Experience of Students with the Digitization of Higher Education Examinations

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Abstract

Higher education examinations are becoming increasingly digitized, especially since the abrupt switch to online education during the COVID-19 pandemic. However, student opinions on taking different types of examinations are rarely explored. This study aims to investigate student perceptions of the digitization of higher education examinations at the University of Groningen. In-depth interviews of four participants were conducted to talk about their experiences with digital and online examinations during and after the COVID-19 pandemic. Student responses predominantly discussed stress levels, distractions, difficulties with technology, efficiency, and autonomy in relation to taking digitized examinations. Stress levels turned out to be lower during digitized examinations in comparison to traditional examinations and distractions were minimal during online examinations. Participants showed appreciation for the efficiency and autonomy of digitization, however, the results also showed difficulties and downsides of the use of digital devices. Despite criticism in certain areas, participants were in favor of the digitization of higher education examinations and emphasized that further improvement is needed for an ideal exam environment.

Keywords: online examinations, digital examinations, student experiences, higher education

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The COVID-19 pandemic has spurred a drastic change in education in the past few years causing strict measures to be taken to minimize infection rates and necessitating most of educational practices to move online (OECD, 2020). These unforeseen circumstances left little room for preparation in constructing an ideal environment for online learning and teaching. Both educators and students were forced to adapt to a new system in a short period of time, and the effect of such a change seems to have created a myriad of opinions, both positive and negative (Djidu et al., 2021).

The digitization of examinations will likely have an impact on the students as it determines a significant percentage of a students' grades. During the pandemic, paper-based examinations were no longer permitted and students had to take their exams online instead. Though the pandemic greatly encouraged the digitization progress within education, studies on digital and online education have been conducted even prior to this drastic change.

For example, studies by Dermo (2009) and Rudland et al. (2011) showed mixed opinions on the digitization of examinations. The former mainly indicated preferences of students with a great lack of in-depth reasoning while the latter provided a list of positive experiences and some constructive criticism. Positives included flexibility and conveniency of time and place, being able to review, revise and research after the exams, lessened fatigue and instant feedback whereas criticisms referred mostly to fixing technical concerns such as accessibility issues. Ultimately, regardless of both studies being quite outdated in terms of the technological advancements that have been made in the past decade, they show that there are advantages to utilizing digitized assessments. In more recent studies, other issues that tend to overshadow these positive attributes arise. Shraim (2018) as well as Küppers and Schroeder (2019) found that students were mainly concerned about fairness, cheating, plagiarism and fraud, which are difficult to verify, especially during online examinations.

Milone et al.'s (2017) study proved that such issues could be tackled with the use of a monitoring software. Due to a high number of enrolments for most online classes, multiple-choice exams were often utilized. The students had the choice of taking these exams in one of the two different environments. The first was a provided space for computer-based examinations monitored by a teaching assistant that had to be attended in person. The second could be done at home and online with the use of ProctorU, which is a specific online proctoring service that uses webcams to prevent cheating or fraud. Despite the mixed opinions on using proctors and online exams by students, the overall experience was rated rather positively as the service was convenient and time of the exam could be chosen freely. The reason for the mixed opinions on the usage of proctors mainly stemmed from issues with setting up the service. Though it was convenient, there were instances where getting them set up took much longer than expected. Some students also mentioned the inefficiency of the process of scheduling the exams, the issue of potential technical issues and the discomfort in using proctors. However, these factors were only mentioned by the minority of students.

The use of a software in the process of digitization in university for examinations does not seem to be an uncommon occurrence. A study conducted by Ardid et al. (2015) took a look at a software called PoliformaT, which uses different question types for assessments. These include multiple choice, numeric, specific, and open text questions. During a test, these questions will randomly be assigned to students so that each has a different test. No significant differences were found in the results between online and in-person exams, which could imply that the exams remain fair even if moved online. It must be noted, however, that this study was only conducted with different bachelor degrees at the University the software was developed at, therefore, the external validity may be considered as low. Furthermore, it is difficult to see how the use of these types of assessments impacts the attitude of students as the study did not explore their experiences of using this software.

The previously mentioned studies have experimented with different ways of conducting exams online, or otherwise digital. It is also important to mention qualitative research that focuses on the experiences that students have made while taking different types of online exams. An example of this is the recent study done by Curelaru et al. (2022) which explores the experiences students make through the transition from face-to-face classes to online classes. Even though the main focus in the study was on the learning aspect, some anecdotes about the exams made by students were also included. The most relevant factor was technology. Accessing one's account, being able to navigate the platform used, Internet connection, and so forth, all affected the exam-taking process for students. Several students also mentioned that the comfort of being in their own homes helped them control their levels of anxiety and stress while taking exams.

A more in-depth comparative study between computer and paper-based tests was conducted by Al Q-Dah and Ababneh (2017). The study was done with students who had no experience in taking online examinations and the purpose was to explore whether there would be a significant difference in results. A learning system quiz tool called 'Moodle' was utilized for the tests. This interactive learning tool is widely used as it can provide resources for learning and also to set up assignments and exams, similar to the PoliformaT software. In the results of this study, it was reported that there was only a slight preference for paper-based exams. However, students found automatic exam results, feedback, and overall, less time taken for the exams, more appealing when it came to the online exam. An interesting finding was that computer majors preferred to read on paper and write by hand while English majors preferred typing on computer screens. Even though there were some complaints that reading from a screen slowed the students down and that it was stressful for the eyes, most students agreed that the online exams felt more relaxed and less tiring. Additionally, in another study

by Hillier (2014), students mentioned that proficiency in typing and familiarity with computers might cause some to have a greater advantage when taking exams.

A more qualitative study in this area of research includes, for example, the study by Berggren et al. (2015) that investigated how the introduction of digital examinations at the Royal Institute of Stockholm affected students, teachers and administrators. Student experiences were gathered from mandatory evaluation sheets that were filled out after each examination. The study was done in two stages: the pilot trial and the 'going live' stage. The digital exams were taken on students' laptops or a provided laptop if a student did not have one available. In the pilot trial, there was an overwhelmingly positive amount of feedback, especially when it came to written examinations, though not many details were provided in this stage.

The initial trial prompted a study with a larger sample size in the 'going live' stage. Students in this study had the freedom to choose courses based on the type of examinations that were offered, such as digital or traditional examinations. Nearly 90% of students chose to do digital examinations. Again, the feedback was overwhelmingly positive with most negative feedback being constructive criticism regarding software. Students mentioned three major advantages of digital examinations. The first was that quick grading and feedback left enough time to reflect on the exam. The second was that students experienced less stress because typing made it easy to edit answers. Furthermore, there had been complaints about hand cramps or wrist pain during traditional exams, which were no longer a problem during digital exams. Thirdly, students mentioned that they preferred how examinations were anonymous since names or date of birth were not displayed during grading and handwriting did not give away who wrote the paper. They also felt that anonymity made digital examinations fairer.

A similar study was conducted by Rytkönen and Myyry (2014). The study took evaluations from both online and digital examinations and the student feedback was received through online questionnaires. Similar results to the study by Berggren et al. (2015) were found in terms of students feeling they had more control during digital examinations as they were able to edit answers in written exams. This flexibility helped them to give better responses. Students thought that traditional exams and digital exams took about the same time to complete. Although some, surprisingly, took longer to complete digital exams because of the ability to edit. Some disadvantages mentioned were the inability to draw concept maps prior to formulating an answer and difficulty in visualizing the expected word count for an answer due to small font. Nevertheless, students were content with the experience and would continue taking digital exams in the future.

When it came to online exams, students mentioned a few more positive aspects of taking this type of exam. Students thought that being able to select their location significantly lowered anxiety and stress. On the contrary, however, some mentioned that too much freedom given during online exams elevated stress levels. The reason for this was that it was allowed for students to use any material available to them and this made it difficult to answer questions because of the time it took to narrow down information. Students appreciated being able to edit answers just as during the digital exams and even mentioned that online exams were "comparable to work-life methods and competences" (Rytkönen & Myyry, 2014, p.7) which created an enhanced learning experience.

Conclusively, the study by Rytkönen and Myyry (2014) argued that preference for online, digital or traditional exams is dependent on the type of student and what they feel is most beneficial to them. Despite differences in preference, the study stated that both digital and online exams had a positive effect on the learning experience overall.

There are numerous perspectives that need to be taken into consideration as higher education becomes increasingly digitized. Though these studies considered the perspective of students and did touch upon different elements such as the usage of technology, stress and exam proctoring, there is still a great lack of exploration within this area of research as digitized exams are increasingly utilized. It is noticeable that the feedback given by the students rarely goes into depth and does not regard topics beyond efficiency, stress and anxiety. Therefore, this paper aims to explore in more depth how students at the University of Groningen experience the digitization of higher education examinations in recent years, such as online examinations and computer-based examinations. Their opinions will be analyzed in order to develop an understanding of how digitization has impacted them and their studies, and what their perspective is on the changes being made for examinations as the use of digital technologies increases.

Method

Participants

This study was conducted using a convenience sample of four participants. Due to the time limitations of this research project, the number of participants has also been limited. The recruitment process was done through an e-mail invitation which included a study information form to give an overview of the topic and some details about the thesis. The participants had the option to accept or deny the invitation for an interview for which no monetary compensation was provided. It should be taken into consideration that of the participants, three were acquaintances and one a close friend, creating a possibility that they can have a tendency in holding similar opinions or beliefs. However, it was ensured that the interview was conducted with caution about leading questions and without a prior conversation on the topic of the research question within the context of the thesis.

Recruitment Process

Each participant was interviewed individually for around 30 to 40 minutes and the interviews were voice-recorded for reference during the analysis. The interview could take place through a video call or in person depending on the availability of the participant. Before the interview, the participants were given an informed consent form, which they had to sign to allow for the interview to be conducted. The participants were not required to provide any personal information; the only mandatory criteria were that the participants are currently students attending the University of Groningen and have experience with either digital or online examinations, or both.

Procedure

The interview included a series of open-ended questions about the participants' experiences taking digital and online examinations. The interview protocol (see Appendix B) was created before the data collection began. It follows the structural basis of Caspecken's (1996) book on critical ethnography. Furthermore, the number and the nature of the questions were dependent on how the participants answered and how much information they provided. The interview protocol can therefore be seen as more of a guide that helped the participants touch upon certain topics if applicable.

Analysis

After the interviews, the voice recordings were transcribed and coded using a program called ATLAS.ti. These codes were then used for a commonly utilized analytic method in qualitative research called the *'thematic analysis'* (see Appendix A) with suggestions from Braun and Clarke's (2006) paper.

Codes are labels of the raw data that is prevalent or of importance. More specifically, they are simplified versions of words or phrases that reflect what participants have shared and can later be used in the creation of themes. An analysis was conducted in which both the

codes and the data as a whole are used for the creation of *themes*. These themes detect important data patterns that give relevant information as an answer to the research question (Braun & Clarke, 2006).

Specific approaches commonly used in qualitative research were taken for the thematic analysis. Firstly, an inductive analysis was carried out, which closely adheres to the existing data when creating codes and themes without any input from the researcher. Secondly, similar to the previous point, an explicit analysis was conducted. This means that the codes and themes are not interpreted further than the explicit content of the data. Finally, it was also an overall analysis that reflects the data as a whole.

The thematic analysis was used as a foundation for the results section. Each theme is described using quotes directly from the participants or by paraphrasing their words. Furthermore, pseudonyms are used for the participants to protect their anonymity. The pseudonyms for the participants are: Jack, Maria, Lisa and Leo.

Results

The thematic analysis resulted in five themes concerning the experiences that participants felt during digital and online examinations. The final themes also captured participants' experiences with taking paper-based examinations to be able to draw comparisons among the various types of examinations. For clarification, online examinations refer to at-home computer-based exams whereas digital examinations refer to in-person computer-based exams that are taken at a university exam hall.

Experiencing stress during digital or online examinations

The first and most prevalent theme was experiencing stress during digital and online exams. Stressful situations in these settings seem to derive from a range of factors, such as unfamiliar exam layouts and navigation, exam preparation, experiencing technical difficulties, and external distractions. Instead of comparing stress levels between digitized

exams and traditional exams, participants described their experiences and observations in terms of what circumstances or factors elicit as well as relieve stress during digitized examinations.

Lisa mentioned that digital multiple-choice exams were "generally stressful, [but] much easier because I didn't have to think about how to fill in a physical form, but I could just click things". They mentioned this point because they had concerns about potentially making a mistake while filling out the physical form of a multiple-choice sheet, in which students are required to fill out the answers to the questions separately for submission. They said that: "It already makes me a bit anxious to fill in the paper form correctly […] especially if you put in the wrong answer […] and you have to draw everything out and you have to put the next answer. But it feels quite limited because you can't put the wrong answer multiple times. There are only so many places that you can eradicate". Maria stated that it relieved stress to be able to type out answers for essay examinations, "I'm mostly stressed about when I write for essay exams because if I'm not fast enough and if I don't have enough time at the end, I won't have time to review the questions and it takes a lot more time and it's very, very stressful".

Furthermore, during essay examinations, handwriting was a prevalent concern among students. Even those that did not mind handwritten essay exams were worried about this factor and how it might affect their performance in the exams as the person grading it may be unable to decipher their writing. Lisa shared that it's "a thing where I'm always like 'Can she read this? Should I rewrite this because it's not readable enough?'" and that it's "really something that stressed me a bit during the exam". Leo added that "when you're typing you can have your mistakes and you can go back and edit, but with your handwriting, it gets super messy. I can't cross something out and write a tiny sentence in the margins." Overall,

participants felt that being able to type out the answers had a greater positive effect since it takes away a stress factor, making the exam experience less daunting and also less tiring.

Though the participants mentioned a number of positive aspects of taking digitized examinations, there are undoubtedly factors that also elicit stress and anxiety. According to the participants, these often tended to stem from technical issues or the structure of the exam. Lisa recalled struggling and panicking during an online exam due to an error with authentication codes. In particular, they mentioned that they were "sitting there […] two minutes after the exam started and I couldn't login and I was just getting crazy already, then I thought: 'I'm gonna fail'". In addition, Maria mentioned that being unfamiliar with an exam layout can be anxiety-inducing, especially "if they just tell you 'Log into the exam, you can start' and there are no instructions, that is nerve-wracking".

Dealing with distractions during digital or online examinations

The second theme concerns distractions during digital and online exams. It describes how students are exposed to distractions during examinations, particularly because of external factors such as being in the presence of others, certain noises made by objects or fellow students, and others experiencing technical issues in the same space. Some students seem to be affected by certain distractions more than others (such as the typing sound and the presence of others). For example, Lisa mentioned that, surprisingly, the typing sound did not bother them as much as they expected it to despite being easily distracted. On the contrary, they shared that "all the typing in the exam hall, for me it was more like white noise that helped me to concentrate […] and it was a bit nicer than just complete silence". Maria mentioned something similar and explained that though the initial start of the exam is nerve-wracking due to the sudden typing sound, it soon "gets diffused in the back of your head when you don't pay attention to the sound and I don't mind it anymore."

Jack and Leo had different opinions on this issue. They mentioned that it was "annoying" being able to hear the typing sounds of others and also expressed that they had difficulty focusing. In this regard, Leo said that "I was just staring at this person cause every time they click, I would instinctively just look at them". They added that this hyperawareness of the sound seems to have amplified after being used to the online environment at home in which they were not surrounded by so many different sounds at once. Not only was the typing sound distracting for these students, but they also mentioned that the sounds that other students made in the exam hall were a distraction. Leo stated that they became distracted "if I hear someone move or shift or cough". Similarly, Jack reported that "everyone is ill, everyone is coughing, it's like a hospital". Students also complained that they became distracted due to others needing to fix technical issues nearby. When a technical issue occurs during a digital examination in-person, students will need to call over the person in charge of holding the exam, and some expressed that these situations can become quite distracting. Leo, for instance, said that "[…] obviously when you're having tech issues and you have the lecturers with you, they're talking and they're trying to whisper, […] then you're stuck in the conversation. All I'm hearing is these people talking."

Distractions do not occur as often during online examinations, according to the participants. All participants mentioned that they did not experience distractions due to other people. Lisa and Leo added that when living with family or with a significant other during the pandemic, simply letting them know that they had an exam would be enough to provide a quiet environment. Leo indicated in this regard that "they were really supportive during this time. They knew. I would tell them I have an exam at this time [and] everyone would go down. Everything was quieter." Jack also added that they did not experience any distractions due to other people because they lived alone. Generally, all participants reached a consensus when it came to feeling less distracted during an at-home online exam.

Additionally, the lower levels of stress during online examinations mentioned in the previous theme also helped to increase concentration levels for some students like Lisa: "I have to think less about my handwriting or filling things out wrong, it's just much easier to correct things online and I feel like in such a stressful setting during an exam, every bit of stress that you can keep out [is] good because it allows [me] to better concentrate."

Difficulties and inconveniences with the use of technical devices during digital and online examinations

The third theme touches upon the difficulties students experienced with the use of technical devices and inconveniences they encountered due to the computers during digital and online examinations. This includes the experiences and effects of technological devices, whether it has to do with the different parts of a computer such as keyboards and screens, or how working with the computer affects one's state. Maria and Leo mentioned that they get frequent headaches from being in front of the screen for an extended period of time. Both mentioned the increased need for focusing on the questions and staring at a screen for a long time were the reasons for the headaches. Lisa said that "[taking digital exams] gave me a headache because I was very focused on the questions and sometimes, I have this thing when I'm very, very focused [and] I stand too close to the screen". Leo also added that "doing it digitally, it takes me ages because I'm trying to reread, get over a headache and process the information all at once."

Keyboard differences while taking the exams can cause hindrances according to some participants. The majority felt more comfortable using their own devices as they are more used to the layout, keyboard, and navigation process. For example, Lisa said that when it comes to keyboards "I have the German one and my boyfriend has an American one and I'm lost on that thing." Maria and Leo mentioned that the university keyboards tend to be quite loud because of the big keycaps and they are used to using a "flat keyboard", which is much

quieter. Maria also added: "I wouldn't say [the university keyboard is] confusing [to use], but if it's the old-fashioned keyboard where you can hear the key typing, it's annoying for the sound" and that it sounds like a "typewriter", which is very distracting. Finally, Maria shared that in the new exam halls, newer keyboards have been implemented that are much quieter and smoother to use.

The efficiency of digital and online examinations in comparison to paper-based examinations

The fourth theme covers the efficiency of digital and online examinations in comparison to paper-based examinations. Participants often referred to the time needed to finish an exam, speed of getting through an exam, flexibility of navigation, and convenience of layout depending on the type of exam. This implies that certain factors can make an exam more efficient than others. They also tended to compare the efficiency factor to paper-based exams, likely to explain it with a baseline reference. Students seemed to have contradictory opinions when it came to the efficiency of specific types of examinations. An example from Lisa is that they preferred having multiple-choice exams digitally or online because they thought paper-based multiple-choice exams made it difficult to browse and find questions, "because on paper […] there is this long list of […] 60 questions or something and then you have to look for which question was which and you have all the papers and it's just… you have to take much more time for it". According to Lisa, this was not the case with digital exams where there is an easy-to-navigate overview of all the questions. Meanwhile, Leo shared that they would prefer to have them on paper because they can take notes as they go regarding certain answers they are contemplating on and that it makes it "easier for us as students to process the information". Maria agreed with this point of view, especially when it came to exams that require calculations: "If it's on paper, I think it's very useful if you wanna

do calculations, if you wanna mark or underline the question, or let's say, if you wanna weigh the alternatives".

A downside in regards to essay examinations, on the other hand, is that on occasion articles were provided along with the exam. The way they had to be accessed was rather inefficient for the students as described by Leo: "If you want to access the articles you have to exit the question page." Exiting the question page meant that students could not copy and paste quotes they wanted to use and had to write them down on a separate piece of paper before returning to the question page to then answer the question. This turned out to be less of a problem during online exams because their personal computer allowed for a "split view" that made it easier to formulate their answers.

Apart from this point, participants generally perceived digitized essay examinations rather positively. They all preferred to be able to type out their answers, therefore feeling inclined towards digital and online examinations. Lisa says this is because it is "much less exhausting […] to write" and Maria adds that "it takes way more time to write […] 750-word type of essays with pen and paper […] rather than typing them out."

Freedom and autonomy of having a safe environment during online examinations

The fifth and final theme encompasses the freedom and autonomy of having a safe environment during online examinations. It covers the positive experiences students encounter while taking online exams from the perspective of such an environment. The ability to move around and have necessities nearby seems to create a so-called safe space for students during the stressful and anxiety-inducing experience of taking an exam. Students shared that ways of recollecting oneself and refocusing are often restricted in an exam hall. Therefore, being in one's home can provide the autonomy that many wish to have. Being able to freely take a break when needed without feeling the pressure to continue when in the presence of others seems to have a positive effect on one's mental state. For example, Leo

mentioned that "I don't have people walking around me making me feel really anxious to perform really well" and Lisa also added that they "could even quickly go outside and take a breath of fresh air and go back in. Just these kinds of small things that can be super helpful when your head is fuming."

In contrast to this freedom in online exams, a regulation during examinations in an exam hall is that if one leaves the hall at any point, they cannot return to continue their exam and no exceptions are permitted. Participants stated that needing to go to the bathroom tends to be an issue that they face. For example, Jack feels "more comfortable. […] I can go wherever I want. If I want to stand up, I can do it, if I forget something cause of stress [or] I need to go to the toilet […] then I know that I can do it". This was of importance for Lisa as well, saying that she "can't stress this enough, I have a very weak bladder and I could go to the toilet at any time […] I had to leave exams earlier because I couldn't wait any longer." Leo also mentioned that it was nice being in the company of family because they felt that the thought of being able to go to them after the exam will help relieve stress: "you would finish and you could just go to wherever your family is and be like, 'I'm done. […] I deserve a snack; I deserve a break.'"

Discussion

To recapitulate, the goal of this study was to explore how students are experiencing the digitization of higher education examinations. As the result section shows, there were five prominent topics which the students touched upon. Experiencing stress and anxiety was a significant factor for students in the exam-taking process. Participants mentioned how being able to type out answers relieved stress and anxiety, especially about making mistakes. There were no more concerns about unreadable handwriting or being unable to edit or add text at any point. Overall, there was a consensus about the preference for typing answers rather than writing them by hand. Participants of the current study, the study by Rytkönen and Myyry

(2014) and the study by Berggren et al. (2015), all mentioned how the flexibility and control they had during written digitized examinations made the experience less anxiety-inducing.

Another prevalent theme that is closely connected to experiencing stress was dealing with distractions. The sound of typing was frequently brought up during the interviews. Some perceived it as white noise that either helped them concentrate or did not bother them, while others perceived it as irritating and distracting. There is a lack of detail in previous research on exam-taking experiences regarding the environment, thus it is uncertain whether those with a higher auditory sensitivity may find certain sounds more distracting. Even those that regarded the sound of typing as white noise mentioned other types of sounds that they found irritating, especially in relation to fellow students. Types of distractions mentioned by all participants were hearing others cough, shift or move around as well as hearing others communicate with supervisors due to technical issues. Participants were much more positive about the lack of distractions during online examinations. They enjoyed the silence in their own homes and all mentioned that there were rarely distractions that bothered them, thus, it could be that a comfortable and safe space can make a person less aware of their surroundings and also less prone to distractions.

For a further positively enhanced exam-taking experience, students mention the factor of efficiency as being valuable. Because students often completed the digitized exams faster, they were left with more time to review, edit and improve answers. Contrary to the results of the study by Rytkönen and Myyry (2014), in which students mentioned that digital examinations can take longer than traditional exams, participants of the current study emphasized that they finished written digital examinations quicker. The speed of going through an exam will most likely be quite individual. Some may take the opportunity of being able to edit to take more time to answer questions, while others might focus on writing as much as possible in a shorter period of time. Al Q-Dah and Ababneh's (2017) study showed

that students preferred online exams because they are able to complete them more quickly and also receive the results and feedback soon after. Participants of the current study did not mention many details regarding feedback time. Maria stated that there is no difference for her in how long it takes to receive feedback between digitized and traditional exams. Jack, on the other hand, shared that for online multiple-choice exams, the feedback was immediate. Feedback seems to be dependent on the type of exam and the professor, therefore it is difficult to say whether this is true in most cases of digitized exams. However, the function to allow for immediate grading is a possibility for digital and online multiple-choice exams. Whether or not this function is utilized depends on the course regulations. Participants did not share their point of view on time taken for feedback.

As for the use of technology, it is inevitable that this will increase with the rise of digitized examinations. Some students are more adapted to the use than others which could show a difference in effects as well. Some mentioned how the extended period of screen time caused headaches while others were not affected by screen time at all. Similarly, Al Q-Dah and Ababneh's (2017) study had participants mention how staring at a screen strained the eyes and that it slowed reading speed for some. Exposure could be the reason why individuals are differently affected by screen time. For example, in the current study, the students who had no complaints about screen time also mentioned that they frequently use a computer in their own time for longer hours. It can be speculated that being accustomed to extended periods of screen time could be an indication one will be less affected by it.

Finally, the freedom and autonomy that online examinations allow made students feel positively about the exam itself as well. The reason for the significantly lowered stress and anxiety levels came from the low-pressure setting of being at home. Being able to take breaks to move around if needed, not having the presence of others around and having their own space for an ideal exam environment suited for each individual made the experience less

daunting and overwhelming. The study by Curelaru et al. (2022) had students mention the same about being able to control stress and anxiety levels in their own homes. Additionally, not worrying about having to go to the bathroom when needed was mentioned. This is especially true for those who may have conditions that require them to go to the bathroom frequently, but are unable to do so during in-person exams. Participants in the study by Al Q-Dah and Ababneh (2017) also mentioned how online examinations were more relaxing and less tiring.

Some other notable findings regarding digitized examinations that can be compared to the current study were mentioned by Curelaru et al. (2022). Their study showed that there was a correlation between certain majors and preference for writing by hand or typing. This, however, was not the case in the current study. There were no preferences in relation to major. Additionally, in Berggren et al.'s (2015) study, a student commented that it was difficult to visualize how long an answer should be during written digital examinations. From personal experience, this would not be an issue for the students at the University of Groningen as, for most examinations, there is a given maximum word count for each of the questions as well as a word counter for each answer box that shows how many words a student has typed.

Though the in-depth interviews provided much detail regarding a variety of topics, there are some limitations in this study that need to be acknowledged. First, the small sample size makes it difficult to generalize these outcomes to the majority of student experiences. An additional point to consider is possible bias due to the convenience sample which included acquaintances and a close friend. This, however, was taken into consideration during the data collection. Second, the sample was derived only from students at the University of Groningen. The level of digitization, types of software used, rules and regulations for examinations and so on, all differ depending on the university. Once again, this makes the

external validity low. Moreover, the University of Groningen can still be seen as being in the introductory phase in terms of the digitization of examinations. Not all courses offer digital examinations and online examinations have rarely been utilized since the end of the pandemic quarantine. Much improvement has yet to be made for digitized examinations and opinions may change once these improvements are implemented.

Conclusion

In conclusion, despite a number of negative or unsatisfactory experiences while taking digitized exams, participants of this study were all supportive of the digitization of higher education examinations. The majority of "negative" experiences were expressed in terms of constructive criticism and minor complaints which did not necessarily discourage this educational development. The participants also agree that exploring the experiences of students with the rise of digitized examinations is important for future improvement of its structure and procedures. It can provide insight into what students feel is lacking in terms of learning experience when they opt for digitized examinations. This can in turn be used to find what factors can be implemented for such examination types to then be able to create a more valuable learning experience. Students also seem to be quite understanding when it comes to shortcomings or issues related to technological developments and are most aware of what needs to yet be improved. Though the current study was not able to recruit more participants due to time limitations, it shows that students are able to give detailed feedback through their experiences in their respective studies. Studies exploring student experiences will be helpful if done on a larger scale with a wider diversity of students from various universities.

Digitization of education, and of educational assessments in particular, is an important area of research due to the exponential growth in technological advancement and increasing implementation of digital devices in the academic world. Students, who are the majority of the academic world, have the most insight on what is effective for their learning process,

especially when it comes to examinations. Therefore, I would argue it is important to continuously learn about how the students experience such changes as they are the ones that will be affected by them the most.

References

Al-Qdah, M., & Ababneh, I. (2017). Comparing online and paper exams: performances and

perceptions of Saudi students. *International Journal of Information and Education

Technology*, *7*(2), 106–109. https://doi.org/10.18178/ijiet.2017.7.2.850

Ardid, M., Gómez-Tejedor, J. A., Meseguer-Dueñas, J. M., Riera, J., & Vidaurre, A. (2015).

Online exams for blended assessment. Study of different application

methodologies. *Computers & Education*, *81*, 296–

303. https://doi.org/10.1016/j.compedu.2014.10.010

Berggren, B., Fili, A., & Nordberg, O. (2015). Digital examination in higher education–

experiences from three different perspectives. *International Journal of Education and

Development Using ICT*, *11*(3), 100–108.

http://files.eric.ed.gov/fulltext/EJ1086656.pdf

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research

in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Carspecken, P. (1996). *Critical Ethnography in Educational Research: A Theoretical and

Practical Guide*. Routledge.

Curelaru, M., Curelaru, V., & Cristea, M. (2022). Students' perceptions of online learning

during COVID-19 pandemic: A Qualitative Approach. *Sustainability*, *14*(13),

8138. https://doi.org/10.3390/su14138138

Dermo, J. (2009). e-Assessment and the student learning experience: A survey of student

perceptions of e-assessment. *British Journal of Educational Technology*, *40*(2), 203–

214. https://doi.org/10.1111/j.1467-8535.2008.00915.x

Djidu, H., Mashuri, S., Nasruddin, N., Sejati, A. E., Rasmuin, R., Ugi, L. E., & Arua, A. L.

(2021). Online learning in the post-COVID-19 pandemic era: is our higher education

ready for it? *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: e-Saintika*, *5*(2),

139–151. https://doi.org/10.36312/esaintika.v5i2.479

Education responses to covid-19: Embracing digital learning and online collaboration. (2020,

March 23). OECD. https://www.oecd.org/coronavirus/policy-responses/education-

responses-to-covid-19-embracing-digital-learning-and-online-collaboration-

d75eb0e8/

Hillier, M. (2014). The very idea of e-exams: student (pre)conceptions. *Proceedings of

ASCILITE 2014 - Annual Conference of the Australian Society for Computers in

Tertiary Education*, 77–

88. http://ascilite.org/conferences/dunedin2014/files/fullpapers/91-Hillier.pdf

Küppers, B., & Schroeder, U. (2018). Students' perceptions of e-assessment. *Springer

International Publishing EBooks*, 275–284. https://doi.org/10.1007/978-3-030-23513-

0_27

Milone, A. S., Cortese, A. M., Balestrieri, R. L., & Pittenger, A. L. (2017). The impact of

proctored online exams on the educational experience. *Currents in Pharmacy

Teaching and Learning*, *9*(1), 108–114. https://doi.org/10.1016/j.cptl.2016.08.037

Rudland, J., Schwartz, P. J., & Ali, A. (2011). Moving a formative test from a paper-based to

a computer-based format. A student viewpoint. *Medical Teacher*, *33*(9), 738–

743. https://doi.org/10.3109/0142159x.2011.577119

Rytkönen, A., & Myyry, L. (2014). Student experiences on taking electronic exams at the

University of Helsinki. *EdMedia: World Conference on Educational Media and

Technology*, *2014*(1), 2114–2121.

https://helda.helsinki.fi/bitstream/handle/10138/158506/edmedia2014_StudentExperie

nces_Rytkonen_Myyry.pdf?sequence=1

Shraim, K. (2019). Online examination practices in higher education institutions: learners'

perspectives. *The Turkish Online Journal of Distance Education*, 185–

196. https://doi.org/10.17718/tojde.640588

Appendix A

Thematic Analysis

Theme 1: Experiencing stress while taking digital or online exams

This theme covers the stressful experiences students make during digital or online examinations. Though digitized examinations can elicit stress, some factors relieve much of the stress that is experienced during traditional examinations. According to all participants, situations that elicit stress can involve coming across technical difficulties, external distractions such as sounds and environment, the unfamiliarity with navigating the exam layouts, and even preparing for the exams. To be more specific, participants often mentioned that having technical difficulties, especially at home, can be quite stressful as there is often no one around to help resolve them, and having to contact the professor or coordinator in charge can be quite time-consuming and anxiety-inducing. This occurs less often during digital exams as it is easier to ask for assistance. Some mentioned that the noises around you during digital exams in person can be quite distracting and in turn also stressful. Noises and sounds include loud typing, students moving around, coughing, and announcements made by lecturers during the exam. Furthermore, being in an exam hall was said to be quite intimidating because students are aware of others students around them. This means that when students begin typing rapidly or when students leave early, it can give an impression that one is either too slow or that they feel they are not as prepared for the exam, making them feel anxious and stressed during certain parts of the exam. On the other hand, an upside that relieves some stress from students is that typing is much easier and less tiring than writing by hand when it comes to essay examinations. Online exams were also said to be less stressful because many allowed for having one's study resources open, which helped ease anxiety both in preparation for the exam as well as sitting the exam. Generally, being at home

can create a "safe space" that can relieve both stress and anxiety in a such high-pressure situation as being in an exam.

Theme 2: Dealing with distractions during digital or online exams

This theme describes how students deal with and experience distractions during digital or online examinations. Participants mentioned that distractions commonly occur due to external factors such as being in the presence of other students, noises and sounds, and others experiencing technical issues. How distractions are perceived seems to depend on each person with some being more sensitive to certain distractions than others. For example, two students that explained how the typing sounds of other students act as white noise to increase concentration while the two other students mentioned that it was quite distracting and it would constantly take them out of focus. Additionally, some participants mentioned that other students in the exam hall experiencing technical difficulties can be quite a distraction because they cannot help but put their attention to them and get carried away by their whispered conversation of instructions. Some also said that they would get distracted by other students who got up after finishing an exam or those who would subconsciously make sounds with their mouths.

Distraction-wise, participants shared much more positive experiences with online examinations that are taken at home. Many mentioned that simply telling family members to keep quiet for a couple of hours while they take their exams was enough to provide them with a distraction-free environment. All mentioned that the people around them were respectful when it came to such situations and made sure that they could take the exams in peace without distractions.

Theme 3: Effects of technology on students during digital and online examinations

This third theme discusses how the use of technology affects students during digital and online examinations. This can include how students feel about using certain technological devices and their general relationship with it. Two participants mentioned that they would consistently get headaches when taking exams that require the use of a computer. They say that this is due to the extended period of time of staring at a screen, which strains their eyes, as well as the contrast between the bright lights in the exam hall and the rather dark screens. Additionally, a participant mentioned that reading comprehension is more difficult when reading off a screen. They are not sure what the exact reason for this is, but they find themselves re-reading questions and excerpts that are displayed on the screen, which becomes quite time-consuming. Other participants, however, mentioned that because they generally spend much time online, an exam that lasts two to three hours does not have a significant effect on them.

Another point that was mentioned by the participants is that an unfamiliar keyboard can cause a bit of discomfort and that they prefer using their own devices because it is easier to use since it is more familiar.

Theme 4: The efficiency of digital and online exams in comparison to paper-based exams

The fourth theme talks about the aspects that are more efficient in different types of examinations. Since digitized examinations are constantly optimized, it can be expected that they will continuously become more and more efficient. The speed of finishing an exam seems to be the main efficiency factor when it comes to digital and online exams, especially for essay examinations. All participants agreed that typing is much faster than writing by hand and in some ways also more efficient. This is because typing leaves plenty of room for

adjustments and editing, which can be more difficult when writing by hand. Mistakes can easily be erased and rewritten while typing, however, when writing by hand, it is difficult to cross out passages and try to add things in the margins. Since essay examinations also sometimes have a certain word count, it is much easier while using a computer since it automatically shows how much one has written, while in handwritten exams, students have to manually count or guess how much they have written.

Generally, navigation and convenient layouts of digitized exams can be more efficient, according to the students. Despite mentioning this, some still prefer the traditional paper-based examinations because you can take notes as you go when unsure about questions, especially when it comes to multiple-choice exams.

Theme 5: Freedom and autonomy of having a safe environment during online exams

This theme touches upon experiences students make during online examinations while they are in the comfort of their own homes. Participants all said that they felt the most comfortable and calm while being in their so-called safe space at home because it allowed for many things that are not possible for examinations that take place at the university. Examples of this include being able to move around freely during the exam to take a break, get some fresh air, or have some food, and being able to shut out most noise and sounds.

A common concern during in-person examinations was that students are not allowed to leave the exam hall during an exam, meaning that they cannot leave if they are planning to come back. This was a concern because, as some participants mentioned, there are times when they have to go to the bathroom, but cannot leave before they finish an exam. It caused them stress and the thought of knowing that they could not go made them want to go even more. However, this was not an issue while taking the exam at home since they were able to go to the bathroom whenever they needed.

Generally, participants preferred having this type of environment while taking an exam because it helped them focus better and feel less anxious.

Appendix B

Interview Protocol

Lead off question 1: Do you recall a recent time that you had to take a digital examination, more specifically, an exam that you had to take in person using a computer? Could you describe the process to me in detail and any thoughts you had while taking the examination?

[Covert categories: proficiency using digital devices; fairness; technological hurdles; exam structure; attention/concentration; positive and negative experiences]

Follow-up questions:
-   Could you take me through how the exams were structured?
-   Could you tell me more about how it was to take exams using a computer?
-   How would you describe taking digital exams in person in comparison to taking paper-based exams?
-   Do you feel any differences between typing and writing?
-   Are there any impressions from taking these exams that were memorable to you?
-   Technical difficulties or frustrations?

Lead off question 2: Now that you shared some of your personal (individual) experiences, I'm also wondering what it was like for you to take digital exams in an exam hall. Can you share any thoughts you have about taking such an exam with the company of other students around you?

[Covert categories: concentration; screen time; distractions; nervousness/anxiety]

Follow-up questions:
-   How did you feel while taking these digital exams? Could you tell me in detail what thoughts went through your mind or any emotions you felt?
-   You told me the exam was […] long, how do you feel about the length of the exam?
-   Does taking the exam in the presence of other students affect you in any way?
-   Is typing distracting?

Lead off question 3: I'm going to ask about a slightly different type of exam that was especially relevant during the pandemic. Could you, in detail, tell me your thoughts on taking online examinations during this time?

[Covert categories: technological issues; positive and negative experiences; exam structure; cheating/fraud]

Follow-up questions:
-   Since you use the computers provided to you when you take the exam at university, how is it different to use your own devices?
-   Was the structure of the exam similar to the one you take in person?
-   Were there any specific rules and regulations that you had to keep in mind while taking online exams?
    -   How do you feel about the surveillance during online exams?
-   How is taking the exam digitally in-person different from taking an online exam at home?

Lead off question 4: Taking an exam at home is a completely different feeling than when you are taking it in person, in my experience. What was it like for you?

[Covert categories: attention span; distractions; differences between take-home exams and exams at an exam hall; comfort levels; learning experience]

Follow-up questions:
- Can you describe the environment you were in while taking these exams?
- Presence of other people at home?
- How do you feel about the screen time?
- Does the aspect of taking an exam digitally using a computer at home feel different from when you are at an exam hall?
- I'm curious about your learning experience while taking online exams. How did you prepare for them in comparison to digital exams in person?

Final question: How do you feel about the change from paper-based exams to digital exams?