

University Students' Experiences of Various Note-Taking Habits

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Abstract

This research aims to provide an answer to the following research questions: (1) How do University students experience the engagement with different note-taking habits? And: (2) How do digital note-taking habits contribute to University students' studying habits in comparison with analogue note-taking habits? Research suggests benefits to both digital as well as on-paper note-taking habits. In the current study, qualitative semi-structured interviews were conducted with students ($n = 4$) from the University of Groningen. Using a phenomenological approach, the study aimed to explore the students' experiences with various note-taking habits. After data collection, thematic analysis was conducted in order to explore common patterns and themes. Three themes are discussed: (1) The efficiency of digital note-taking habits, (2) Less active engagement with digital note-taking habits, and (3) Context dependency. Digital notes tend to be efficient when it comes to speed and availability. However, taking notes digitally appears to be less actively engaging than taking them by hand. In addition, there are many different contexts in which students can make use of note-taking habits, and this affects which habits are expressed and how students manifest them. Keeping in mind the increasingly digitized learning environment, the results can be used to develop the most fitting note-taking strategies for students. Future research can improve limitations of the study such as making use of a convenience sample, for example by making use of a simple random sample.

Keywords: Note-taking, Note-taking habits, Digital learning, Digital note-taking habits, On-paper note-taking habits

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The past few decades have seen a rapid increase in the use of digital tools in daily life. Today's youth tend to grow up with many different digital tools available, such as mobile phones, laptops, gaming consoles, etcetera. In homes, these tools are being used frequently, and in academic settings it is becoming increasingly common to employ more digitized forms of education. With the availability of many digital tools and studying materials increasing, there is an ongoing shift to more frequent online learning. This shift towards education with new technologies might transform what people learn, how they learn, and where they learn (Warschauer, 2007).

When the COVID-19 pandemic emerged and affected most countries around the world, a rapid transition towards fully online education had to be implemented in order to continue with education under circumstances characterized by multiple restrictions and regulations. This unprecedented situation required decent and efficient forms of online education tools and methods, as well as the availability of knowledge on how to make the general process of online education most effective and achievable for both students and teachers. Precisely because of these challenges, however, educators and students gained first-hand experiences with online education, which allowed them to learn about its qualities that might also be beneficial to future uses of online education (Hussein et al., 2020). Thus, several lessons can be learnt by the COVID-19 pandemic even for educational settings, mostly regarding how to use digitized forms of education in more fruitful ways.

As forms of education are becoming increasingly digitized, it is expected of students to have adequate knowledge of the digital tools used for academic purposes. As it is nowadays normal to grow up in a highly digitized environment, this seems to be feasible for most students across the globe. What is a more complex process, however, is studying efficiently in

an academic world that increasingly often consists of a mixture of in-person and digital forms of education. This mixture of educational forms requires students to be motivated, determined, and able to implement study methods that could help them succeed in the modern, complex learning environments. In order to succeed in academic life, many students tend to develop personal study habits that suit better their learning purposes. According to De Houwer (2019), habits can be described as “*behaviors that are emitted frequently or in a persistent, automatic manner*” (De Houwer, 2019, p. 2). According to Bibi and colleagues (2020), study habits cover different elements such as a student’s individuality, daily routines of a student, and preparation time apportioned for routine tasks. In short, study habits are the patterned behaviors implemented by students related to their studies (Bibi et al., 2020). Research by Rabia and colleagues (2017) has indicated that several students, even those with a high intellectual capacity, might show poor academic results because of unsatisfactory study habits (Rabia et al., 2017).

Whilst there are many different analogue as well as digital types of study habits, this paper focuses on note-taking habits, both analogue and digital. There are many different types of note-taking habits with differing functions that students usually implement. According to Kiewra and colleagues (1991), there are three main functions of note-taking habits: (1) encoding, during which a student takes notes but does not review them, (2) encoding plus storage, during which a student takes notes and reviews them, and (3) external storage, during which a student is not present during a lecture and reviews borrowed notes. According to this study, encoding plus storage is the superior note-taking method, whilst encoding appears to be the least efficient method (Kiewra et al., 1991). According to research by Crumb and colleagues (2022), taking notes by hand benefits the process of encoding material and results in external storage of higher quality in comparison with digital note-taking (Crumb et al., 2022). Overall, note-taking and the process of reviewing these notes appear to be positively

related to students' academic achievement. It should be noted, however, that not all students prefer taking many notes, and there are also several factors that are able to constrain the note-taking habits and reviewing methods, with an example being lecturing rate (Kiewra, 1987).

Whether students' academic achievement is improved by certain note-taking habits appears to depend on the type of lecture and whether the student tends to review his or her notes (Luo et al., 2018). Besides, according to Morehead and colleagues (2019), the efficacy of note-taking habits, in regard to academic achievement, further depends on a lecturer's style and course material. Thus, the relative efficacy of note-taking habits may differentiate in circumstances. Morehead and colleagues provide an example that depicts how taking notes digitally is likely more efficient in circumstances in which lecturers speak rapidly or when lecture slides do not include visuals (Morehead et al., 2019). Another study by Wong and Lim (2021) found that there is a superiority effect for handwritten notes. Their experiment found that students who take photos of lecture materials rather than taking notes tend to perform more poorly. They also investigated a group of students that did not take any notes at all when watching a video-recorded lecture, and this group appeared to perform comparably to the photo-taking students (Wong and Lim, 2021).

There are a number of differences in uses of and approaches to note-taking that can be investigated. First of all, note-taking habits tend to differ in in-person educational settings from those used in digital educational settings (Luo et al., 2018). Moreover, note-taking habits are often manifested differently when reading texts on paper versus from a laptop-screen. Another example would be how note-taking habits vary when writing notes on paper versus typing in notes in a digital file on a laptop or computer. In terms of note-taking habits on paper versus on a laptop or computer, research by Luo and colleagues (2018) has shown that students with laptop note-taking habits usually take more verbatim notes whereas students

with on paper note-taking habits tend to take more visual notes (Luo et al., 2018).

By investigating more closely the use of laptops for note-taking habits, Crumb and colleagues (2022) observed that the presence of laptops in the classroom, even when exclusively used for note-taking, can have a negative impact on academic achievement. Thus, it is possible that when note-taking habits rely on the use of a laptop, students might get distracted more easily (Crumb et al., 2022). According to Wong and Lim (2021), students who write their notes by hand experience less mind-wandering, which, in turn, leads to an improved recollection of lecture material (Wong and Lim, 2021).

The purpose of this study is to explore different types of note-taking habits used by University students. The study aims to investigate the “best of both worlds” of on paper and digital note-taking habits, and could be used to develop a general framework of different note-taking habits that appear to be most used and most beneficial in educational settings. In turn, such a framework could be used in order to educate students on the concept of note-taking, and in guiding them in developing personal note-taking habits that would work best for them. The study is performed by means of a phenomenological approach, which enables gaining an insight into what the University students’ *personal experiences* of making use of different note-taking habits are (Willig, 2013).

The main research questions this study aims to provide an answer to are: (1) How do University students experience the engagement with different note-taking habits? And: (2) How do digital note-taking habits contribute to University students' studying habits in comparison with analogue note-taking habits?

Method

Data Collection Method

The current study is being conducted as part of a University Bachelor thesis project.

The researcher has little to no previous experience with the stream and methodology of research. Thus, it is unlikely that the research has been influenced by prior knowledge.

Prior to the process of data collection, a decision was made regarding the number of interviewees to be assembled. Four participants were asked to participate in the interviews for the study. This number was decided because of the limited time available for the research process. During the process of participant attrition, no change occurred in the decided number of participants, meaning that the final sample constituted four participants. The only inclusion criterion present was the requirement for the participants to be students at the University of Groningen. The participants were recruited via text messages sent using a mobile phone. A small amount of information regarding the topic and purpose of the study were presented to the recruited participants in advance of the interviews. In addition, the participants were presented with a study information form including basic information on the study. Each of the participants also signed an informed consent form. No incentives were given to the interviewees, making their participation completely voluntary. The study received an ethical approval by the Ethics Committee of the University of Groningen.

All four interviewees who participated in the study were females who all originated from different countries. With the first interviewee being Dutch, the second interviewee being Indonesian, the third interviewee being Slovakian, and the fourth interviewee being Finnish, this sample establishes cultural variability in order to be as representative as possible. Each of the interviewees is a student at the University of Groningen. A researcher-participant relationship is present, as the researcher is acquainted with the interviewees because of their mutual path of education at the University of Groningen. The sample consists of acquaintances and friends of the researcher.

As mentioned, data was collected by conducting interviews. In consideration of the research being of a phenomenological nature, the decision was made to conduct interviews in

order to gain an insight into the experiences of University students of implementing their personal note-taking habits. The data collection method was decided upon beforehand and was not altered during the process of research and data collection. The researcher was moderately engaged during the interview process. An interview question protocol (Appendix A), inspired by Carspencken's (1996) work, was developed beforehand to determine the overall structure of the interviews. However, there was a certain level of flexibility during the interviews in how the researcher responded to the interviewees' answers to the main questions as well as how the researcher worded follow-up questions depending on the interviewees' answers. The interviews were held for thirty-two to forty-two minutes, with an average interview duration of thirty-eight minutes. The interview questions were divided into five main categories which, in short, are about (1) general study habits, (2) digital note-taking habits, (3) on-paper note-taking habits, (4) different situations in which note-taking habits are manifested, and (5) note-taking habits as a method of exam preparation. All the interviews were held in an online environment. All interviews were audio taped and later transcribed by the researcher.

Data Analysis Method

After data collection was conducted, transcripts of each of the interviews were made. The first step of data analysis was to code the transcripts. Coding was done to ensure an ultimate understanding of the interviews and gain as much information from the transcripts as possible. A program called 'ATLAS.ti' was used for coding. The researcher had no previous experience with coding in qualitative research. After the process of coding was completed and the created codes were reviewed, thematic analysis (Appendix B) was conducted. This was done in order to identify common themes, patterns and ideas that emerged in all four interviews.

This type of analysis should ensure methodological integrity, as coding and thematic

analysis are fitting methods of analysis in qualitative research. According to Braun and Clarke (2006), thematic analysis should be considered as a foundational method for analyses of qualitative nature. Braun and Clarke (2006) describe themes in the following way: ‘‘A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set’’ (Braun and Clarke, 2006, p. 82). Thus, thematic analysis can be used to create an overview of common patterns and ideas which in turn could lead to insightful ideas regarding the topic of study. It was decided to use thematic analysis for this study in order to create an overview of common patterns and ideas derived from the large amounts of information collected during the interviews. In the result section, pseudonyms shall be used for the participants’ quotes in order to ensure their privacy whilst still creating a clear overview of their responses. The pseudonyms used for the participants are the following: Anna, Claire, Mandy, and Jill.

Results

During the process of thematic analysis, a number of common themes was studied. These shall now be explored further and supplemented with various examples and excerpts of data.

Efficiency of digital note-taking habits

The first theme concerns the efficiency of digital note-taking habits. One of the main benefits of taking notes digitally is the rather obvious element of typing-speed. The speed of the process of taking notes digitally was mentioned multiple times in the interviews. For example, when asking Jill about her opinion on the benefits of digital note-taking habits, she said the following: ‘‘*Well, the first one that I find that’s real obvious, is that it’s really convenient for people to just type, cause it’s faster.*’’ Anna expressed her opinion on the benefits of digital note-taking habits in the following way: ‘‘*Those are a lot easier for when*

there's a lot of information that you need to write down quickly, I feel like digital is a lot better."

Based on what the interviewees said, it appears that when typing notes in a document on a laptop, it is fairly easy for them to type a lot more words in a certain amount of time in comparison to what they would write by hand in the same amount of time. This can, in part, be seen as a significant benefit of digital note-taking habits. In general, it is easy to bring a laptop or iPad in class, open all the documents needed, type the notes, and then save the documents quickly. As Claire mentioned: *"So, I feel like when you open [Inaudible]... you have, all at once, your documents there. Rather than flipping through a notebook."*

However, although taking notes digitally is efficient in general, an issue could arise because of the speed when typing notes on a digital device. Namely, the engagement levels when taking notes digitally are likely to be lowered.

Less engagement with digital note-taking habits

The second theme is about the lowered engagement levels when taking notes digitally. Although the process of taking notes digitally is rather quick in general, a downside to this speed is how it affects the students' engagement levels when taking notes digitally. When creating notes digitally, students tend to type quickly in order to copy everything that is being said by a lecturer. Because of this, they appear to blindly copy the lecturer's words which likely diminishes the active engagement of learning. As Anna put it: *"But usually, like I said, I write much shorter sentences whereas on, on the laptop, I feel like I'm just, kind of blindly copying whatever the professor is saying, or whatever is in the book."*

One could argue that, when students are writing notes by hand, they do not have time to copy all the lecturer's words, and are thus being stimulated to be more actively engaged with the study material. For example, they have to summarize or paraphrase the lecturer's words because they do not have enough time to copy all the words blindly. Further, because

the students do not have time to write everything down by hand, they are encouraged to pick up the information that they find most relevant to be written down. Thus, it is more likely for students writing notes by hand to be actively engaged with the material during a lecture, in turn possibly already learning more about the course during a lecture as well. At least, more than the students taking notes digitally, who often tend to copy the lecturer's words as they are talking during a lecture.

Engagement levels were mentioned often during the interviews. Jill commented the following: *“Because a, it's a lot quicker to just type it in, delete it, no erasing or scrapping it out, you don't have to focus on that. Uhm, so it's usually more words and explanations which is useful if there's examples or if it needs to be cited, it's a lot easier to do that. But on paper, what I like is that... Because I use less words, I'm kind of forced to maybe re-phrase what the lecturer said, which is useful. So, if I hear something that's like a paragraph or an explanation, and I know that I can't write that down all in the same time, then I'll have to think of my, like, in my own words, of a shorter explanation, that is useful for me to memorize.”*

Apparently, even though taking notes digitally is rather quick and easy to do, it might be that the lack of active engagement during the process could be a downside to taking notes digitally rather than by hand. Anna mentioned how writing notes by hand feels more beneficial for her: *“But, uhm, I never use a digital device, because, eh, I'm the type of person, if I type using a laptop, for some reason, I don't know why, but for some reason, eh, the concept and the knowledge and the explanation that the lecturer gives me, it just doesn't, uh, it wouldn't, like, get inside my brain. Like, I would just be typing, and then that's it. I wouldn't attain any information.”* For Anna, there is clearly a lack of active engagement when taking notes digitally, which is why she decided to write notes by hand.

Context dependency

The third theme highlights the context dependency and sensitivity of note-taking habits. There are many different situations in which these habits can be implemented. For example, one could think of taking notes when reading literature as a preparation for lectures versus taking notes in the actual lectures themselves. Further, in an increasingly digitized learning environment, various new contexts in which note-taking habits can be manifested arise. For example, there are many different types of lectures during which there might be different experiences of note-taking, such as online versus in-person lectures, lectures for which PowerPoint slides are uploaded in advance, pre-recorded lectures, or practical classes. Finally, note-taking habits can be used for studying for exams. Some interesting points regarding such varying contexts came up during the interviews.

For example, a striking observation was the fact that some of the interviewees mentioned not taking any notes at all during online classes, even when they do tend to take notes when attending in-person lectures. Jill described it in the following way: *“Uh, in-person I usually take digital notes. Especially nowadays. But regardless of that, when I have online classes, I do not take notes at all.”* Still, there was also a participant, Mandy, who actually experienced this to be the other way around: *“I have got the idea that I... In... Like, in live lectures, write less than in online lectures.”* Apparently, for this student, lectures being held online led to her taking more notes than during in-person lectures. In the context of online education, digital note-taking methods are not consistently used by all students. Apparently, students vary in their manifestation of note-taking habits expressed in digital environments. Possibly, some students might still prefer analogue note-taking habits in such contexts, as the digital learning environments are still relatively new in their academic journey.

Furthermore, when attending digital classes, students might experience distracting factors such as noise from family members or use of a mobile phone. Still, some interviewees mentioned some benefits of attending a digital class. Anna mentioned the theory of social

learning which can also occur whilst looking at a lecture in a digital environment: *‘‘There’s actually a theory that I learned in class about this, I think it’s called the social norm or something? Like, when you see other people do something, uhm, it also pushes you to do the same thing as they do. Because everyone else is doing it, then why shouldn’t I do it? So, I believe that really applies to me, especially in here, because, uhm, I see a lot of people writing on their laptops and their iPads, and... It really, uhm, made me realize, oh, I should also be taking notes as well.’’* Here, the interviewee got motivated to start writing notes when looking at other students taking notes in a pre-recorded lecture. Overall, in the context of digital classes, there are likely some factors (e.g., distraction) present that may negatively impact learning. Yet, in some cases, learning may be facilitated even in digital environments because of social learning through a screen.

When focusing on the note-taking habits used when PowerPoint slides are made available before the class, there are again some mixed findings. For instance, Claire believes that the availability of PowerPoint slides before the classes has a negative effect on note-taking habits: *‘‘So, I think that slides might actually have a negative consequence in the fact that people don’t actually put the effort into making their own notes, because they just look at the slides. And the slides don’t require any active engagement with the, with text.’’* Here, a lack of engagement with the study material arises due to the readily available PowerPoint slides leading to a decreased motivation to make use of note-taking habits. Another participant mentioned actually taking more notes when PowerPoint slides are available. A different participant stated that she never looks at PowerPoint slides in advance of a lecture. Clearly, there are differences in how students’ note-taking habits differ when PowerPoint slides are made available versus when they are not. In short, digital technologies have given rise to the possibility to publicize digital tools such as lecture slides. However, it seems that in such contexts, there are differences in how students’ note-taking habits are

affected by the availability of such resources (i.e., PowerPoint slides).

Finally, the use of note-taking habits when studying for exams was discussed with all of the interviewees. Anna acknowledged that she rarely re-uses notes when studying for exams, but rather only as a last resort: *‘And I feel like I’ve done everything I can, I don’t know what else to do now, but I still want to prepare somehow and I want to study, then I’ll go through my notes.’* Mandy mentioned how she re-uses her notes really often whilst studying for exams, sometimes creating an extensive summary or even starting a creative project using her notes. When asked whether she experienced the re-use of her notes in this way to be useful or not, she responded in the following manner: *‘I think it is. Because otherwise I would just be reading the texts again and listening, but at a given moment it stops being useful for remembering. At a given moment, you just need to be engaged with the study material.’* For her, this method of actively using her notes to create an extensive summary to study for an exam was rather beneficial when it comes to studying progress. Again, the active engagement with taken notes is likely to lead to a better understanding of the study material which, in turn, assumably benefits academic performance. Because of this, active engagement should be encouraged in digital settings, in order for students to create proper notes that may be beneficial when revising them during the studying process for exams.

Overall, the rise of digital technologies in education has brought about various new contexts in which note-taking habits can be manifested by students. This highlights the importance of considering context dependency when exploring digital note-taking habits in educational settings. It is relevant to consider the various contexts (e.g., in-person versus online classes, distractions in online environments) in which note-taking habits are manifested by University students, in order to ensure that the most effective and relevant methods of note-taking can be implemented.

Discussion

The primary purpose of this study was to explore students' experiences of various note-taking habits. The two research questions were (1) How do University students experience the engagement with different note-taking habits? And: (2) How do digital note-taking habits contribute to University students' studying habits in comparison with analogue note-taking habits?

Summary of Results and Integration in Current Literature

The three following themes arose after thematic analysis: (1) Efficiency of digital note-taking habits, (2) Less engagement with digital note-taking habits, and (3) Context dependency.

In general, it appears that digital note-taking habits are efficient when it comes to their speed and availability. Looking back at the results, several participants mentioned how they experienced the speed of taking notes digitally to be one of the main benefits of digital note-taking. This finding is in line with research conducted by Morehead and colleagues (2019), where one of the conclusions was that digital note-taking appeared to be beneficial in circumstances where lecturers tended to speak rapidly (Morehead et al., 2019). It appears that students find the speed of taking notes digitally rather efficient. Besides, availability of digital notes was mentioned as an efficient benefit of digital note-taking. As we saw, Claire talked about how she experienced it to be rather easy to open documents with notes on a laptop and beneficial to have them all readily available in one device. According to Kiewra and colleagues (1987), there appear to be several constraints, such as lecturing rate, to note-taking habits. Thus, digital note-taking habits might be promising in the sense that they can possibly work around these possible constraints by, in this case, being quick and efficient. Here, when digital technologies are implemented during the process of taking notes on a device, learning may be facilitated due to the efficiency and speed of digital note-taking habits.

Focusing on engagement levels experienced during the manifestation of note-taking habits, it seems that, overall, students tend to experience less engagement when taking notes digitally rather than by hand. This might affect how the manifestation of digital note-taking habits influences students' learning processes. In general, all the participants in the current study mentioned how they experienced taking notes digitally to be less engaging in the sense that, because of the possibility to type them in quickly, they tend to blindly copy exactly what lecturers' say. Apparently, taking notes by hand might activate the brain more, since students have to actively think about what they want to write down and how they should paraphrase lecturers' words. In this sense, taking notes by hand might actually be more beneficial for learning purposes than digital note-taking habits. This finding might be supplemented by research by Luo and colleagues (2018), in which it was found that students engaged in digital note-taking habits take more verbatim notes, whereas students involved in on-paper note-taking habits tend to take more visual notes (Luo et al., 2018). One explanation for the current study's finding that on-paper note-taking habits are more engaging could be that visual notes demand more activation from the brain. Luo and colleagues' finding that students engaged in digital note-taking habits take more verbatim notes could in turn be explained by the fact that it is far easier to copy lecturers' words when typing notes digitally, which thus leads to students taking lengthier notes than handwritten ones. All in all, it appears that students are less actively engaged when taking notes digitally, which means that digital notes are likely to be less useful for efficient learning purposes. Considering the mediation of learning by digital technologies, digital note-taking habits should be encouraged to be as actively engaging as possible in order to be beneficial when it comes to learning. Here, there is room for development of methods that increasingly facilitate active engagement in the process of taking notes digitally, in order to optimize its effectiveness for academic purposes.

With the final theme, the context dependency of note-taking habits was explored.

Generally, there are various contexts in which students manifest note-taking habits. First of all, during online lectures, it appears that not all students take notes, physical or digital. Reflecting on previous literature, it is suggested that not taking any notes leads to a poorer performance in students (Wong and Lim, 2021). Another relevant finding regarding context dependency concerns students' experience of factors such as distraction when taking notes digitally. According to research conducted by Crumb and colleagues (2022), students are more likely to experience distraction when relying on their laptops when taking notes (Crumb et al., 2022). Here, in the case of distraction, handwritten notes might be more efficient in comparison with digital notes. Research by Wong and Lim indicated that students tend to experience less mind-wandering when writing their notes by hand (Wong and Lim, 2021). Further, it seems that the availability of lecture slides diminishes the motivation of students to take notes. Looking at these examples, it can be inferred that students' experience of digital note-taking habits depends on the context. Overall, the increasingly digitized learning environment gives rise to various new contexts (e.g., online lectures, availability of PowerPoint slides) in which digital note-taking habits can be manifested by students. Learning can be facilitated by understanding how such contexts affect students' experience and implementation of note-taking habits. Then, the most effective methods of digital note-taking can be developed which are able to be manifested by students in the increasingly digitized learning environment.

Using this integration of findings from the current study and previous literature, it is possible to provide an answer to the research questions and reflect on them. When it comes to the first research question, which asks how University students experience the engagement with different note-taking habits, a few points can be made. First of all, students describe how they experience digital note-taking habits to be efficient when it comes to typing speed and availability of the documents containing their notes. However, they also experience less active

engagement when taking notes digitally, leading to a tendency to start copying notes blindly and taking rather verbatim notes. When reflecting on on-paper note-taking habits, it appears that students experience the process of taking notes by hand to be more actively engaging. Students have to activate their brain more during the process of writing notes and are likely to take more visual notes. Overall, University students appear to experience digital note-taking habits to be efficient and quick, rather lengthy in words and verbatim focused, but not as actively engaging as on-paper note-taking habits. Thus, reflecting on how the use of digital note-taking habits may mediate learning, the findings on the first research question suggest that University students' positive experiences of the efficiency and accessibility of digital note-taking habits are likely to be relevant contributors to their learning processes and academic achievement.

Considering the second research question, which is about how digital note-taking habits contribute to University students' studying habits in comparison with analogue note-taking habits, it appears to be context dependent. In some contexts, digital note-taking habits may be more relevant contributors to University students' studying habits. However, there are also still contexts in which students make more use of analogue note-taking habits. In general, note-taking and the process of reviewing these notes seem to be positively related to students' academic achievement (Kiewra, 1987). The current study suggests that the active engagement with study material that occurs during the process of taking hand-written notes likely benefits students' academic performance. The active engagement of students with their notes might be the largest contributor of note-taking habits to effective studying. When it comes to digital note-taking habits, such habits should be developed in order to be more actively engaging, in order to most effectively affect students' learning.

In a progressively digital environment, students have to increasingly often adopt their note-taking habits to new, various contexts. Because the digitized learning environment is still

on the rise, it should be noted that the manifestation of digital note-taking habits is still developing and analogue note-taking habits are still implemented regularly by students. This again highlights the importance of research into digital note-taking habits and its most beneficial elements or styles. Further, findings suggest that students do not always take notes for digital classes. However, this might be partially due to the shift in educational formats as digital education is still rather new. Still, several students already implement digital note-taking habits and use them as studying habits, for example by creating an extensive summary using literature and lecture notes in order to study for exams. All in all, it appears that digital, but also on-paper, note-taking methods implemented by University students contribute to their studying habits and are likely to be beneficial to academic achievement.

Research Implications

There are several implications of the current study. First of all, because of their described efficiency, digital note-taking habits can be easier and quicker to implement than analogue variants, and thus should be encouraged to use. Especially in today's world where digitization is common, students should be encouraged to learn how to take notes efficiently for various digital contexts. For example, specifically taking notes digitally for digital lectures or as preparation for digital exams. Besides, digital note-taking habits are able to work around some of the downsides of writing notes by hand, for example by enabling students to quickly copy a lecturer's words when that would not be possible to do so by hand. In turn, more old-fashioned ways of taking notes can be developed further by implementing some of the benefits that come with taking notes digitally. However, the benefits of on-paper note-taking habits are also relevant to consider. The active engagement that appears to be much more evident when writing notes by hand is a salient advantage.

Further, when reflecting on the many different contexts in which note-taking habits might be expressed, it should be noted that for most students, it is presumably helpful to be

able to manifest both digital as well as on-paper note-taking habits. This would enable students to implement the most efficient note-taking habits depending on the context in which they are manifested. In general, the current study implies that the best of both worlds of note-taking styles can be developed by students in order to create a personal method that works best for them.

Overall, this study has implications for students as well as educators and educational institutions. The findings on the experiences of students with note-taking habits can be explored by these groups in order to gain an understanding of the benefits of such habits. For students, it could mean that they can be educated on note-taking styles as an addition to their regular studies. Knowledge on how to study effectively can be helpful in general, and if specific guidelines can be provided in order to learn how to take notes effectively in various contexts, this might be even more profitable to educational achievement. For educators and educational institutions, knowledge on the topic of the current research could be used to guide their students in developing proper note-taking habits.

Limitations and Future Research

Although the current study provides some valuable additional information on the topic in general, there are a few limitations regarding the way the study was developed and conducted. Taking such limitations into consideration can give rise to possibilities for future research.

First, the study made use of a convenience sample consisting of acquaintances and friends of the researcher. These participants are also likely to be part of a WEIRD sample (Western, Educated, Industrialized, Rich, Democratic). Further, all of the participants were students of the University of Groningen. Therefore, making use of this sample limits the generalizability of the study and decreases external validity. Further research could improve external validity by making use of more fitting methods of participant sampling. By using

more diverse samples, future research will be able to lead to more generalizable outcomes.

More insights could have been obtained if more students (e.g., $n = 20$) had been interviewed.

Furthermore, the interviews were all conducted in an online setting. This might affect participants' experience and limit their understanding of the interviewer. Because of the online setting, internet connection may have been weak at times and caused some words to be inaudible. Besides, because of the online setting, the interaction between the interviewer and the participants may have been harmed by being less genuine and expressive due to the physical distance. Future research could improve on such matters by conducting interviews in an in-person setting in order to constitute natural and smooth interactions between the researcher and the participants.

Several interesting points could also be explored more deeply in further research. First of all, further research could focus on how to make the process of taking notes digitally more engaging. Because this appeared to be the main limitation of taking notes digitally, it would be interesting to explore how to improve on this matter. Another interesting direction of study would be to explore how to adopt digital note-taking in various contexts most effectively. Overall, there is plenty of room for further research and exploration.

Conclusion

Concluding, the current study explored University students' experience with various note-taking habits. In this study, a literature review was done and four interviews were conducted. Using a phenomenological approach, the goal was to gain an understanding of how University students experience both digital and on-paper note-taking habits.

When reflecting on the mediation of learning by digital technologies, a few findings in regards to digital note-taking habits were found. First of all, the main benefit of digital note-taking habits appears to be efficiency. Digital notes are typed in quickly and are easily

accessible. This finding suggests that digital note-taking habits are an efficient (i.e., quick and accessible) way to incorporate digital technologies as a method of learning. Further, it appears that there is less active engagement whilst taking notes digitally rather than by hand. When taking notes digitally, students tend to copy lecturers' words quickly, whereas when writing notes by hand, students are encouraged to actively engage with the material when deciding what has to be written down. In this way, the brain is activated more when writing notes by hand rather than taking notes digitally. Hence, learning is facilitated more effectively when writing notes by hand because of the active engagement with study material. Here, when it comes to the manifestation of digital note-taking habits for learning, it becomes clear that there is also room for some development. In order to improve the efficiency of implementing digital note-taking habits for learning, an increase in the active engagement is necessary. The researcher of the current study believes that if methods of digital note-taking that facilitate active engagement with learning material can be developed, digital note-taking habits will enhance learning more effectively. Finally, there are various contexts in which students can make use of note-taking habits, which also affects which types of note-taking habits they choose to manifest and how the habits are implemented. These contexts should be taken into account in order to most effectively implement digital note-taking strategies for learning. Since the digitized learning environment is rather new, students will have to learn how to manifest their digital note-taking habits in such new and varying contexts.

As a concluding remark, the author believes that it might be most beneficial for students and educators to make use of the best of both worlds. That is, both on-paper and digital note-taking habits can be combined in order to create efficient strategies that work most effectively for each student individually. With the rise of digital technologies in learning, focus could be placed on digital note-taking strategies, whilst still valuing and implementing the most beneficial elements of on-paper note-taking habits. In this way, students' note-taking

habits can start to develop and possibly become an effective method of studying in a world where digital education is becoming increasingly common.

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Appendix A

Interview Question Protocol

Main question 1: We can start with your study habits in general. Can you start by telling me something about the study habits you typically adopt in your academic life? You can give as many details as you want.

Follow-up questions:

1. *How do you think your study habits benefit your academic life?*
2. *Could you explain how you developed your study habits?*
3. *Could you describe a situation during which you adopted specific study habits when studying for an exam? You can explain how you experienced this process and possibly its results.*

Main question 2: Now let's talk about your digital note-taking habits. Could you explain in detail what the process of taking notes digitally looks like for you?

Follow-up questions:

1. *When it comes to studying, in what cases do you tend to adopt digital note-taking habits?*
2. *Could you give me an example of what you typically do when taking notes digitally?*
3. *If you prefer taking notes digitally rather than on-paper, could you explain why this is the case?*
4. *Could you explain how you experienced the development of your digital note-taking habits over the course of your study?*

5. *Now, could you explain how your digital notes differ from notes on paper? You can, for example, talk about differences in the number of words, use of visual illustrations, or the construction of sentences.*

Main question 3: *Now let's talk about your on-paper note-taking habits. Could you explain in detail what the process of taking notes on-paper looks like for you?*

Follow-up questions:

1. *When it comes to studying, in what cases do you tend to adopt on-paper note-taking habits?*
2. *Could you give me an example of what you typically do when taking notes on-paper?*
3. *If you prefer taking notes on-paper rather than digitally, could you explain why this is the case?*
4. *Could you explain how you experienced the development of your on-paper note-taking habits over the course of your study?*
5. *Now, could you explain how your on-paper notes differ from digital notes? You can, for example, talk about differences in the number of words, use of visual illustrations, or the construction of sentences.*

Main question 4: *We can now talk about your experience of your note-taking habits in the classroom. Could you talk me through a typical class during which you adopt your note-taking habits?*

Follow-up questions:

1. *During what types of situations in the classroom do you tend to make notes?*
2. *How do your note-taking habits differ when having online versus in-person classes?*

3. *When you are in the process of note-taking in the classroom, do you ever experience factors that distract you from the process? If so, could you give an example of what happened?*
4. *Have you ever used pre-recorded lectures rather than following a lecture live in the lecture hall?*
 - *Could you tell me if and how your note-taking habits changed in comparison to regular lectures?*
5. *When there are PowerPoint slides available for a class or lecture, what do you typically do when taking notes when participating in the class or lecture?*
 - *Do you feel note-taking is less important when lecture slides are made available?*

Main question 5: *Finally, let's discuss how you experience your note-taking habits regarding the re-use of your notes when studying for exams. Could you explain whether and how you typically re-use your notes when studying for exams?*

Follow-up questions:

1. *When studying for exams, how do you experience the re-use of digital notes versus on-paper notes?*
2. *If you have ever reused your notes when studying for exams, could you explain whether or not you experienced this to be helpful for your results?*
3. *Could you give an example of a situation during which you re-used your notes when studying for exams? You can describe how you experienced the process and possibly its results.*

Appendix B

Thematic Analysis

Two main research questions are aimed to explore and provide an answer to during the research. (1) How do University students experience the engagement with different note-taking habits? And: (2) How do digital note-taking habits contribute to University students' studying habits in comparison with analogue note-taking habits? Thus, during the interviews, students' experience with both digital and analogue note-taking habits was explored. Further, several contexts in which notes can be taken were considered and it was aimed to investigate how note-taking habits are implemented by students in their academic lives in general. Upon further investigation during the process of transcribing and coding, three main themes have arisen.

Efficiency of digital note-taking habits

One of the main benefits of taking notes digitally is the rather obvious elements of typing-speed. When typing notes in a document on a laptop, it is fairly easy for students to type a lot more words in a certain amount of time in comparison to what they would write by hand in the same amount of time. This can, in part, be seen as a significant benefit of digital note-taking habits. In general, it is easy to bring a laptop or iPad, open all the documents needed, type the notes, and then save the documents quickly. However, an issue that could arise is concerned with the active engagement in the process of taking notes.

Examples of excerpts on the topic of efficiency to be used:

‘Those are a lot easier for when there's a lot of information that you need to write

down quickly, I feel like digital is a lot better.”

“Well, the first one that I find that’s real obvious, is that it’s really convenient for people to just type, cause it’s faster.”

Less engagement with digital note-taking habits

Students often tend to blindly copy what is being said by a lecturer during a lecture when creating digital notes. When they are writing notes by hand, they do not have time for this, and are thus being stimulated to be actively engaged with the study material. For example, they have to summarize or paraphrase the lecturers’ words because they do not have enough time to do so. Further, they are encouraged to pick up relevant information that has to be written down. Thus, it is more likely for students writing notes by hand to be alert as to what the lecturer is saying exactly during a lecture, in turn possibly already learning more about the course during a lecture as well. At least, more than the students taking notes digitally, who often tend to copy the lecturers’ words as they are talking during a lecture.

Examples of excerpts on the topic of active engagement to be used:

“Because a, it’s a lot quicker to just type it in, delete it, no erasing or scrapping it out, you don’t have to focus on that. Uhm, so it’s usually more words and explanations which is useful if there’s examples or if it needs to be cited, it’s a lot easier to do that. But on paper, what I like, is that... Because I use less words, I’m kind of forced to maybe re-phrase what the lecturer said, which is useful. So, if I hear something that’s like a paragraph or an explanation, and I know that I can’t write that down all in the same time, then I’ll have to think of my, like, in my own words, of a shorter explanation, that is useful for me to memorize.”

‘‘But, uhm, I never use a digital device, because, eh, I’m the type of person, if I type using a laptop, for some reason, I don’t know why, but for some reason, eh, the concept and the knowledge and the explanation that the lecturer gives me, it just doesn’t, uh, it wouldn’t, like, get inside my brain. Like, I would just be typing, and then that’s it. I wouldn’t attain any information.’’

‘‘Whereas, for note-taking, uhm, using a paper and a pen, uhm, for me, personally, I feel like it could help me retain the information more. Because as I’m writing it down, uhm, I’m also writing down my thought process, so I’m not just clicking the keyboard, I’m also writing it down, using, like, my hands.’’

‘‘But usually, like I said, I write much shorter sentences whereas on, on the laptop, I feel like I’m just, kind of blindly copying whatever the professor is saying, or whatever is in the book.’’

Context dependency

In an increasingly digitized learning environment, various new contexts in which students can manifest note-taking habits arise. For example, because of the development of digital technologies in educational settings, online lectures can be held and PowerPoint slides can be shared with students. Overall, it may vary how note-taking habits are manifested in such contexts. Thus, it is relevant to explore these various contexts and try to understand what elements or methods of note-taking may work best across the different contexts. Furthermore, there are contexts in which digitization of education may lead to distraction among students. This is something to be highlighted and stay aware of, as distraction may lead to a negative effect on learning and thus, academic achievement.

Examples of excerpts on the topic of context dependency to be used:

“So, I think that slides might actually have a negative consequence in the fact that people don’t actually put the effort into making their own notes, because they just look at the slides. And the slides don’t require any active engagement with the, with text.”

“Uh, in-person I usually take digital notes. Especially nowadays. But regardless of that, when I have online classes, I do not take notes at all.”

“There’s actually a theory that I learned in class about this, I think it’s called the social norm or something? Like, when you see other people do something, uhm, it also pushes you to do the same thing as they do. Because everyone else is doing it, then why shouldn’t I do it? So, I believe that really applies to me, especially in here, because, uhm, I see a lot of people writing on their laptops and their iPads, and... It really, uhm, made me realize, oh, I should also be taking notes as well.”