: The age when employees got their first digital device has a positive effect on their expectations.

The amount of hours per day a person uses a technical device and the internet are expected to influence the students' digital skills level as well as the employees' expectations positively. Although van Deursen, van Dijk and Peters (2011) do not find a significant influence of hours a week using the internet on digital skills, other researchers find an influence of the amount of web use on tasks completed successfully (Hargittai & Shafer, 2006) or on the intensity of mobile use on knowledge concerning privacy issues (Park & Mo Jang, 2014), but also on weekly web hours on skills (Hargittai, 2010). With today's devices, the differentiation between actual internet use and the use of the device is blurring, as many applications need access to the internet which is not always perceived as the internet by the user, two hypothesises were formulated. The first one is concerning the daily use of digital devices which includes offline and online use, e.g. using applications working without the internet and others like social networking applications which require internet access. The second is about the amount of time spent using the internet for studies or work.

H7a: Increase of hours a day using a technical device has a positive effect on the students' digital skills level.

H7b: Increase of hours a day using a technical device has a positive effect on the employees' expectations of students' digital skills level.

H8a: Increase of hours a day using the internet for studies has a positive effect on the skills level and expectations.

H8b: Increase of hours a day using the internet for work has a positive effect on the employees' expectations of students' digital skills level.

The perception of usefulness is another independent variable which is examined in the study. Zhang (2002) compared opposing internet attitudes, including usefulness of the internet of industrial workers and college students. Employees in this study found the internet to be more useful than the students did. Additionally, Wang et al. (2015) found in their study that the perception of usefulness, in that case in leisure internet use, can enhance of further internet use. As other hypothesis state that internet experience and internet use positively influence digital skills and the expectations of these, this might also be true for the perception of usefulness of digital skills. If the participant perceives the internet as very useful for example, the person likely uses the internet more and in a more sophisticated way than other people. Through this widened use, the perception of usefulness of the internet might be a predictor for the level and expectations of digital skills.

H9a: The perception of usefulness of the internet for studies has a positive effect on the students' digital skills level.

H9b: The perception of usefulness of the internet for work has a positive effect on the employees' expectations of students' digital skills level.

3. METHOD

3.1 Sample

For data collection, an online survey was carried out. For this, the survey program "Qualtrics" was used which enables the user to build online surveys. The survey was distributed over the internet, specifically for the students over the social networking site "Facebook" and in Facebook groups of various universities or study courses. The participants being in a job were also collected over Facebook groups concerning the job, but more on XING, a career focused social networking platform which is especially used in Germany. Professionals were also addressed through emails which were sent to the person in charge for firms working in the field of communication science, computer science and economics. In total, 467 students and 231 professionals took part in the survey. At the point of data collection, 87 students were studying communication science, 103 computer science, 85 students economics and 191 students were studying none of the above. Looking at the professionals, 50 are employed in the field of communication science, 81 in computer science and 41 in the field of economics. 90% of the total participants are from Germany and 301 participants were male and 387 females. Students are to 63.7% females, while the sample of the professionals consists out of 59.2% of females. The mean age of all participants is 28.09 years, with the employees being an average 36.92 years old and the students 23.61 years. Table 1 shows in more detail the distribution of students in their subject area regarding their age with the standard deviation and the gender.

Due to a logarithmic transformation, all cases with missing values in questions about digital skills were excluded from the analysis. This reduced the amount of student's participants of communication science to 86, computer science to 101 and economics so 83. The professional

Table 1. Sample

	Students			Professionals		
	CS	IT	EC	CS	IT	EC
N	87	103	85	50	81	41
Average age	23.1	23.3	22.9	35.6	37.6	39.3
	(SD = 2.5)	(SD = 3.6)	(SD = 3.3)	(SD = 10.1)	(SD = 9.4)	(SD = 11.2)
Gender	12.6% male	72.8% male	32.9% male	42.0% male	81.5% male	56.1% male

Note. CS: Communication science, IT: Computer science, EC: Economics

participants numbers were also reduced, in the end 34 communication science, 58 IT and 28 economics professionals took place in the survey.

3.2 Measures

Before the actual survey was carried out, a pretest was conducted, with 28 students and six employees as participants. They were asked to comment on every question they did not understand, or which was unclear for them. As a result, a few questions were deleted or reformulated for a better understand. For example, the questions “I am able to manage different online identities” and “I am able to construct online identities” was reworded and combined into the question “I am able to manage and construct different identities or profiles in the digital world”. Furthermore, a factor analysis with the data from the pretest was carried out to see whether the items are loading on the skills. The alpha score of the pretest was at $\alpha = .91$.

3.2.1 Explanatory factor analysis

To test the six theoretical digital skills dimensions, a factor analysis was conducted with the items. Overall, the factors from the theoretical framework were divided into seven factors. The Kaiser-Meyer-Olkin value can be described as very good with .92 (Kaiser & Rice, 1974) and the Bartlett-Test is also significant ($p<.001$).

The first factor of the factor analysis includes all items of the theoretical dimension of utilization. Therefore, the factor can be seen as the utilization skill. Factor two combines several items of the communication dimension, as well as one creation item and most of the items from the reflection and lifelong learning dimension. Items of the third factor are all apart from one factor each from the communication and lifelong learning dimension part of the informing dimension and are, except for the items from communication and lifelong learning, all describing of how to get reliable information. The items of the fourth factor are like the previous factor items from the informing skill dimension. The fifth factor consists of items from the communication, creation and one of the reflection dimension. As the items from communication and creation are referring to standing out or creating online profiles and creating content, those can be described as one factor, while the item from the reflection dimension is removed, as it does not fit with its description. The factor can thus be called creation of online profiles and content. The sixth factor represents four

items from the communication dimension and can be labelled as harmonic communication. The last factor of the seven consists only of two items of the communication dimension.

It is noticeable that the dimensions from the explanatory factor analysis are not able to reflect the dimensions of the theoretical construct. Apart from the utilization dimension, all items from the theory were mixed up by the factor analysis and oftentimes didn't fit together in their description or, as in the case of the last two factors, only consist out of two or three items. Therefore, the factor analysis was used as an exploration of the instrument but turned out to be not useful. The factor analysis will be further discussed in the limitations of this study.

3.2.2 Reliability of the theoretical factors

Since the explanatory factor analysis was unable to provide useful results, the reliability of the theoretical factors was calculated. Cronbach's alpha for the utilization skill dimension is at α = .955. The informing skill factor has an alpha of α = .895. The communication and collaboration factor has an alpha of α = .855. Creation had an original alpha score of α = .690. By excluding two items, which did also not load on any factor from the analysis, the alpha score grew to α = .758. Reflection skills from the theoretical dimension had their first alpha at α = .828. By analysing the item-total-correlation of the items from this dimension, it is obvious that the first item does not fit to the others, as the correlation is -.138 (Baur & Fromm, 2008). After removing this item from the factor, the alpha increased from α = .828 to α = .904. The alpha score of the last of the six skill dimensions, lifelong learning, is at α = ,828. Since the reliability of the six theoretical factors of utilization, informing, communication and collaboration, creation, reflection and lifelong learning is ranging from acceptable to very good, these factors are taken for subsequent analyses in this study.

Table 2. Descriptives for digital skill dimensions

	M	SD
Utilization skills (α = 0.953) N = 692)	4.63	0.54
Students should be able to operate digital devices	4.78	0.67
Students should not encounter problems with opening applications	4.55	0.79
Students should be able to fill out online forms	4.83	0.56
Students should have no problem buying something online	4.75	0.67
Students should be able to save different kinds of information	4.78	0.63
Students should be able to save information on different devices	4.69	0.65
Students should be able to download files from the internet	4.70	0.69
Students should be able to copy files on different devices	4.67	0.66
Students should be able to transfer information from one device to another	4.67	0.66
Students should be able to save information in another format	4.67	0.71
On their phone or tablet, students should be able to open a file in another application	4.38	0.90
Students should be able to switch between different software/ applications and folders without losing orientation	4.54	0.75
Students should always know in which application they are located	4.55	0.74
Students should be able to switch between different websites and search results without losing orientation	4.62	0.73
Students should be able to switch between different browser tabs without losing orientation	4.62	0.74
When using hyperlinks, students should be able to go back and forth between different websites	4.53	0.77
When using hyperlinks, students should keep a sense of orientation where they are through which hyperlink they came to the site	4.32	0.82
Informing skills (α = 0.893, N = 692)	4.12	0.50
Before starting their search, students should know exactly what they are searching for	3.89	0.86
When students start searching, they should know what kind of information they are looking for	4.21	0.79
Before starting their search, students should define the places where they want to search for information	3.64	1.07
Students should know where they have to search for different kinds of information	4.39	0.83
Before starting their search, students should define the keywords	3.77	1.09
Defining the search keywords is essential to efficiently find information	4.05	1.04
Students should select information and search results according to specific criteria	4.20	0.87
When the search results don't fit their information criteria, students should not take a closer look at it	3.34	1.20
Students should be able to distinguish irrelevant from relevant information	4.38	0.76
When noticing irrelevant information, students should no longer proceed the search and should look for more relevant information	3.97	1.03
Before clicking on a search result or link, students should check the headline and source for relevance	4.27	0.88
When searching for information, students should try to stay objective and look at information from different perspectives	4.25	0.86
Students should not only look at information that fits their personal view	4.07	1.05
Students should be able to distinct between accurate and inaccurate information	4.22	0.77
The information the student selects should be reliable	4.41	0.75
Students should be able to check if the source is reliable	4.25	0.82
When searching for information, students should always check if the source is reliable	4.07	0.97
Students should be able to evaluate if the search results are contributing to their search goal	4.28	0.70
Students should use graphics and tables to better understand information	3.72	1.07
Students should be generally able to understand information they find online	4.39	0.75
Students should be able to organize and sort different kinds of information	4.43	0.71
Students should be able to categorize information according to different criteria	4.39	0.75

(Continued)

Table 2. (Continued)

	M	SD
Communication and collaboration skills (α = 0.851, N = 684)	3.92	0.46
Students should be able to understand the functions of language, style and vocabulary of digital information	4.22	0.77
Students should be able to communicate different types of messages in different situations for different purposes (e.g. send emails for different occasions, to family and colleagues)	4.62	0.66
Students should be able to adjust their digital communication style to specific situations (be able to differentiate the context)	4.56	0.70
Students should be able to formulate arguments in different styles (as picture, text)	4.38	0.75
Students should know when it's their turn to communicate	4.26	0.79
Students should not forget to answer people in social media platforms, messages and emails	3.04	1.30
When communicating with other people online, students should always consider the impact their message can have	4.01	0.94
Students should always (or try to) be respectful to others (in anonymous interaction they should not disrespect people)	4.62	0.70
Students should be aware of the norms of different cultures and respect those online	4.27	0.87
Students should be good at attracting attention online (e.g. getting more followers on Instagram)	2.50	1.10
Students should stand out with their online profile(s)	2.51	1.17
Students should be able to manage and construct different identities or profiles in the digital world	3.23	1.16
Students should be able to manage their contacts in different social networks	4.01	0.94
Students should be a part of different social networks to manage contacts and stay in touch (e.g. LinkedIn for professional use, Facebook/Instagram/ Snapchat for private contacts)	3.77	1.18
Students should appreciate the strengths and weaknesses of other people and try leveraging those when interacting with others digitally	3.70	0.91
When doing teamwork digitally, students should be able to motivate other people or plan the work	3.86	0.89
Students should be able to cooperate efficiently with the help of digital technologies. With the help of other people, they should solve problems digitally	4.07	0.83
It is becoming more and more important that people can work together through digital technologies	4.43	0.78
Students should not encounter problems with solving problems with the help of the internet	3.70	1.07
Students should be able to negotiate via different forms of online communication (text, speech, video)	4.20	0.84
Students should be able to present results or solutions via different digital media (Skype, email, video, presentation, text)	4.28	0.83
Creation skills (α = 0.765, N = 686)	3.69	0.62
Students should know how to use strategies to help them create and/ or develop new ideas (brainstorming, mind-mapping)	4.16	0.85
When searching for ideas, students should use strategies like mind mapping to create them	3.31	1.18
Students should be able to create new content (write own texts, make photos or combinations)	4.19	0.92
Students should be good at creating attractive online content	3.34	1.03
Students should be able to recombine different content or information in new ways to create something new	3.37	0.97
When producing own content, the students should check if other people are doing the same	3.47	1.10
Own content should be unique, so the student should check if other people are having the same ideas	3.24	1.10
After disseminating/ uploading content/ information, the student should check how other people respond	4.06	0.91

(Continued)

Table 2. (Continued)

	M	SD
Reflection skills (α = 0.914, N = 683)	4.26	0.50
Students should be able to change their own views and beliefs when something else makes more sense	4.29	0.81
When evaluating their own doings, students should consider different views and sides	4.36	0.76
When confronted with other information, students should be able to correct their views and decisions	4.37	0.75
When learning something about their decisions, students should be able and willing to correct and revise them	4.40	0.73
Students should be able to compare different information (from different viewpoints and sources)	4.54	0.68
Students should be able to combine information (from different and sources)	4.57	0.65
In order to reach a goal, students should be able to compare and combine information (e.g. comparing and combining different sources to create something new)	4.48	0.70
Students should be able to integrate different information to solve a task	4.49	0.69
Students should be able to evaluate their own decisions (e.g. what they could have done better, like specifying search keywords, making more informed choices, being more critical towards information)	4.34	0.78
Lifelong learning skills (α = 0.848, N =682)	4.09	0.59
Students should know their own digital skills and abilities	4.30	0.78
Students should know the digital skills which they need to improve	4.26	0.83
Students should want to learn / continue learning to improve their skills	4.44	0.81
Students should be eager improving skills regarding new technologies	4.19	0.89
Students should be able to develop goals, short-term and long-term	4.11	0.86
Students should be able to adapt to new opportunities and challenges	4.23	0.77
Students should be able to manage different goals at the same time	3.87	0.95
Students should be able to manage their time and workload	3.90	1.08
Students should be aware of the current developments of technical devices and new software	3.84	0.99
Students should be aware of the new digital trends	3.79	1.03

Note. Items were measured on a 5-point scale.

3.3 Analysis

For the analysis of the first research question, the six dependent variables were logarithmically transformed, as they are not normally distributed. The Wilcoxon or U-test can be used when the mean doesn't describe the central tendency or in other words, if there is no normal distribution (Nachar, 2008; Neuhäuser, 2010; Skovlund & Fenstad, 2001). It examines if the median diverges significantly between two samples, in this case the students and professionals and the null hypothesis is namely the case where the discrepancy between the two median is zero (Eid, Gollwitzer, & Schmitt, 2013). Therefore, first a U-Test was carried out looking at the variation between students and professionals in general. In addition, U-Tests were calculated for the three groups of communication science, computer science and economics to see whether the expectations

from the professionals in the working field are different from the ones from the students who will soon be working in the same area.

To test the second research question, a Kruskal-Wallis-Test was used to analyse the data. As normality of the variables cannot be assumed as in the other tests, the Kruskal-Wallis test was used (Chan, 2008; McCrum-Gardner, 2008). Similarly, to the previous analysis, this research question was split into two tests. The first one examined if there are discrepancies between the students of the three subject areas and the second if there are differences between the employees working in the fields of communication science, computer science and economics.

For the analysis of the third research question with the hypotheses, a regression analysis was conducted. By carrying out a regression analysis, the effect of an independent variable on a dependent one is estimated (Wolf & Best, 2015). In other words, the six skills utilization, informing, communication and collaboration, creation, reflection, and lifelong learning are the criterium variables and the variables such as age, gender, subject area, and others are described as predictor variables. These are used to predict the dependent variables (Fahrmeir, Kneib, Lang, & Marx, 2013; Urban & Mayerl, 2011). Similar to (van Deursen & van Dijk, 2011) whose framework was presented earlier, a regression analysis was conducted for students and professional and each time an own regression analysis for each skill. The first step of the analysis was to create six new variables, each one representing the average score of a single skill factor. As one precondition of regression analysis is for the independent variable to either be interval scale or dichotomous (Fromm, 2008), the variable about the student's or professionals subject background was recoded into three dichotomous variables. The independent variables were included stepwise into the analysis, with list wise exclusion of cases. The independent variables were included stepwise into the analysis, with list wise exclusion of cases.

4. RESULTS

The first research question is expecting a discrepancy between the students' digital skills level and the employees' expectations. According to the data, which is presented in table 3, the comparison between students and professionals from all the three subject areas is showing significant differences in the skills of utilization ($p>0.05$), creation ($p>0.05$), reflection ($p<0.001$) and lifelong learning ($p<0.05$). Regarding differences amid students and professionals of the communication science metier, they only vary in their skills and expectations in the factor of reflection ($p<0.01$). IT professionals and students have significant variations in terms of utilization ($p<0.001$) and reflection skills ($p<0.05$), whereas economics professionals and students differ in information skills ($p<0.05$). As the Mann-Whitney-U-Test is only pointing out if the differences between the medians are significant or not, but not how they contrast, table 4 is presenting the medians of the groups. It can be derived from the table in general, that the students self-reported skills do not meet the expectations, as in the skill dimensions of creation, reflection, and lifelong learning the median of the professionals is higher than the students'. The same can be said for the reflection skills and expectations of communication science and computer science students and professionals and about the economics students' informing skills and the expectations, where the expectations are significantly higher than the students' skills. On the other hand, computer science students' digital skills are significantly higher than the employees' expectations. Therefore, the research question can be partly accepted, as in some skills differences between expectations and skills can be found. By carrying out a Kruskal-Wallis test, the second research question, if students and professionals differ in their expectations and skills level regarding their subject area, was analysed.

Table 3. Mann-Whitney U test results for the groups of all participants and participants from communication science, computer science and economics

	Utilization	Informing	Communi-cation	Creation	Reflection	Lifelong Learning	All Skills
U All	-2.44*	-1.39	-.24	-1.99*	-3.61***	-2.02*	-1.47
U CS	-.92	-.95	-1.09	-1.18	-2.76**	-1.20	-.79
U IT	-3.50***	-.84	-.97	-1.70	-2.51*	-.99	-.66
U EC	-.16	-2.16*	-.86	-.59	-.63	-.84	-.97

p<.05: *, p<.01: ** p<.001: ***

Table 4. Median of the groups of students and professionals in their subject area

Median $\bar{x}$	Utiliza-tion	Informing	Communi cation	Creation	Reflection	Lifelong learning	All Skills
All - Students	4.88	4.15	4.00	3.62	4.50	4.20	4.21
All - Professionals	4.76	4.22	3.95	3.87	4.77	4.30	4.24
CS - Students	4.82	4.09	4.04	3.81	4.44	4.10	4.18
CS - Professionals	4.70	4.20	3.95	3.93	4.77	4.30	4.24
IT – Students	5.00	4.27	3.85	3.62	4.55	4.30	4.25
IT – Professionals	4.82	4.22	3.95	3.87	4.77	4.30	4.25
EC - Students	4.82	4.04	4.00	3.62	4.33	4.10	4.11
EC -Professionals	4.76	4.25	4.00	3.68	4.55	4.15	4.21

Note. Items were measured on a 5-point scale.

Table 5. Kruskal-Wallis test comparing the skills levels of students and the expectations by the groups of communication science, computer science and economics

	Utilization	Informing	Communi-cation	Creation	Reflection	Lifelong learning	All Skills
Chi-Square Students	30.17***	9.64**	2.49	2.26	2.81	1.71	2.62
Chi-Square Employees	1.92	1.04	.89	1.45	3.54	.52	.36

p<.05: *, p<.01: ** p<.001: ***

The results are showing a disparity between the students' skills in the dimension of utilization and informing. Employees on the other hand are showing no variations in their expectations. As it can be seen in table 4, which is comparing the median of the various groups, IT students' utilization skills median is the highest one with $\bar{x}$=5.00, whereas communication science and economics students have a lower median at $\bar{x}$=4.82. The same can be said for information skills, where IT students have a median of $\bar{x}$=4.27, and communication students $\bar{x}$=4.09 and economics students $\bar{x}$=4.05

Table 6. Regression of students' digital skills levels with predicting variables

	Utilization skills β	Informing skills β	Communication skills β	Creation skills β	Reflection skills β	Lifelong learning skills β	All Skills β
Age	-.05	-.10	-.11	.01	.00	-.00	-.07
Nationality	-.04	-.03	-.03	.00	-.09	-.11	-.05
Gender (M/F)	-.08	.07	.06	.06	.17*	-.04	.09
Subject area	.02	-.03	-.01	-.03	.07	.06	-.02
Communication science	-.07	-.01	.01	.06	-.10	-.05	.03
Computer science	.11	.09	-.13*	-.07	.07	.01	-.03
Economics	-.04	-.08	-.01	.00	.03	.05	-.00
Age of first internet use	.09	.14*	.14*	.12	.13	.12	.17*
Age owning first device	-.03	-.08	-.12	-.05	.13	-.00	.00
Age owning first digital device	-.12	-.09	-.12	-.04	-.19**	-.08	-.14*
Number of devices owned	.07	.00	-.04	.03	-.01	-.00	-.03
Hours a day using a device	.28***	.15*	.28***	.16*	.17*	.14*	.21**
Hours a day using the internet for studies	-.11	-.03	-.16*	-.10	-.05	.10	-.08
Hours a week using analogue media for studies	-.09	-.03	-.08	.01	.06	-.04	-.01
Perception of usefulness of the internet	.20**	.18**	.25***	.13	.21**	.23**	.23***
R2	.13	.08	.14	.02	.12	.08	.16
F	15.36***	6.22***	6.32***	5.86*	7.24***	9.30***	9.24***

p<.05: *, p<.01: ** p<.001: ***

The third research question is testing several independent variables for its influences on the students' skills and on the employees' expectations. Table 6 is showing the results of the regression analysis for every skill factor regarding the students' skills. Hours a day a student uses technical devices and the perception of usefulness of the internet for studies influence the skill of utilization positively. The skill dimension of informing is positively influenced through the variables of age when first using the internet, hours a day using a technical device and the perception of usefulness of the internet. Communication is positively influenced through the factors age of first internet use,

Table 7. Regression of the employees' expectations with predicting variables

	Utilization skills β	Informing skills β	Communication skills β	Creation skills β	Reflection skills β	Lifelong learning skills β	All skills β
Age	-	-	-.03	-.02	-.13	-.08	-.09
Nationality	-	-	-.00	.03	.03	-.01	-.04
Gender (M/F)	-	-	-.00	-.08	.07	.08	.02
Subject area	-	-	-.01	-.23*	-.07	-.09	-.06
Communication science	-	-	-.00	.02	.05	.06	.04
Computer science	-	-	.03	.02	-.05	-.06	-.04
Economics	-	-	-.04	-.07	-.33**	-.28**	-.20*
Age of first internet use	-	-	.00	-.03	-.04	-.15	-.09
Age owning first device	-	-	.09	.04	-.02	-.07	-.02
Age owning first digital device	-	-	.31**	.32**	.25*	.33**	.34**
Number of devices owned	-	-	.03	.10	-.06	.13	.08
Hours a day using devices	-	-	.22*	.24*	.23*	.31**	.29**
Hours a day using the internet for work	-	-	-.17	-.10	-.15	-.12	-.16
Hours a week using analogue media for work	-	-	-.07	.01	-.06	-.03	-.05
Perception of usefulness of the internet	-	-	-.03	.05	.12	.17	.06
R2	-	-	.13	.18	.17	.22	.19
F	-	-	6.68**	6.18**	5.95**	7.83***	6.83***

p<.05: *, p<.01: ** p<.001: ***

hours a day using a technical device and usefulness. Studying IT has a significant negative effect on the level of student's communication skills. Hours a day using a technical device is the only variable with a significant effect on creation skills. Reflection skills are significantly influenced through four divergent variables. Gender, hours a day using a technical device and usefulness all have a positive effect on the level of reflection skills. The age when participants first owned a digital device on the other hand has a negative effect on student's reflection skills. Lifelong learning is influenced positively through the independent variables hours a day using a technical device and

usefulness of the internet. The seventh column are representing the mean digital skills level, as it includes all six skills. It is influenced with significant effects positively through age of the first internet use, hours a day using technical devices and the perception of usefulness of the internet and negatively through the age of the first own digital device.

Table 7 is showing the regression analysis of the professionals, where variables were entered stepwise and cases were missing list wise. For the average skill variables of utilization and informing, no predictors are significant. Hours a day using a technical device and age when first owning a digital device both have a significant and positive influence on the communication and collaboration skill. The creation variable is also positively influenced by hours a day using a technical device and the age getting the first digital device, but also negatively through the variable of the studied background. The expectation of student's reflection skills is positively influenced through the age the professional owned their first digital device, but negatively influenced through a job in the field of economics. Lifelong learning expectations are also negatively influenced through working in economics and positively through the number of hours a day using technical devices and the age when having the first digital device. Overall, the expectations of students' skills are influenced positively through the age of the professionals when they had their first own digital device and the hours a day they are using technical devices, and negatively through working in the field of economics.

As just discussed, some variables are influencing the skills level and the expectations while other do not, resulting in an acceptance or rejection of the various hypothesises. H1 expects that IT students are possessing other skills than communication science and economics students. As the variable concerning IT students is only significant in the skills of communication, this hypothesis can be partly accepted. H2 can also be partly rejected apart from the skill of communication. As the variable of "being an IT student" is influencing the skill of communication negatively, it is even contrary to the hypothesis. Age of the students does not have any significant influence on the skills level, which is why H3 is rejected.

H4a is partly accepted, internet experience has only a positive significant effect on the digital skills level of students in the dimensions of informing and communication. H4b can also be rejected, because the employees' internet experience has no effect on their skills expectations. The students' and employees' age of their first own device, proposed in hypothesis H5a and H5b, is also rejected, since the variable has no significant influence on the expectations or skills level. Next

to the age of the first own device, the study checked also for an influence of the age of the participant they were when they got their first digital device, H6a and H6b. H6a cannot be confirmed, because students' digital skills are not influenced, whereas the expectations are all except from the utilization and informing dimension, positively influenced. This leads to a partly acceptance of H6b.

H7 expected an influence from the number of hours the participant uses technical devices on the skills level and expectations. For students, this hypothesis H7a, can be accepted for all the six skills and for the employees, H7b, for the skills of communication, creation, reflection and lifelong learning as well as for the mean of all six skills. That the amount of hours a day the participant uses the internet for studies and work, H8a and H8b, has a positive effect on the expectations and skills level can be rejected. Although with the students' skill of communication being significantly influenced through the variable, but negatively, it can be dismissed. The perception of usefulness of the internet for studies influencing the skills and expectations, can be accepted for all of the students' skills except for the creation skill, H9a. Professionals expectations on the other hand are not influenced by this variable H9b.

The regression analysis did also check for other variables influencing the skills and the expectations significantly. One of these is the variable of gender which influences the students' skill of reflection positively. Professionals expectations are furthermore influenced through the variable of subject area, which is grouping the participants into the subject fields regarding what they studied at university. This influence is significant negatively, but unfortunately, the more distinctive group which would be one of the dummy variables is not significant. Additionally, professionals' expectations are influenced negatively in the skills of reflection and lifelong learning through their job in economics. Also, both groups are in some skill dimensions significantly influenced through the age the participant was when owning their first digital device. But here, students' reflection skills are influenced negatively by that variable, whereas employees' expectations regarding the students' communication, creation, reflection and lifelong learning skills are positively influenced.

5. DISCUSSION

5.1 Main findings

The first two research questions were opting for differences between students' skills and the employees' expectations and furthermore for skill and expectational disparities regarding the subject area of the participants. The third research question is analysing the influence of several independent variables on the skills level and expectations. Regarding the first research question, there are some disparities between the expectations of the people working in the fields of communication science, computer science and economics and the students of these areas, although the differences cannot be found in every skill dimension. Expectations from communication science and computer science professionals are higher than the student's reflection skills and economics students do not meet the employees' expectations in the information skills dimension. But also, utilization skills from computer science students are exceeding the expectations from the managers. The second research question found out that students from computer science have significantly higher utilization and information skills as their communication science and economics counterparts. In comparison, employees of the three metiers do not disagree in their expectations of student's skills.

Furthermore, the study shows which factors are influencing the digital skills level of students and the expectations of these from employees. Students' skills are all positively influenced through the amount of time spent daily using a digital device, and also with the exception of creation skill through the perception of usefulness. Also, informing skills are positively influenced through the age of the first internet use, communication skills also positively through the age of the first internet use and negatively through the subject area of IT and hours a day using the internet for studies. Reflection skills are impacted by gender and negatively by the age of the first digital device. Employees on the other hand are positively influenced through the number of hours of daily device usage and the age of the first digital device all dimensions except utilization and informing skills, as there no variables are significant. Creation skills are negatively influenced through the subject area and reflection and lifelong learning skills are related negatively with having studied economics at University.

To conclude, the skills and their expectations are varying in certain cases depending on the subject area. As communication and computer science students do not meet the employees'

expectations in the skill of reflection, it can be deduced that this skill needs more attention in the education.

But in order to put more attention on the education of digital skills in schools and universities, the literature and researchers need to agree on a uniform definition of digital skills. There is no benefit if numerous definitions and understandings are existing which are all meaning the same thing. National curricula of schools and universities can only include digital skills if the literature comes to an agreement of the terms (Claro & Ananiadou, 2009). Instead of politicians and educators putting large amounts of money into the computer education (Talja, 2005) which contributes often only to the utilization skills, instead they should focus on higher thinking skills such as the evaluation of information and its sources and critical thinking. One example of enhancing critical thinking is to create specific questions for students to enhance critical thinking as well as to connect course material to practice situations (Swart, 2017).

In general, the divide between people with low and high digital skills level is widening, as the amount of information which needs to be processed is exploding. As a result, it becomes harder for the people to find the information they are seeking. In that manner, people with a high digital skills level will be able to manage the amount of information, but for people with low digital skills it will become even harder with the time to use the internet (van Deursen & van Dijk, 2009). It is also interesting to note that (Matzat & Sadowski, 2012) found out that an persistent internet use lead to a raise in the persons digital skills level. This self-learning of digital skills thus does not lead to a reduction of skill gaps between a person with low and high level of digital skills. Rather, both are increasing their skill levels with a more frequent use of the internet.

Since in this study, only computer science students were able to exceed the employees' expectations, while all other skills were not significant, or the students were unable to live up to the employees' expectations, there seems to be a new gap on what employees expect from students and the students' actual digital skills. This skill gap is especially important concerning the higher order digital skills, such as reflection and lifelong learning, because learning how to use a computer or certain application is much easier than to learn how to develop objectives and how to attain these. Furthermore, the future holds much more technical developments, which the employees and the students as the approaching workforce have to master.

One of the big questions nowadays is therefore how to close the skills gap, between the required higher level and existing skills. The educational aspects already start in school, where

nowadays many schools teach computer classes, but are mostly focused on the skill dimension of utilization, e.g. how to build a snowman with various word figures or how to make a PowerPoint presentation. In most cases, the aspects from the theoretical framework such as communication and collaboration, informing, creation, reflection, and lifelong learning skills are ignored. This educational style is continued in university, although here the skill of informing is in the primary focus, when students have to search for information for their assignments. The aspect of communication and collaboration is usually cultivated by the students themselves, by sharing documents in a cloud or by editing seminar papers online. Within the context of education, many other digital skills aspects are not further discussed. Students are therefore left on their own to develop higher order digital skill such as creation or reflection, but after their studies are then expected to excel in these skills. There are several possibilities, how the skills gap could be closed. For once, starting again in the school lessons, computers and the internet can be integrated into school lessons, e.g. for younger children in year five and six two hours per week and for the older students every day in school. This leads to not only learning utilization and informing aspects, but also to be familiar with communication and collaboration aspects, as well as creation, lifelong learning and reflection. These measures would of course need higher investments to buy the technical equipment, but also changes in the pedagogical concept and training of the teachers. Even if the students all have their own computer, it is no use if a digital concept is missing or if the teacher is not trained sufficiently and appropriately (Kühne & Burchard, 2017). For university students, who can most often decide if they use a piece of paper or a laptop to take notes of a lecture, it is now important to build on the skills learned in school and to expand these in university with no longer dull lectures, but discussions and case studies. However, the education must not stop with the entrance into the working life. In order to develop and evolve digital skills, the employer should create a learning environment for the employees, where learning is the priority and is rewarded. Additionally, is it useful to for the organization to create a clear path of development for the employee (Capgemini, 2017), where the individual can see which skills need to be improved and which ones are already good.

5.2 Limitations and further research

One disadvantage of the survey presented in this study is the self-rating of the students' skills. Because of the social desirability bias, some students might have overrated their skills. In other studies for example, the majority of the participants rated themselves as middle to quite skilled. Similarly to the social desirability responses, women tend to rate themselves as lower skilled than men do (Hargittai & Shafer, 2006). In consideration of the gender distribution in the course of studies, where 86% of the communication students, but only 28% of the IT students are female, the overrating of men should be especially put into focus. As computer science students are composed with the highest percentage out of men, the chances for overrating their skills is the highest one in this group.

Another limitation of the study might be the online survey and its distribution. Although many students are registered in social networks, not all of them are using Facebook, where the survey for students was distributed. The same can be said of the distribution for the employees. They were invited to the study via various groups of the social networking site "Xing", which is specialised for work or professional contact. The people who took part in the study therefore needed to be registered in Xing and additionally they had to be part of at least one of the more than 200 groups the link to the survey was posted in. Although the researcher of this study also sent emails to some companies specialising in the fields of communication science, computer science and economics, the process of distribution was imposed to restrictions.

Next to these two limitations arises another limitation concerning the factor analysis and the analysis. In an earlier section of this study, an explanatory factor analysis was presented, which turned out to be unvaluable, as it was unable to represent the dimensions of the theoretical framework properly and fitting in regard to the content. Future studies should therefore develop a valid measurement instrument which allows to measure the expectations of students' digital skills levels and at the same time the students' digital skills level itself. An additional constraint of this study is the low share of the explained variance, although the model has a good fit. A reason for this is, that of course there are many more variables apart from the predicting variables in this study, which can have an influence on the students' digital skills levels and the employees' expectations. Another point of discussion is that the data is not normally distributed. This can be the cause of the items and the scale being not too sensitive to indicate differences, for example future researchers could use a 7-point scale instead of a 5-point scale or make more challenging

statements which are more able to elicit differences between the participants. These are all factors for future studies in this field of research.

It would thus be suitable to further investigated the research questions of this study. For once, they could develop a test to effectively measure the actual skills of the theoretical dimensions. In the focus of this text could be the factors of communication, creation and reflection skills, where the participants for example need to show their proficiency in writing emails, creating a good social media post or to evaluate sources, book a good but cheap vacation or to critically evaluate and discuss about specific information. It would be also interesting to see, whether there are discrepancies between the skills of students and employees in more subject areas. This could for example include students and practitioners of the fields of medicine, law, physics, mathematics, biology, mechanical engineering, history, sociology, psychology, languages, cultural studies and others. Another implication for further research could be to examine the digital skills level of students from the same university. As the curricula or focus often depend on the university, it would be interesting to see if digital skills gap can be the cause of various types of learning methods and curricula.

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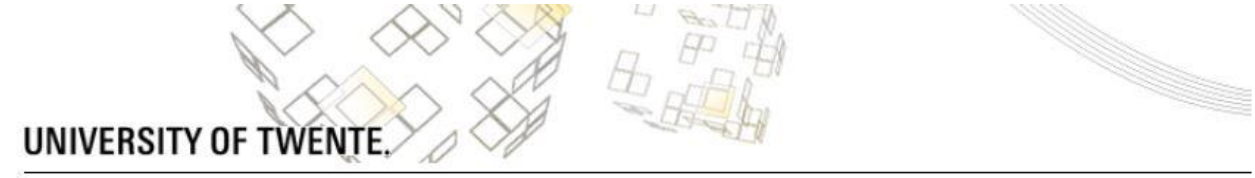
7. APPENDIX



Start Block

Dear participant,

Thank you for taking part in this survey.
I am a student of the University of Twente and am gathering the information for my master thesis in communication science.

The survey will take approximately 10-15 minutes. Your statements are anonymous and will only be used for scientific reasons. There is always the possibility of exiting the survey.

Please answer spontaneous and truthfully, there are no right or wrong answers in this survey.

I would appreciate your support very much. If you have any questions or want to be informed about the results of this study, please do not hesitate to contact me under l.p.n.lindenthal@student.utwente.nl.

Luisa Lindenthal

What is your current occupation?

- ○ Student
- ○ Employed (full- or parttime)
- ○ Unemployed

Students

Please rate how strongly you disagree or agree with the following statements concerning your personal skills of using technical devices.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I am able to operate digital devices (turn computer, smartphone, tablet on and open applications, e.g. word, excel, webbrowser and files)	○	○	○	○	○
I don't encounter any problems with opening applications	○	○	○	○	○
I am able to fill out online forms (e.g. registrations, shopping, newsletters, ...)	○	○	○	○	○
I am able to buy something online	○	○	○	○	○
I am able to save different kinds of information (e.g. documents, voice recording, pictures)	○	○	○	○	○
I am able to save information on different devices (e.g. smartphone, laptop, tablet)	○	○	○	○	○
I am able to download files from the internet (e.g. pictures, music, files and videos)	○	○	○	○	○
I am able to copy files on different devices (e.g. smartphone, tablet, computer)	○	○	○	○	○
I am able to transfer information from one device to another (e.g. pictures from camera to computer)	○	○	○	○	○
I can save information in another format (e.g. word document as pdf)	○	○	○	○	○
On my phone or tablet, I can open a file/ document in another application (open pdfs in ibooks or open Dropbox documents in word)	○	○	○	○	○
I can switch between different software/ applications and folders without losing my orientation	○	○	○	○	○
I always know in which application I am located	○	○	○	○	○
I can switch between different websites and search results without losing orientation	○	○	○	○	○
I can switch between different browser tabs without losing orientation	○	○	○	○	○
When using hyperlinks, I am able to go back and forth between different websites	○	○	○	○	○
When using hyperlinks, I keep my sense of orientation where I am and through which hyperlink I came to the site	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning your personal skills of finding information online.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Before starting my search, I know exactly what I am searching for	○	○	○	○	○
When I start searching, I know what kind of information I am looking for	○	○	○	○	○
Before starting my search, I define the places where I want to search for information (e.g. email, contacts, newspapers, chat-forums)	○	○	○	○	○
I know where I have to search for different kinds of information (private photos on device storage, emails and contacts in email applications)	○	○	○	○	○
Before starting my search, I define keywords	○	○	○	○	○
Defining search keywords is essential to efficiently find information	○	○	○	○	○
I select information and search results according to specific criteria (actuality, source, first page on google)	○	○	○	○	○
When the search results don't fit my information critera, I do not take a closer look at it	○	○	○	○	○
I am able to distinguish irrelevant from relevant information	○	○	○	○	○
When noticing irrelevant information, I no longer proceed the search and look for more relevant information	○	○	○	○	○
Before clicking on a search result or link, I check the headline and source for relevance	○	○	○	○	○
When searching for information I try to stay objective and look at information from different perspectives	○	○	○	○	○
I do not only look at information that fits my personal view	○	○	○	○	○
I am able to distinct between accurate and inaccurate information	○	○	○	○	○
The information I select must be reliable	○	○	○	○	○
I am able to check if the source is reliable	○	○	○	○	○
When searching for information, I always check if the source is reliable	○	○	○	○	○

I am able to evaluate if the search results are contributing to my search goal	○	○	○	○	○
I use graphics and tables to better understand information	○	○	○	○	○
I am generally able to understand information I find online	○	○	○	○	○
I am able to organize and sort different kinds of information	○	○	○	○	○
I am able to categorize information according to different criteria	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning your personal skills of communication.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I am able to understand the functions and meanings of language, style and vocabulary of digital information	○	○	○	○	○
I am able to communicate different types of messages in different situations for different purposes (e.g. send emails for different occasions, to family and colleagues)	○	○	○	○	○
I am able to adjust my digital communication style to specific situations (be able to differentiate the context)	○	○	○	○	○
I am able to formulate arguments in different styles (as picture, text)	○	○	○	○	○
I know when it's my turn to communicate in a chat conversation	○	○	○	○	○
I often forget to answer people in social media platforms, messages and emails	○	○	○	○	○
When communicating with other people online, I always consider the impact my message can have	○	○	○	○	○

I am always (try to be) respectful to others (in anonymous interactions I do not disrespect people)	○	○	○	○	○
I am aware of the norms of different cultures and respect those online	○	○	○	○	○
I am good at attracting attention online (eg. Getting more followers on Instagram)	○	○	○	○	○
I want to stand out with my online profile(s)	○	○	○	○	○
I am able to manage and construct different identities or profiles in the digital world	○	○	○	○	○
I am able to manage my contacts in different social networks	○	○	○	○	○
I am part of different social networks to manage contracts and stay in touch (e.g. LinkedIn for professional use, Facebook/ Instagram/ Snapchat for private contacts)	○	○	○	○	○
I appreciate the strengths and weaknesses of other people and try leveraging those when interacting with them online	○	○	○	○	○
When doing teamwork digitally, I am able to motivate other people or plan the work	○	○	○	○	○
I am able to cooperate efficiently with the help of digital technologies. With other people, I can solve problems digitally	○	○	○	○	○
It is becoming more and more important that people can work together through digital technologies	○	○	○	○	○
I do not encounter problems with solving problems with the help of the internet	○	○	○	○	○
I am able to negotiate via different forms of online communication (text, speech, video)	○	○	○	○	○
I am able to present results or solutions via different digital media (e.g. skype, email, video, presentation, text)	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning your personal skills of creating online content.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I know how to use strategies to help me create and/ or develop new ideas (brainstorming, mind-mapping)	○	○	○	○	○
When searching for ideas, I use strategies like mindmapping to create them	○	○	○	○	○
I am able to create new content (write own texts, make photos or combinations)	○	○	○	○	○
I am good at creating attractive online content	○	○	○	○	○
I am able to recombine different content or information in new ways to create something new	○	○	○	○	○
When producing content, I check if other people are doing the same	○	○	○	○	○
My content should be unique, so I check if other people are having the same ideas	○	○	○	○	○
I don't care if I have the same content as other people	○	○	○	○	○
It is not possible to check everywhere if someone has the same ideas as I do, so I just go for it	○	○	○	○	○
After disseminating/ uploading content/ information, I check how other people respond	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning your personal skills.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
When confronted with contradicting information to my own beliefs, I keep on insisting they are true	○	○	○	○	○
I am able to change my own views and beliefs when something else makes more sense	○	○	○	○	○
When evaluating my own doings, I am able to consider different views and sides	○	○	○	○	○
When confronted with other information, I am able to correct my views and decisions	○	○	○	○	○
When learning something about my decisions, I am able and willing to correct and revise them	○	○	○	○	○
I am able to compare different information (from different viewpoints and sources)	○	○	○	○	○
I am able to combine information (from different sources)	○	○	○	○	○
In order to reach a goal, I am able to compare and combine information (e.g. comparing and combining different sources to create something new)	○	○	○	○	○
I am able to integrate different information to solve a task	○	○	○	○	○
I am able evaluate my own decisions (e.g. what I could have done better, like specifying search keywords, making more informed choices, being more critical towards information)	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning your personal skills.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I know my own digital skills and abilities	○	○	○	○	○
I know the digital skills which I need to improve	○	○	○	○	○
I want to learn and/ or continue learning to improve my skills	○	○	○	○	○
I am eager on improving my skills regarding new technologies	○	○	○	○	○
I am able to develop goals, short-term and long-term	○	○	○	○	○
I am able to adapt to new opportunities and challenges	○	○	○	○	○
I am able to manage different goals at the same time	○	○	○	○	○
I am able to manage my time and my workload	○	○	○	○	○
I am aware of the current developments of technological devices and new software	○	○	○	○	○
I am aware of the new digital trends	○	○	○	○	○

How old are you?

What is your Nationality?

- ○ German
- ○ Dutch
- ○ other

Are you currently enrolled in a university in the following countries?

- ○ Germany
- ○ Netherlands
- ○ other

You are

- ○ male
- ○ female
- ○ other

In which semester of university education are you?

- ○ Bachelor 1st year (semester 1 & 2)
- ○ Bachelor 2nd year (semester 3 &4)
- ○ Bachelor 3rd year (semester 5 & 6)
- ○ Bachelor 4th year (semester 7 & 8)
- ○ Master 1st year (semester 1 & 2)
- ○ Master 2nd year (semester 3 & 4)
- ○ Master 3rd year (semester 5 & 6)

What are you studying?

- ○ Communication Science
- ○ Computer science (IT)
- ○ History
- ○ Economics
- ○ Other

Did you already work in the field of your studies (e.g. internship)?

- ○ No
- ○ Yes, please fill in how many weeks (of full-time working)

At what age did you start using the internet? If you don't know the exact age, please select in which stage of your life you were or if you know it, please select how old you were at that time

How many hours a day do you spend using a technical device (e.g. phone, computer, tablet)?

How many devices do you own and use (Laptop, Computer, Tablet, Smartphone, Smartwatch)?

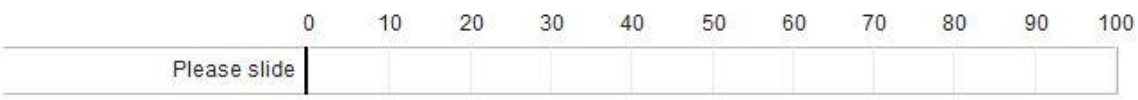
At what age did you own your first device with connection to the internet?

At what age did you own your first digital device (e.g. computer, phone, camera)?

How many hours a day do you spend using a technical device for your studies (e.g. computer, tablet)?

How many hours a week do you spend with analogue media (e.g. books) for your studies?

How useful do you perceive the internet to be for your studies?



Final Block

Thank you for answering all the questions. Please go to the next page to finish the survey.

If you want to take part in the drawing of 10 Amazon vouchers of 10€ each, please fill in your email address. Your address will be handled completely confidential and will not be saved with your responses. It will be deleted once the winners are informed.

Professionals

Please rate how strongly you disagree or agree with the following statements concerning student's skills of using technical devices.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Students should be able to operate digital devices (turn computer, smartphone, tablet on and open applications, e.g. word, excel, webbrowser and files)	○	○	○	○	○
Students should not encounter problems with opening applications	○	○	○	○	○
Students should be able to fill out online forms (e.g. registration, shopping, newsletters, ...)	○	○	○	○	○
Students should have no problem buying something online	○	○	○	○	○
Students should be able to save different kinds of information (e.g. documents, pictures, videos)	○	○	○	○	○
Students should be able to save information on different devices (e.g. smartphone, laptop, tablet)	○	○	○	○	○
Students should be able to download files from the internet (e.g. pictures, music, files, videos)	○	○	○	○	○
Students should be able to copy files on different devices (e.g. smartphone, tablet, computer)	○	○	○	○	○
Students should be able to transfer information from one device to another (e.g. pictures from camera to computer)	○	○	○	○	○
Students should be able to save information in another format (e.g. word document as pdf)	○	○	○	○	○
On their phone or tablet, students should be able to open a file/ document in another application (open Pdfs in ibooks or open Dropbox documents in word)	○	○	○	○	○
Students should be able to switch between different software/ applications and folders without losing orientation	○	○	○	○	○
Students should always know in which application they are located	○	○	○	○	○

Students should be able to switch between different websites and search results without losing orientation	○	○	○	○	○
Students should be able to switch between different browser tabs without losing orientation	○	○	○	○	○
When usign hyperlinks students should be able to go back and forth between different websites	○	○	○	○	○
When using hyperlinks, students should keep a sense of orientation where they are and through which hyperlink they came to the site	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning student's skills of finding information online.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Before starting their search, students should know exactly what they are searching for	○	○	○	○	○
When students start searching, they should know what kind of information they are looking for	○	○	○	○	○
Before starting their search, students should define the places where they want to search for information (e.g. email, contacts, newspapers, chat-forums)	○	○	○	○	○
Students should know where they have to search for different kinds of information (private photos on device storage, emails and contacts in email applications)	○	○	○	○	○
Before starting their search, students should define the keywords	○	○	○	○	○
Defining the search keywords is essential to efficiently find information	○	○	○	○	○

Students should select information and search results according to specific criteria (actuality, source, first page on google)	○	○	○	○	○
When the search results don't fit their information criteria, students should not take a closer look at it	○	○	○	○	○
Students should be able to distinguish irrelevant from relevant information	○	○	○	○	○
When noticing irrelevant information, students should no longer proceed the search and should look for more relevant information	○	○	○	○	○
Before clicking on a search result or link, students should check the headline and source for relevance	○	○	○	○	○
When searching for information, students should try to stay objective and look at information from different perspectives	○	○	○	○	○
Students should not only look at information that fits their personal view	○	○	○	○	○
Students should be able to distinct between accurate and inaccurate information	○	○	○	○	○
The information the student selects should be reliable	○	○	○	○	○
Students should be able to check if the source is reliable	○	○	○	○	○
When searching for information, students should always check if the source is reliable	○	○	○	○	○
Students should be able to evaluate if the search results are contributing to their search goal	○	○	○	○	○
Students should use graphics and tables to better understand information	○	○	○	○	○
Students should be generally able to understand information they find online	○	○	○	○	○
Students should be able to organize and sort different kinds of information	○	○	○	○	○
Students should be able to categorize information according to different criteria	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning student's skills of communication.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Students should be able to understand the functions and meanings of language, style and vocabulary of digital information	○	○	○	○	○
Students should be able to communicate different types of messages in different situations for different purposes (e.g. send emails for different occasions, to familiy and colleagues)	○	○	○	○	○
Students should be able to adjust their digital communication style to specific situations (be able to differentiate the context)	○	○	○	○	○
Students should be able to formulate arguments in different styles (as picture, text)	○	○	○	○	○
Students should know when it's their turn to communicate	○	○	○	○	○
Students should not forget to answer people in social media platforms, messages and emails	○	○	○	○	○
When communicating with other people online, students should always consider the impact their message can have	○	○	○	○	○
Students should always (or try to) be respectful to others (in anonymous interaction they should not disrespect people)	○	○	○	○	○
Students should be aware of the norms of different cultures and respect those online	○	○	○	○	○
Students should be good at attracting attention online (e.g. getting more followers on Instagram)	○	○	○	○	○
Students should stand out with their online profile(s)	○	○	○	○	○
Students should be able to manage and construct different identities or profiles in the digital world	○	○	○	○	○
Students should be able to manage their contacts in different social networks	○	○	○	○	○
Students should be a part of different social networks to manage contacts and stay in touch (e.g. LinkedIn for professional use, Facebook/Instagram/ Snapchat for private contacts)	○	○	○	○	○

Students should appreciate the strenghts and weaknesses of other people and try leveraging those when interacting with others digitally	○	○	○	○	○
When doing teamwork digitally, students should be able to motivate other people or plan the work	○	○	○	○	○
Students should be able to cooperate efficiently with the help of digital technologies. With the help of other people, they should solve problems digitally	○	○	○	○	○
It is becoming more and more important that people can work together through digital technologies	○	○	○	○	○
Students should not encounter problems with solving problems with the help of the internet	○	○	○	○	○
Students should be able to negotiate via different forms of online communication (text, speech, video)	○	○	○	○	○
Students should be able to present results or solutions via different digital media (Skype, email, video, presentation, text)	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning student's skills of creating content online.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Students should know how to use strategies to help them create and/ or develop new ideas (brainstorming, mind-mapping)	○	○	○	○	○
When searching for ideas, students should use strategies like mindmapping to create them	○	○	○	○	○
Students should be able to create new content (write own texts, make photos or combinations)	○	○	○	○	○
Students should be good at creating attractive online content	○	○	○	○	○
Students should be able to recombine different content or information in new ways tp create something new	○	○	○	○	○
When producing own content, the students should check if other people are doing the same	○	○	○	○	○
Own content should be unique, so the student should check if other people are having the same ideas	○	○	○	○	○
The student should not care if he/she has the same content as other people	○	○	○	○	○
It is not possible to check everywhere if someone has the same ideas as the student, so they should just go for it	○	○	○	○	○
After disseminating/ uploading content/ information, the student should check how other people respond	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning student's skills.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
When students are confronted with contradicting information to their beliefs, they should keep on insisting they are true	○	○	○	○	○
Students should be able to change their own views and beliefs when somehting else makes more sense	○	○	○	○	○
When evaluating their own doings, students should consider different views and sides	○	○	○	○	○
When confronted with other information, students should be able to correct their views and decisions	○	○	○	○	○
When learning somehting about their decisions, students should be able and willing to correct and revise them	○	○	○	○	○
Students should be able to compare different information (from different viewpoints and sources)	○	○	○	○	○
Students should be able to combine information (from different and sources)	○	○	○	○	○
In order to reach a goal, students should be able to compare and combine information (e.g. comparing and combining different sources to create something new)	○	○	○	○	○
Students should be able to integrate different information to solve a task	○	○	○	○	○
Students should be able to evaluate their own decisions (e.g. what they could have done better, like specifying search keywords, making more informed choices, being more critical towards information)	○	○	○	○	○

Please rate how strongly you disagree or agree with the following statements concerning student's skills.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Students should know their own digital skills and abilities	○	○	○	○	○
Students should know the digital skills which they need to improve	○	○	○	○	○
Students should want to learn / continue learning to improve their skills	○	○	○	○	○
Students should be eager on improving skills regarding new technologies	○	○	○	○	○
Students should be able to develop goals, short-term and long-term	○	○	○	○	○
Students should be able to adapt to new opportunities and challenges	○	○	○	○	○
Students should be able to manage different goals at the same time	○	○	○	○	○
Students should be able to manage their time and workload	○	○	○	○	○
Students should be aware of the current developments of technical devices and new software	○	○	○	○	○
Students should be aware of the new digital trends	○	○	○	○	○

How old are you?

What is your nationality?

- German
- Dutch
- other

You are

- male
- female
- other

What is your highest educational qualification?

- Secondary general school certificate (Hauptschulabschluss)
- Intermediate School certificate (Realschulabschluss)
- University entrance qualification (Hochschulreife)
- Apprenticeship/ vocational training (Lehre/ Berufsausbildung)
- Bachelor
- Master
- Diploma
- Doctors degree (Promotion)

If you went to University, did you study one of the following?

- No
- Communication Science
- Computer science (IT)
- History
- Economics

Are you currently having a job related to

- Communication science
- Computer science (IT)
- History
- Economics
- None of the mentioned

Are you currently working at a job related to what you studied?

- Yes
- No

How long have you been working at your current job (or in the same field)?

Years	
Months	

At what age did you start using the internet?

How many hours a day do you spend using a technical device (e.g. phone, computer, tablet)?

How many devices do you own and use (Laptop, Computer, Tablet, Smartphone, Smartwatch)?

At what age did you own your first device with connection to the internet?

At what age did you own your first digital device (e.g. computer, phone, camera)?

How many hours a day do you spend using a technical device for work?

How many hours a week do you spend with analogue media (e.g. books) for your work?

How useful do you perceive the internet to be for your work?

Final Block

Thank you for answering all the questions. Please go to the next page to finish the survey.

If you want to take part in the drawing of 10 Amazon vouchers of 10€ each, please fill in your email address. Your address will be handled completely confidential and will not be saved with your responses. It will be deleted once the winners are informed.