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# ATTITUDES OF STUDENTS – FUTURE TEACHERS, FOR THE APPLICATION OF GENERATIVE ARTIFICIAL INTELLIGENCE

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**Abstract.** The widening scope of the application of digital technologies and artificial intelligence (AI) is undoubtedly leading to a transformation of education in different areas of activity – one of which is unquestionably the preparation and qualification of teachers. Without focusing on the risks tied to the application of AI in education – most often concerning the credibility, security, safety and privacy of the subjects – the demand is on its potential for teaching and learning and the need for specialized training to do so. The research focuses on assessing the extent of the use of generative AI in both the everyday and professional activities of students – future teachers, with the aim of gauging the current state of attitudes and readiness for its application in future professional activity. The study sample comprises 200 students enrolled in the pedagogy professional program at both bachelor's and master's levels. The data collection was conducted via an online questionnaire with four separate groups of questions related to the use of generative AI in daily life, education, their current training, and prospects for application in professional practice. A low level of readiness for the use of generative AI by students was found, which, in turn, necessitates a reconsideration of educational practices regarding the formation and development of their digital competence, particularly concerning the application of AI. A logical relationship was found between students' readiness to use generative AI in education and their future professional activities related to ethical context, preparation of didactic tools, interaction with children and students, generation of educational content and development of assessment tools.

*Keywords:* students-future teachers; generative AI; attitudes and applications in current and future professional activities

## Introduction

Despite large language models and generative artificial intelligence being publicly available over the past decade, it wasn't until the end of 2022 that

ChatGPT sparked a true boom in the IT industry, becoming the fastest adopted technology. Within a few months of its release as a chatbot, the General Pretrained Transformer (the de facto standard for creating large language models to this day) reached over one hundred million active users (Alier Forment et al. 2024). Generative artificial intelligence and the large language models underlying ChatGPT and other similar platforms are undergoing rapid development. At the same time, their specific application domains are expanding. Generative AI is entering most walks of life with a mix of excitement, rejection or disbelief. In the educational sphere, calls range from a complete rethinking of education to the complete banning of generative AI in this field (Chan 2023).

A lot of research has been carried out in three main areas – AI policies in education, development of a toolkit to help educators with their opportunities and challenges, and last but not least, students' readiness and attitudes towards using generative AI.

Generative artificial intelligence generates new content by stepping on algorithms to learn patterns, with content spanning text, images, sound, and video. The generated content is also placed in a specific context through prompts from the user, which inherently takes shape as a new skill within the use of this technology. The number of parameters of the major language models underpinning generative AI is continually growing, and its ability to access online and up-to-date content (not just historical such) is fundamentally changing the possibilities for its everyday application.

Generative AI has the potential to transform teaching and learning, which is why the search for the place of generative AI within today's higher education, and in particular within teacher education, is relevant.

Within the framework of the research presented, several key questions arise, to which we are looking for an answer, namely:

**RQ1:** What is the extent of the use of generative AI in the daily activities of students-future teachers?

**RQ2:** To what extent does the current training prepare them for the application of generative AI in their future professional activity?

**RQ3**: What are their attitudes and expectations about this technology as an element of their future activities as teachers?

Artificial Intelligence is emerging as one of the major technological trends with an outstanding role in the development of society. As such, it must find its reflection in the development of digital competence on the part of the teacher and on the part of the learner. Defining a framework of competencies and setting levels for measurement and assessment set the possibility of its management (Tsankov & Damyanov 2019). Hence, within the scope of the surveys,

students underwent an assessment to determine the level of digital competence of future pedagogical specialists based on their self-assessment using the self-assessment grid according to the European Digital Competence Framework (Redecker 2017).

**Related Work**

AI will significantly transform the teaching and learning process by automating the tracking of learner progress, offering personalized teaching methods, and providing valuable information to teachers. Administrative tasks, assessment and giving feedback are also subject to this transformation. While AI will influence what and how students learn, teachers remain the ultimate decision-makers regarding content and teaching methods (Chaudhry & Kazim 2022). In (Chan & Hu 2023), authors have explored university students' perceptions of generative AI technologies in higher education and in particular on their cognition, willingness to engage, potential benefits and challenges, and effective integration. The challenges posed to higher education with the advent of generateive AI is explored and discussed in the work of T. Chiu (2024). Although implemented as a limited piece of research, it notes that future higher education must transform to prepare students for work in an AI-driven society. Digital literacy has already undergone transformation and continues to expand. Additionally, AI literacy is emerging. Future teachers who are currently students, will not be able to prevent students from using generative AI, and they must quickly adapt, learn more about the technology, and stay abreast of its development (Bowles & Kruger 2023).

Prioritizing digital skills in higher education is vital, as digital literacy is necessary for productive use of technological tools. Universities need to encourage and assess these skills to prepare graduates for the evolving technological environment. Narrowing the digital competence gap is critical to ensure inclusive benefits from technological advances in education (Grájeda et al. 2024).

Ouyang and Jiao (2021) discuss three paradigms for the integration of artificial intelligence in education: AI as a learning assistant, AI as a collaborative tool among students, and AI as a tool for self-directed learning. The authors highlight the importance of connecting generative AI applications to educational theories, which enriches the educational impact of AI and helps students cope with the complexity of modern learning. Quite naturally, there is also a need for exploring how students – future teachers use generative AI and how their preparation can be developed to meet the challenges posed by this rapidly evolving technology and its ubiquity. For it to become a full part of the academic curriculum, current university teachers need to embrace it, the results of the application of which will become evident in years to come. In (Kiryakova

& Angelova 2023) was explored the attitudes of university professors towards the application of generative artificial intelligence in their practice.

In the Digital Education Action Plan (2021 – 2027) the development of digital skills and competences necessary and guaranteeing a full digital transformation is highlighted as an important priority area, which requires the need for: (1) the formation and development of basic digital skills and competences from an early age; (2) the formation and development of digital literacy, including the fight against misinformation; (3) a focus on computer education; (4) ensuring a good knowledge and understanding of data-intensive technologies, such as artificial intelligence; (5) the formation and development of in-depth digital skills that equip more digital professionals and ensure that girls and young women are equally represented in digital training and work. This in turn necessitates: (1) the development of common guidelines for teachers and all those involved in education, with the aim of promoting digital literacy and tackling misinformation through education and training; (2) updating the European Digital Competence Framework to include artificial intelligence and data-related skills; (3) support the development of learning resources on artificial intelligence for schools, vocational education and training organizations, and other education providers; (4) creating a European Digital Skills Certificate that can be recognized and accepted by governments, employers and other stakeholders across Europe; (5) a recommendation to improve the provision of digital skills in education and training, the targeted use of tools to invest in the professional development of teachers, the sharing of best practices, on teaching methods in high-quality computing education and working with himan resource users to establish and update the necessary skills as they emerge; (6) development of STEAM education and promotion of female participation in it.

In recent years, a number of studies (Napal Fraile et al. 2018, Rolf et al. 2019, Morellato 2014, Lázaro-Cantabrana et al. 2019) have analysed and compared teaching practices related to digital competence, or developed tools to assess teachers' digital competence. Various studies have also been conducted on the assessment and self-assessment of digital competences of students and teachers (Lasić-Lazić et al. 2017; Kuzminska et al. 2018).

In research related to digital competence and its decomposition, such as that by E. Instefjord (2015), there is often a focus on critical thinking skills as key, with a continuous emphasis on the need for critical and reflective use of technologies in constructing new knowledge. As a result of the expansion of research, new dimensions have been added to the classical definitions of digital competence as the same has acquired a new broader focus, in which the added value and importance of digital knowledge and skills for social engagement in society as a whole is sought. With a focus on cognitive and emotional skills in the structure of digital competence are also the studies of F. M. Røkenes and

R. Krumsvik (2014) who also highlight the social knowledge for the effective use of the digital environment.

Specialized literature presents several models of digital competence, one of which is by A. Calvani et al. (2008), based on a framework grounded in three key areas, namely technological, ethical and cognitive. In continuation, W. Ng (2012) creates a model integrating technical, cognitive (related to critical thinking ability) and socio-emotional (able to use the Internet responsibly, including „Netiquette", protecting safety and privacy and recognizing threats and dangers) parameters.

In a European context, a framework of digital competence for teachers has been developed, targeting educators at all levels of education, from early childhood to higher education and adult learning, including vocational training, special education and non-formal learning. It aims to cover those digital competences specifically relevant to teachers and focuses on specific dimensions of digital competence, enabling the development of models of digital competence in the countries of the European Union at national and regional level. The proposed framework addresses 6 different competence areas with a total of 22 specific competences. These core areas are (1) Professional engagement, (2) Digital resources, (3) Teaching and learning, (4) Assessment, (5) Support for learning and (6) Enhancing students' digital competence (Redecker 2017). In order to facilitate the adoption of the framework, the levels of expertise are presented through a reasoned description of specific roles that can also be projected onto the professional levels also proposed in the Common European Framework of Reference for Languages from A1 to C2. Previous research (Tsankov 2023) has shown that the training of pedagogical specialists at university only reaches B1 level, which makes subsequent qualification significantly more difficult. This framework requires the development of a comprehensive strategy for the development of teachers' digital competence, ensuring quality both within their university training and in the context of the continuing qualification of pedagogical specialists through various forms and activities.

**Methodology**

The study was conducted between January and March 2024, with a sample of 200 students enrolled in their first year of study in the Pedagogy professional field, persuing Bachelor's degree (33.5%) and a Master's degree (66.5%) to acquire a professional qualification Чelementary or preschool teachersЧ.

Data were collected using an anonymous online questionnaire developed in Google Forms. The link to the questionnaire was circulated among the students, allowing them to use it at their convenience. The questionnaire was composed of four sections, with the first section including a filtering question about whether

they use generative AI in their daily activities. A second section contains questions aimed at those who use generative AI in their daily activities. The last two sections cover questions related to readiness to apply AI in education, as well as satisfaction and engagement in applying generative AI in their current training.

In the framework of the study, the identification of the level of digital competence of the future pedagogical professionals was implemented on the basis of their self-assessment through a self-assessment card based on the digital competence self-assessment matrix. The digital competence assessment tool being part of the Europass: CV, developed according to the European Citizens' Digital Competence Framework, also known as DIGCOMP (Ferrari et al. 2013), outline five areas: information processing, communication, content creation, safety/security and problem-solving.

**Results**

The research conducted recorded an alarmingly low awareness in the application of AI even at the everyday level, with only 6.00% of the respondents indicated that they use generative artificial intelligence such as ChatGPT or Copilot in their daily activities. On the five-point scale to assess their readiness to use generative AI in education only 3% of them have full readiness, 9% feel partially prepared and 55% unprepared to apply it in their education, the mean readiness on the scale is M=2.28 (SD 1.10).

59% of students had no preparation whatsoever regarding the ethical aspects of using generative AI in education, with a very low mean confidence score for discussing ethical issues related to generative AI with students M = 2.19 (SD 1.13). There was a lack of confidence in 58% of respondents regarding the use of generative AI to prepare teaching materials and didactic tools for their future professional activities as elementary or preschool teachers, and the mean score regarding the readiness and attitude to use generative AI to improve interaction with students was extremely unsatisfactory at the entrance of university education M = 2.26 (SD 1.13).

78.5% of the students claim that there are currently no decisions involving the application of generative AI technologies in their education, with the average rating for such presence being very low M = 1.75 (SD 1.09). However, with the highest mean and the only score above the scale mean (Table 1) is the degree of student interest in the application of generative AI in education M = 2.93 (SD 1.31), with over 60% stating such.

There is an above-average level of interest registered towards the application of generative artificial intelligence in education, which, in turn, indicates motivation for the formation and development of students' skills for its application in future professional activities.

**Table 1.** Descriptive Statistics

| Descriptive Statistics | Mean | | Std. Deviation | Variance |
|---|---|---|---|---|
| | Statistic | Std. Error | Statistic | Statistic |
| How do you rate your readiness to use generative AI in education? | 2.2750 | .07796 | 1.10248 | 1.215 |
| How confident do you feel discussing ethical issues related to GenAI with students? | 2.1900 | .08001 | 1.13150 | 1.280 |
| How confident do you feel using GenAI to prepare instructional materials? | 2.2650 | .07877 | 1.11399 | 1.241 |
| How confident do you feel to use GenAI to improve interaction with students? | 2.2550 | .07957 | 1.12530 | 1.266 |
| Are solutions requiring and implementing GenAI technology capabilities currently present in your instruction? | 1.7500 | .07692 | 1.08785 | 1.183 |
| To what extent are you interested in the application of generative artificial intelligence in education? | 2.9250 | .09295 | 1.31454 | 1.728 |

Regarding the possibilities of using generative artificial intelligence in their activities as future educational professionals (Figure 1), students see its purposeful application for: (1) Searching, finding and processing data and information (61%); (2) Generating ideas for educational activities (55%); (3) Creating educational content (35.5%); (4) Translating and structuring information (27. 5%); (5) Designing methodological options for educational activities (30%); (6) Creating didactic tools (30.5%); (7) Creating assessment tools (26%); (6) Designing individual learning paths and personalizations of educational activities (25.5%); (8) Designing feedback tools (25%); (9) Administering processes in an educational institution (21.5%).

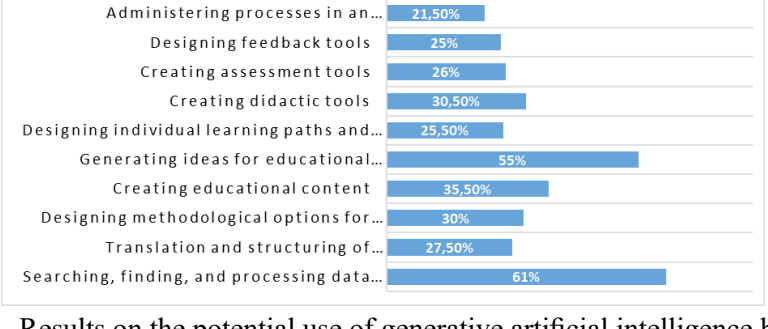


**Figure 1.** Results on the potential use of generative artificial intelligence by future educational professionals

In the course of the study, an expected patterned relationship between students' willingness to use generative AI in education, on the one hand, and their sense of confidence to discuss generative AI-related ethical issues with students (Correlation Coefficient r=0.691; Sig. (2-tailed) = .001), their sense of confidence to use generative AI to prepare learning materials (Correlation Coefficient r=0.722; Sig. (2-tailed) = . 000) , as well as the sense of confidence to use generative AI to enhance interactions with children and students (Correlation Coefficient r=0.676; Sig. (2-tailed) = .000), which is actually an indication of awareness of the responsibility of using generative AI in their activities as future educational professionals, both in terms of generating educational content and resources, and in terms of meaningful communication with children and students and the ethical considerations involved.

Upon further analysis of the obtained results regarding the self-assessment of digital competence and the application of artificial intelligence by future teachers as part of it, several conclusions can be drawn: (1) The observed imbalance in the self-assessment levels of digital competence is becoming increasingly apparent and influencing the attitudes and motivational structure of the students, with this influence being statistically significant ($p=0.006<0.05$, Asymp. Sig. (2-tailed)); (2) there is a need to synchronize cognitive and practical skills in the context of seeking opportunities to synergize the application of AI as a segment of the digital competence of future teachers, with these opportunities being identified as necessary with the required statistical significance ($p=0. 003<0.05$, Asymp. Sig. (2-tailed)); (3) There is motivation for a more realistic self-assessment based on the recognized need and attitudes towards the application of AI in students' activities during their education, but with even greater statistical significance in their professional realization as elementary or preschool teachers ($p=0.001<0.05$, Asymp. Sig. (2-tailed)).

**Discussion and Conclusions**

The study reveals several contradictions regarding students' self-assessment of digital competence at the beginning of their education in pedagogical specialties and the skills, attitudes and opportunities for solving specific cognitive and practical tasks with targeted application of technology established in training in the „Information and Communication Technologies in Education and Work in Digital Environment" academic course.

The discrepancy of the students' self-assessment made on the basis of the map based on the digital competences self-assessment matrix (part of Europass: CV, developed according to the European Framework for Digital Competence of Citizens DIGCOMP) and their actual knowledge, skills and attitudes at the basic level at the entrance to university education for the Bachelor's degree or at its continuation for the professional qualification "teacher" in the Master's degree, verified by a series of cognitive and practical tasks in the course of training. These

contradictions were also registered in terms of students‘ attitudes and readiness for the use and applications of generative artificial intelligence in education and their subsequent professional activities.

The study brings to the fore several main problem areas worthy of attention and subsequent research interest, namely: (1) systematic and purposeful preparation of future teachers, regarding the application of AI in educational and professional activities; (2) synchronization of skills for conscious application of AI, as basic elements of the digital competence of the teacher; (3) design of methodological options for purposeful application of AI in the activities of teachers and evaluation of the effectiveness of this application; (4) familiarity with a wide range of tools integrating AI capabilities to develop educational content, resources, assessment and progress tracking tools, meaningful communication, and more in an educational context.

A comprehensive rethinking of the tools for evaluation and self-assessment of the degree of formation and development of digital competence in the conditions of the development of generative artificial intelligence is required, integrating additional modules related to it. This framework also needs to be rethought in the context of the entrance of generative artificial intelligence in education, both by teachers and students, which are also tracing pathways for rethinking the preparation of future educational professionals.

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