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Generative AI in Tertiary Education: A Case Study on Student Use, Pedagogical Challenges and Institutional Strategies

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Taking a small teacher training college in Austria as a case study, this paper explores how students use generative AI tools for their studies, the challenges and opportunities genAI presents for university teachers and how the institution responds to these challenges. Drawing on survey data and expert interviews, findings reveal that students frequently use genAI tools for academic tasks but often lack the necessary competencies. University teachers face didactic and legal challenges, while the university propagates for AI integration into curricula and professional development, emphasizing the importance of supporting teachers and students for successful AI adoption in tertiary education.

Am Beispiel einer Pädagogischen Hochschule in Österreich untersucht dieser Artikel, wie Studierende generative KI-Tools für ihre Studien nutzen, welche Herausforderungen und Chancen KI-Tools für die Lehre bereithalten und wie die Institution auf diese Herausforderungen reagiert. Basierend auf Umfrageergebnisse und Expert:inneninterviews, zeigt sich, dass Studierende KI-Tools in ihrem Studium verwenden, ihnen jedoch oft die erforderlichen Kompetenzen fehlen. Universitätslehrende sehen sich didaktischen und rechtlichen Herausforderungen gegenüber, während die Universität für die Integration von KI in Curricula und interne Lehrendenfortbildungen plädiert und so die Unterstützung von Lehrenden und Studierenden für eine erfolgreiche Implementierung von KI im Hochschulsektor betont.

1. Introduction

Since the introduction of the internet into classrooms in the 1990s, little has had such a disruptive nature in education, or even the potential to "revolutioniz[e] the educational landscape" (Faisal Rashid/Duong-Trung/Pinkwart 2024: 2), than generative AI. Right after openAI released the generative AI tool Chat GPT to the public in November 2022, media was quick in highlighting the potential of AI enabling cheating in the educational context (Marshall 2023). This led, among others, to generative AI tools being quickly identified as "one of the most disruptive technologies of our time" (Pelletier et al. 2023: 21) and an "unexpected insidious academic threat" (Reich 2022). Schools and universities found themselves in the situation of having to react faster than expected, leading to some schools even prohibiting the use of the generative AI tool Chat GPT (Elsen-Rooney 2023; Proschofsky

2023). However, not only facing the 'new reality' of new tools helping with, for example text writing, was challenging for teachers and universities but in what ways teaching and, above all, the assessment of students' work had to be revised (Sparrow 2022; Weale 2023) and, in general, how scientific writing and publishing would be impacted (Der Standard 2023).

Teachers have been reacting to this 'new reality' by incorporating generative AI into their teaching and altering their assessment criteria, while universities have been busy with sorting out legal aspects of data security and provision of guidelines. Yet, while teachers and universities are trying approach the new reality from a legal and didactic angle, students are continuing using generative AI tools for their studies, mostly without proper guidelines of usage nor without having acquired AI competencies (Maznev/Stützer/Gaaw 2024).

Therefore, taking the case study of a small university college for teacher training in Austria, this paper provides a snapshot of how this university has so far reacted to this 'new reality' by outlining the status quo of AI use among students and discovering the challenges and opportunities for the university teachers and the institution, and what conclusions can be drawn for the university sector in general. The following research questions will be answered:

1. How and for which purposes do students use generative AI tools for their studies at the university college?
2. Which challenges and opportunities arise for university teaching regarding didactics and teaching methods?

3. In what way does the university college react to the challenges arising from generative AI in their teaching and curriculum?

A brief overview of research on AI in the educational landscape will be provided in the next section. This is followed by the description of the data before the findings on the three research questions are discussed. The paper concludes with an outlook on the educational landscape and generative AI in university teaching and learning.

2. Generative AI in the educational landscape

While AI in the education sector has now "the potential to become mainstream" (Pelletier et al. 2023: 10), research on AI in and for universities has been carried out for much longer (Romiszowski 1987; Zawacki-Richter et al. 2019). Main research areas range from learning analytics (Schön et al. 2023), use of chatbots (Schlemmer et al. 2023), to empowering learners (Gašević/ Siemens/Sadiq 2023) and the application of generative AI in teaching (Faisal Rashid/Duong-Trung/Pinkwart 2024; Kohnke/ Moorhouse/Zou 2023; Schaper 2024).

Research has also focused on specific areas in connection with generative AI tools such as the acceptance by teachers (Watanabe/Schmohl/Schelling 2023), students (Stützer 2022; Johnston et al. 2024), and teacher educators (Rütti-Joy/Winder/Biedermann 2024), as well as the differing perceptions of implementing AI tools in academic writing among university teachers and students (Barrett/Pack 2023; Poole/Polio 2023). Next to research on teach-

ing and/with AI, another research area hones in on AI literacies as an increasingly important part of digital competencies (Long/Magerko 2020; Ng et al. 2021). The implementation of AI literacies across curricula (Southworth et al. 2023), the benefits of specific AI literacy courses (Kong/Cheung/Zhang 2022) and the intricacies of how AI literacy can be tested (Laupichler/Aste/Raupach 2023) are just a few research foci of the last few years.

Narrowing the focus to tertiary education and the location of Austria, Brandhofer et al. (2024) carried out nation-wide research on AI in tertiary education. While several chapters deal with either the use of AI among students and teachers, acceptance of AI or comparison of AI university guidelines respectively, this paper contributes to this line of research by focusing on a specific university and exploring any challenges and opportunities university teachers, students and the institution face by the 'new reality' emanating from the access to and use of generative AI.

3. Data and Methodology

The specific university taken for this case study is a small university college based in Vienna. It is one of the smallest teacher training colleges in Austria with about 1000 students studying in various bachelor's and master's degree programmes (numbers from 2024). Students either study to become teachers or consultants in the agricultural and environmental sector. A significant number of students are therefore from rural areas in Austria and work on their own farms and in small companies. The study programmes

are organised in a blended learning format and digital competencies are taught in specific elearning classes in the bachelor's and master's degree programmes. The university has about 40 full-time teaching staff.

For answering the three research questions, two sets of data are drawn upon. For the first research question, data is taken from a comprehensive survey consisting of 30 questions on digitalization and English language use among students that was conducted in February/March 2024. The questions are based on questionnaires by Leppänen et al (2011), Melton/Miller/Samona (2014) and Miglbauer (2017). For this paper, only the questions on the usage of AI tools for studying and leisure are used. The questions are a mix of open and closed questions. The answers to the open questions were analysed qualitatively by adding codes emerging from the text, which were then merged into categories (Corbin/Strauss 2015). The questionnaire was sent out to the students at the university via the students' email list. 141 students out of 993 students replied, which is a return rate of 14 %.

For answering the other two research questions, the data comprises two expert interviews which were conducted in June 2024. Expert 1 is a Department Head, a member of the curriculum revision team during the academic year 2024/2025[1], and a lecturer in the field of elearning. Expert 2 is a university lecturer with strong expertise in elearning and media didactics and a member of the digitalization team at the university college.

The interviews were conducted to explore the university's reaction to AI and future developments, among others in the curriculum (expert 1), and about the challenges and opportunities the lecturers face in their teaching (expert 2). In both interviews the focus lay on the challenges and opportunities for the institution and the lecturers respectively. The interviews lasted 35 to 45 minutes respectively and were transcribed verbatim. Drawing on Grounded Theory (Corbin/Strauss 2015), a microanalysis in which the interviews were analysed word-by-word was carried out. A data-driven approach was applied by annotating the interviews with codes that emerged from the texts. These codes were then merged into categories and further into themes in order to answer the two research questions.

4. Case study: Challenges and opportunities of Generative AI for a (small) university

In this section the case study will be outlined in three sub-sections, one sub-section for each research question. The first sub-section is about the students' use of genAI, which I have called 'the status quo'. The second sub-section deals with the adaptation to this status quo by the university teachers, which is followed by the third sub-section about the university's reaction to the status quo and the challenges arising from that for the university teachers.

4.1 The status quo: student use of GenAI tools

The majority of students use genAI tools both for educational and private purposes (see Figure 1). More students use genAI tools for their studies (75 %) than for private purposes (65 %), which is most likely due to the fact that the main occupation of students is studying and AI tools help with various study-related activities. A quarter of the students do not use AI tools for their studies, which may be surprising taking the omnipresence of AI in the media into consideration.

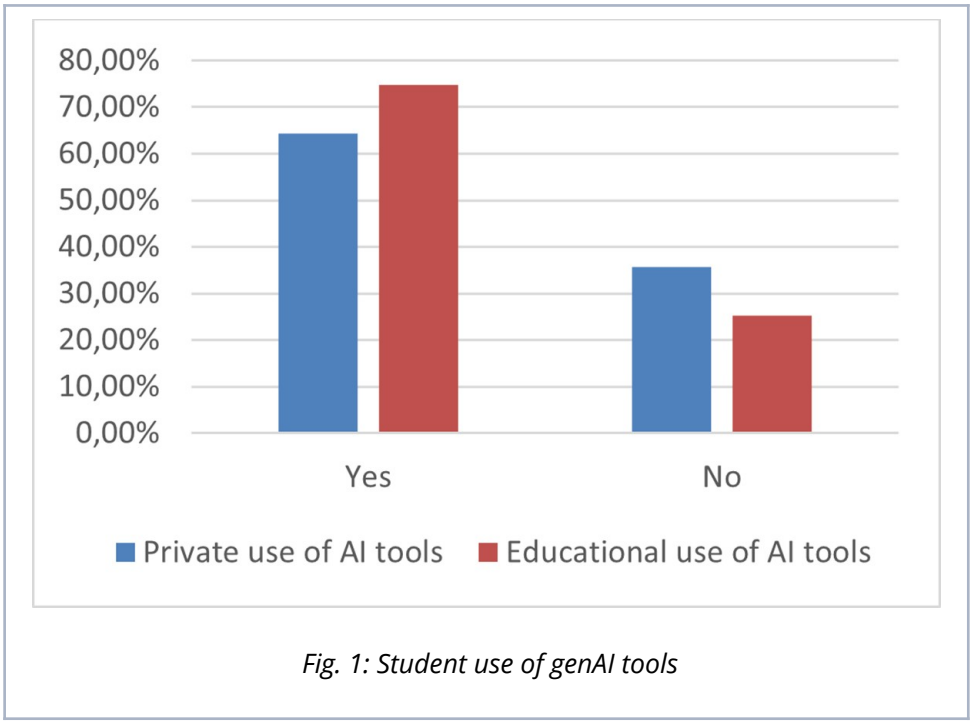

Fig. 1: Student use of genAI tools

As can be seen from Figure 2, of those students who use genAI tools, slightly less than two-thirds use ChatGPT (60 %), followed by one-fifth who use the translation tool deepL (21 %). 80 % of those

who use genAI tools use one or both tools. The remaining tools mentioned in 'Other tools' are tools supporting academic writing (scribbr, perplexity, chatpdf), picture creating tools (dalle, midjourney), various chatbots (ecosia, snapchat, bing) and chatgpt alternatives like gemini.

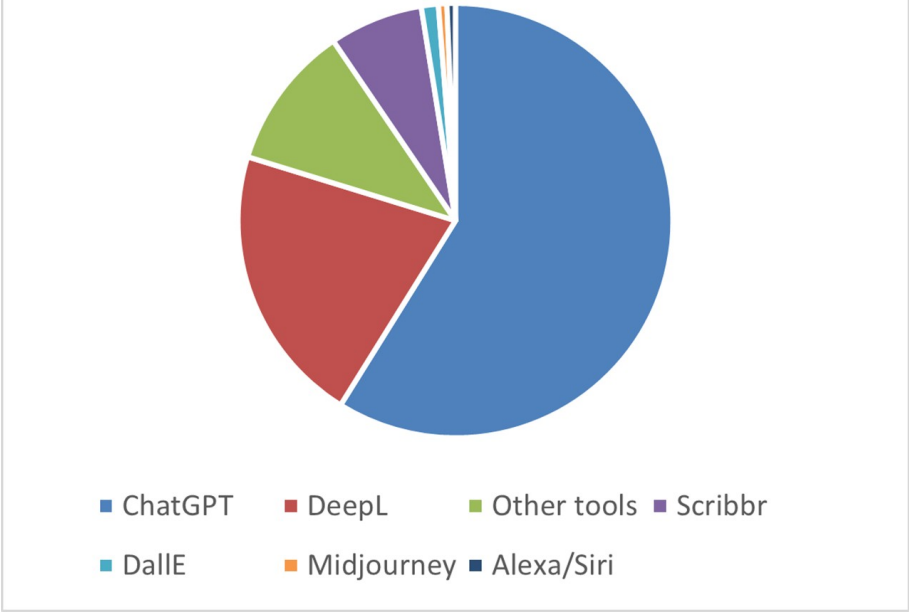

Fig. 2: AI tools used by students

The students were also asked about the purposes they use these AI tools for in their studies. Their answers to this open question can be arranged into the following three categories: information-seeking purposes, text generation and educational material generation.

Using AI tools for information-seeking purposes includes gathering information, verifying facts and conducting general research. Some students mention obtaining quick responses to specific questions in this context. Others use AI tools for summarizing papers and finding inspirations and ideas for tasks and projects. Another use of AI tools is for generating written materials such as formulating texts and writing content. GenAI tools are used for text processing and revision including enhancing the quality of the texts (grammar and style) as well as translation purposes particularly between German and English. When it comes to seminar papers, genAI tools help with creating outlines, structuring and organizing the (con)text. Since the students are training to become secondary school teachers, another purpose is mentioned: using genAI tools for creating educational content such as lesson plans, quizzes, and summaries.

When we look at Figure 1, we see that one quarter of the students did not use AI tools for their studies at the time the survey was conducted. These students were asked to list the reason(s) that prevent(ed) them to use genAI tools. The answers can be put into the following four categories: preference to create their work themselves, lack of familiarity with genAI tools, skepticism and ethical and moral concerns:

The preference to create their work themselves includes aspects such as ensuring (academic) honesty, learning more effectively and maintaining personal integrity in their academic or professional efforts. Some others claim to ‘have an old-fashioned mind-

set', preferring to complete their work without any use of additional tools so that a thorough understanding and mastery of the subject matter can be guaranteed. Connected to this aspect is the lack of perceived need to use genAI tools for their tasks and the failure of genAI tools to provide necessary scientific sources or precise information required, leading them to rely on traditional methods.

The next reason mentioned is lack of familiarity with genAI tools, or AI-induced anxiety (Dempere et al. 2023). Some students state that they do not have enough experience in using genAI tools because they did not have enough time to acquire the skills in how to use them effectively. Some of those who have, indeed, tried out genAI tools found them either complicated, time-consuming or just not as the time-savers they expected them to be.

Further aspects mentioned that prevent students from using genAI tools are skepticism towards AI and moral and ethical concerns. Some students highlighted their being skeptical about the reliability and accuracy of AI-generated content, doubting the quality and fearing potential mistakes. Other students cited moral and ethical concerns as reasons for not using genAI tools. They specifically voiced concerns about AI-generated work being submitted as their own work and thus fearing accusations of plagiarism.

We can draw from these findings that students use genAI tools and they use them primarily for any work in written form. However, some students tend to be anxious about and skeptical of us-

ing these tools effectively hinting at lack of AI literacy. This is not surprising since the whole field of AI is developing fast. Additionally, legal frameworks and university guidelines are being developed and thus often not yet accessible for students. In general, they need support, training and guidelines to be able to use genAI tools most effectively. This is why the university and teaching staff need to consider training students in genAI usage as part of their digital competencies. How the university teachers at the university college react to AI-generated student work and adapt their teaching is shown in the next subsection.

4.2 Adapting to the status quo: Challenges and opportunities for university teachers

Due to the use of AI tools university teachers having to face altered conditions for their teaching which lead to various challenges as well as opportunities. The expert interview with the university teacher (expert 2) disclosed four areas in university teachers' professional lives that are specifically impacted by AI: teaching, competencies, regulations and institutional backing.

Transformation of learning processes and didactic scenarios

According to expert 2, the integration of genAI will fundamentally transform learning processes due to an altered approach to academic writing and knowledge management in tertiary education. How written texts are produced will have a significant impact on teaching in general and task design and learning processes in particular. Therefore, a "shift from product-oriented to process-ori-

ented learning" will be necessary according to expert 2. Regarding knowledge management, expert 2 raises the question of what impact does AI-generated knowledge have on knowledge generation since

> knowledge generation is usually tied to humans but if AI is not human, what about the definition of knowledge generation in an AI-era?

On a more didactical and methodological level, the integration of AI could lead to a "shift from traditional individualistic learning towards more interactive and collaborative approaches". In this context, AI could be utilized as "a partner in task completion", "a coach for learner groups", and "a tool for verifying information", thus enhancing students' critical thinking and evaluative skills.

A focus on process-oriented learning may also instigate a necessary shift from traditional summative assessments, which are becoming less relevant, towards formative assessments and process-based evaluations. If collaborative learning is to play a more prominent role in the learning process, adapting assessment strategies to new kinds of feedback will definitely be necessary.

AI competencies for students and university teachers

Referring to the basic AI competences awareness, application, evaluation and ethics (Long/Magerko 2020; Ng et al. 2021), expert 2 regards understanding the ethical and regulatory implications as the most important skill for students, followed by critically evaluating AI-generated texts and then "only towards the end

somewhere in the far back" the effective use of genAI tools. Since the students are pre-service students, university teachers should also keep in mind the competence/skill of effectively incorporating AI into their learning arrangements for their teaching. It may also be crucial that curricula which include AI are designed and that ethical AI usage is promoted, applied and learned during the studies. However, training students in AI competencies requires that university teachers also have these competencies. The question by the interviewer whether there were any additional teacher-specific AI competencies did not yield any answers by expert 2.

Ethical and regulatory challenges of AI integration

While AI brings along opportunities for introducing new didactic approaches and teaching ideas, the ethical usage and regulations (or the lack thereof) is regarded as a huge challenge for university teachers. In the interview, next to the ethical implications of AI-generated content, data privacy and intellectual property were regarded as significant challenges for university teachers. As developing an understanding of these challenges is crucial for "creating a safe and ethical learning environment", clear guidelines both from teachers to students but, most importantly from the institutions to the teachers are of utmost importance, which other studies have also highlighted (cf. Dempere et al. 2023).

Institutional support during these transformative times

The need for clear guidelines and above all regulatory frameworks is strong because without guidelines, it is difficult to incorporate the use of genAI tools into university teaching. Therefore, comprehensive support from educational institutions is necessary regarding legal aspects but also for professional development (see AI competencies, for instance). Students also need institutional backing because – as the findings indicate – they face uncertainties and require clear guidelines for the use of AI for their study-related tasks.

The next section will disclose the reaction of the university to these requests and demands from the university teachers and students.

4.3 Reacting to the status quo: Challenges and opportunities for the university

In the interview, expert 1 (the Department Head) mentions the following areas the university needs to take into consideration: general challenges and opportunities in tertiary education, ethical and legal considerations, AI competency and curriculum development.

Challenges and Opportunities of AI Integration in Tertiary Education

According to expert 1, the university perceives genAI and their integration in teaching and learning as having “enormous potential for enhancing teaching and administrative tasks”, addressing individual weaknesses among students and university teachers, and

streamlining processes in text generation and translation. As most challenging and urgent matter which the university needs to react to is “genAI and its impact on academic research and writing”. While tools for data collection, analysis and presentation significantly reduce time and effort and are perceived as opportunities, the challenge is how to deal with academic integrity and ethical and legal concerns.

Ethical and Legal Considerations of AI Use

Regarding ethical and legal considerations, challenges for the institution are data privacy, the authenticity of AI-generated content including citation, and the potential biases introduced by these technologies. According to expert 1, clear regulations and policies are important for all parties involved – students, university teachers and the universities themselves. Regulations are also of “utmost importance” since without knowing what is and is not allowed, it is not possible to use genAI for educational purposes effectively or even at all. Therefore, expert 1 pointed out that the university was working on developing guidelines for the use of (gen)AI to navigate all these issues at the time the interview was conducted.

AI competencies and curriculum development

In general, expert 1 discloses that the university recommends integrating (gen)AI into the seminars and lectures. Expert 1 also stresses that the most important AI competence for university teachers is the competence to use genAI tools. Regarding training

the university teachers in AI literacy, the university relies on the individual teachers' motivation to "familiarize themselves with various genAI tools", to understand their application and to incorporate them effectively into their teaching. It is also expected by the university that "lecturers gain knowledge of tools that may be relevant to their specific subject areas". In a second step, professional development will be offered to university teachers in the form of webinars and workshops focusing on the didactic implementation of genAI tools in teaching.

AI competencies are not only required by the current staff but they will be a prerequisite for prospective staff. Expert 1 draws a comparison to the importance of digital competencies over the last two decades and states that "teaching without AI competencies will not be possible any longer".

Regarding students' competencies, expert 1 highlights that it is crucial to equip students with the necessary competencies to navigate and utilize genAI tools effectively. Ensuring that students also understand the practical applications and ethical implications of AI, it is necessary to integrate AI-related topics across various subjects in the curriculum. Currently the curricula for both the bachelor's and master's degree programmes are being developed; AI (like digital competencies) is intended to be incorporated in all subjects taught, however, there will also be a compulsory lecture on AI in the curriculum.

In this context, expert 1 does mention two more competencies, which pose a challenge for society in general: critical thinking and

ethical awareness. According to the expert, it is crucial to understand “the potential for AI to generate misinformation and the impact on privacy and individual rights”. Further, “broader societal changes driven by the adoption of AI” must also be taken into consideration in curricula and most definitely in university classes.

In a nutshell, the university regards AI and all the challenges and opportunities as positive, focusing on the potential for teaching and studying. Guidelines for teachers and students are being developed, which both students and teachers are in dire need of to use and implement genAI tools properly. AI as a broader topic is also incorporated in the new curriculum. AI competencies are regarded as important for both existing and prospective staff, therefore professional development will be provided. This last point is interesting and challenging due to the unique situation of training teachers while the ‘AI race’ is still happening at a significant pace.

5. Conclusion

Taking this specific University College for Teacher Education as a case study for showing the impact of AI on tertiary education, this paper explored the status-quo of the students’ use of genAI tools and how a teacher and the university react to the emerging challenges and opportunities.

GenAI tools have entered the lives of 75 % of the students’ lives as the survey results show. Those who use genAI tools use them for

any tasks in their studies. Those who do not use genAI tools disclose various reasons such as lack of familiarity with genAI tools, and ethical and moral concerns for not using genAI tools. These reasons highlight the importance of AI competencies, and the role of the university and university teachers may have in training the students since it is their task to develop the students' AI competencies as part of their digital competencies (Brandhofer et al. 2016). This means that genAI tools should be one of the digital tools to be incorporated into university teaching, which obviously leads to both a few challenges and opportunities. While the challenges for university teachers are of ethical and legal concerns as well as getting enough support from the university, the opportunities present themselves as being able to 'revolutionize' teaching by developing new ways of didactically incorporating these tools, training students in various (AI) competencies and creating new learning processes.

The role of the university and how a small university reacts to the status quo is not to be underestimated. Even though universities may be aware of the challenges university staff may have to face, universities need to be aware of the importance of their supporting them. Universities need to provide the legal and ethical framework so that all three stakeholders, i.e. students, university teachers and universities, know how to move forward in this 'AI race'.

Taking the impacts of AI on a micro, meso and macrolevel into consideration (Schmohl/Watanabe/Schelling 2023: 10f), we see that the small university of this study is currently mainly focusing

on the microlevel (application of AI tools in learning processes) and less on the meso and macrolevels. Despite AI being an important component in the new curriculum, according to expert 1, there are no tools yet at the small university's disposal to, for example, find gaps or redundancies in the curriculum. Nor are AI tools/bots used for administrative staff for enhancing their work in counselling prospective students or dealing with processing students' applications. However, what is situated on the meso level and is provided by the small university is the continuous professional development with a focus on didactic use of genAI tools. The macro level involves the use of AI for university politics such as learning analytics to increase student performance and lower drop-out rates. However, implementing AI at a macro level is much more challenging for smaller rather than large universities.

Despite the small university and universities in general aiming at all these issues, the AI race is challenging due to the required fast pace to keep up with the developments. Still, it is crucial to keep up because

> [i]ntegrating GenAI tools into educational settings is not just an emerging trend; it's rapidly becoming an essential part of modern teaching methodologies across multiple disciplines (Faisal Rashid/Duong-Trung/ Pinkwart 2024: 10).

Anmerkung

1 Due to the legal requirement to change the length of the bachelor's degree programme from four to three years by 2026, universities and university colleges for teacher education in Austria were in the process of revising their curricula at the time of writing this paper.

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