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Teacher Candidates' Fears and Expectations About the Using of Artificial Intelligence in Education

Pál Iván SZONTAGH

ORCID: 0000-0001-6714-9852

(Károli Gáspár University of the Reformed Church, Budapest, Hungary)
szontagh.pal@kre.hu

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Abstract: *In recent years, the use of artificial intelligence (AI) has been the subject of an increasingly intense debate in almost all fields of science. Education is no exception, including in the public and higher education sectors. In our study, we explore the intersection of public education and teacher training in higher education, to see how we can most effectively prepare today's student teachers for tomorrow's practicing teachers. We will touch on the problems, challenges and fears of traditional higher education in relation to the use of AI by students, teachers and researchers, and take stock of the potential uses and limitations of AI in the everyday practice of teachers in public education. In the context of AI, we also consider the paradigm of "learning by teaching - teaching by learning" to be particularly important, as technological change is forcing us all into new roles, whether as students, academics or practising teachers. Emphasis will be placed on pedagogical process design, preparation and the renewal of assessment and evaluation. Our method is mainly documenting analysis, reviewing the relevant national and international literature. We then describe the design, methods and tools of our research, which will start in 2025.*

Keywords: teacher training, artificial intelligence, digital education

Introduction

A major step in the technological paradigm shift in education is the 2020 Covid-19 pandemic, where the epidemiological regulatory environment has rapidly forced the integration of digital technology at all levels of education, making AI-based teaching and assessment applications available and usable

by those who would not have been interested in these developments themselves.

Regarding the evolution of technology, it can be observed that first communication processes are shifting to the online space, followed by the digitalisation of information acquisition, and then the digitalisation of personalised information processing.

The use of distance learning to varying degrees, depths and quality has been a shared experience worldwide, which has made it widely clear that digital technological developments offer many new perspectives for the organisation of learning in public and higher education, but also that teacher presence and personal interaction are still essential at all levels of education.

In recent years, the use of artificial intelligence (AI) has been the subject of an increasingly intense debate in almost all fields of science. Education is no exception, including in the public and higher education sectors. The emergence of generative text generation models such as GPT (*Generative Pretrained Transformer*), including the so-called large language models (LLM), in everyday social discourse has also heightened expectations and fears about *Artificial Intelligence* (AI). What has long been known and expressed by researchers and those interested in the subject has become widely apparent: that the use of AI will gradually change our lives, not only in the technological field, but also in everyday life, and especially in education. There is no single, universally accepted definition of artificial intelligence, but for the purposes of this study we accept as valid the definition of the European Union Agency for Fundamental Rights (FRA), which states that "*Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions - with some degree of autonomy - to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications)*" (European..., 2021:19).

Within artificial intelligence, generative AI technology is defined as "*a generative AI technology that uses deep learning models to produce human-like content (e.g. Generative AI uses natural language processing to analyze textual (possibly image or voice) input content and then produces content from the elements on a probabilistic basis that is highly human-like*" (KRE IKT, 2024:5).

Effects and counter-effects of using AI for educational purposes

In our study, we formulate some dichotomies about the rise of artificial intelligence in education, which are discussed in more detail below.

The first is the dichotomy of *fears and expectations*. The emergence of artificial intelligence is accompanied by at least as many (often unjustified and exaggerated) fears as (often unjustified and exaggerated) expectations.

The second contradiction is the dichotomy of *creation and vulnerability*. *Szűts* (2024) distinguishes between AI users who are governors and drifters, i.e. those who use the new without being aware of it and without a sense of purpose, and those who accept the phenomena and information of the "new world" without critical vision and analytical evaluation.

Related to the previous point is a dilemma about the role of AI in education. While some argue that the use of AI will usher in an era of *equal access* and thus *equal opportunities*, others believe that the use of technology will further widen the gap between users, determined by family background and existential circumstances, and that a growing mass of people will be denied access to a competitive knowledge market.

Finally, in line with the narrowed focus of our study, teacher education, we must also address the issues of *teaching and learning,* and *teaching to learn*. The shaping of attitudes, which interacts closely with training, determines the openness and motivation of future users towards new technologies, whether in higher education (teacher training) or in the teaching and learning work of practising teachers.

Fears and expectations

Throughout human history, every technological innovation has heightened fears of change, from the advent of the printing press to the machine-wrecking movements of the Industrial Revolution. Education is no exception. Our age is also characterised by 'automation anxiety' (Dietz, 2020:55), the fear that machines will take our jobs. According to some dystopian approaches, teachers, and even schools as we know them today, will become obsolete in the foreseeable future (Bokor, 2024; Zhu, 2022). Inappropriate and excessive use of AI can weaken manual dexterity, eclipse human creativity in the arts, and lead to a generalised, uncritical, misinterpretation of information without background knowledge. AI is seen by many as dangerous in terms of abuse of power, unauthorised and uncontrolled facial recognition, the creation and distribution of various deepfake recordings, copyright infringement and weakened data security.

One of the most significant challenges facing pedagogy is "*the phenomenon of digital transformation, which 'subverts' previous value creation processes through digital innovations. The education system has barely recovered from the shock of the digital work system introduced in the context of the COVID-19 pandemic and is already facing a new disruptive innovation linked to the ChatGPT application developed by OpenAI, which will be released in November 2022*" (Horváth, 2023:6).

These fears are best addressed by knowledge and applied knowledge: "*The rapid pace of development creates fear in people, but this fear is reduced as technology is learned*" (Szűts, 2024:27).

Parallel to fears and anxieties, however, there is also - and this is an experience that transcends ages and types of innovation - an attitude of uncritical enthusiasm for the new. In many studies, we read (overly) optimistic expectations that paint a utopian picture where AI can fully replace teachers and solve the global teacher shortage. Positive approaches highlight the potential revolution in learning-teaching and the improvement of the quality of education (Horváth, 2023).

Researchers at the two extremes conclude that it is hopeful for the teaching profession that the various adaptive learning systems are not yet able to replace experienced teachers, that they cannot necessarily choose the appropriate methodology for the learners and groups of learners, and that they are not able to develop community and communicate values. "*Since interpersonal relationships cannot be replaced, and machines cannot perform functions other than knowledge transfer, these tools cannot develop social or emotional competences in pupils, so the presence of teachers will remain indispensable*" (Demeter & Mező, 2023b:36). In this approach, it is the teacher who will be the one who will introduce the future society to the appropriate use of digital and, more narrowly, artificial intelligence technology (Szűts, 2024).

The dichotomy of fears and hopes can be summarised briefly: AI has the potential to replace humans in certain areas, but it also has the unprecedented potential to improve humans. "*AI thus does not exclude the teacher from teaching but merely acts as a virtual assistant to help the teacher extend his or her abilities and evaluate*" (Dietz, 2020:60). If in the future the traditional school becomes more and more a multi-purpose educational centre, the role of the teacher will also change. In the future, the teacher will not only be a mentor but also a partner for students: both a coach and a training partner who develops together with their students (Zhu, 2022).

Creation and vulnerability

In his study on the use of AI, Szűts (2024) describes society as a kind of "multi-speed humanity", where *governors* use technology consciously to achieve their goals, developing their own competences more and more effectively through personalised improvements. In contrast, *drifters* use AI out of convenience, routinely, lose their ability to focus, and at certain ages, as victims of "endless scrolling", put their own cognitive development at risk. Just as certain skills (kneading pasta, sewing or even cleaning) have disappeared or survived at a lower level in society with the advent of household appliances, we are now witnessing the corrosion of cognitive skills such as sustained attention, deep learning, data collection and analysis. This is a serious social problem, especially if the skills that are lost are not matched by new and useful knowledge or performance. A smaller number of potential users, but present, are the *rejectionists*, who deliberately and by design keep themselves away from the opportunities offered by AI, due to technological or social fears. Lastly, we must not forget those who, for whatever reason - mainly existential, but sometimes social or ideological - *do not have access* to new technologies and thus remain on the development curve of the 20th century.

In the student role, the *governor* uses the AI as a virtual assistant, while the *drifting* student writes and submits homework with ChatGPT without proofreading or correction.

In the role of teacher, the *drifter* impersonalises teaching by seizing the opportunity of automatic task generation and assessment. "*AI tools offer a simplification of the learning and scholarly creative process to the extent that it can destroy the commitment to analytical and critical thinking*"

(ELTE PPK, 2023:3). In contrast, the *governing* educator appropriately parameterizes AI and uses it to illustrate their own pedagogical goals. AI literacy refers to competencies that enable an individual to critically evaluate, communicate, and interact effectively with AI in order to use it as an effective tool online, at home, and at work (Horváth, 2023).

There are almost no naysayers among students, but a good number of refusers among teachers - who are likely to be professionally marginalised in the foreseeable future. Even if this layer does not become significant, there is a risk that there is often no consumer choice in the use of AI, as governments and large organisations may decide to implement AI without consulting the end-users, who are forced to use it (Schepman & Rodway, 2020).

Equal opportunities issues

The Hungarian Digital Competency Framework (DigKomp, 2019) adopted in 2019 aims to ensure that no one in Hungary is excluded from the digital world and the digital economy due to a lack of digital skills and competences, and to continuously expand the pool of digitally literate workers.

AI as a technological innovation allows the cost of quality education to be reduced. It can be safely argued that reducing the cost of education is an equal opportunities agent, especially since digital competence - including the use of AI - and the ability to learn continuously are key prerequisites for academic and later labour market success. Personalisation, adaptive management of cultural and ability differences, and continuous and immediate feedback can also reduce the risk of drop-out for learners at risk, whatever their circumstances. Image and voice recognition, emotion analysis, virtual assistants for pupils with special needs open up possibilities for compensating for disadvantage and preventing dropouts that even the best-equipped institutions with a wide range of specialised teachers and assistants can only dream of today.

At the same time, there is generalised direct experience worldwide, to varying degrees, that the introduction of online education outside the classroom in the context of the Covid-19 epidemic has caused serious equity deficits among children from disadvantaged backgrounds (Kende et al, 2021) There is a reason of the fear that the above-mentioned benefits of AI-enhanced education will not be available to the most needy student population, perpetuating the already wide intergenerational gaps that are already inherited from family backgrounds. It is our shared social and professional responsibility to ensure that the school system is able to manage and balance differences in technological access, tradition and motivation, so that schools become the crucible that blocks the emergence of a multi-speed humanity (Szűts, 2024).

Teaching and learning, shaping attitudes in the age of AI

It is almost obvious that the role of the teacher is changing. The role of the teacher in the 21st century is primarily focused on facilitation, content production and development, and networking.

The application of AI will revolutionise pedagogy, mainly using intelligent tutoring systems, support for personalised learning paths and habits, automated and adaptive feedback methods for accountability and assessment, and more efficient administration of education (Lu & Harris, 2018).

The Artificial Intelligence in Education (AIED) model shows that there are both advantages and disadvantages to the use of AI in the education and training process. With appropriate use, the quality of education is improved, personalised education is achieved, but there is a risk of social and interpersonal relationships being eroded. It cannot be classified as positive or negative, but it is a fact that AI is taking over certain roles of the teacher - in parallel with the transformation of the teaching role (Horváth, 2023).

AI can play a direct mediating role between the teacher and the learner, primarily by influencing the learning process. At the same time, AI can act as a complementary virtual assistant, focusing primarily on collaborative processes, supporting the work of teachers and learners, providing additional resources, facilitating collaborative learning and facilitating communication between learners. Finally, the AI can act as a novice learner partner and primarily influence the learning process. In this approach, teaching AI to act as a novice learner partner consolidates learning outcomes and develops learners' self-efficacy (Xu & Ouyang, 2022).

In the context of changing teacher roles, *Daugherty and Wilson* (2018) in their general model distinguish between human-only activities (where technology currently suggests that humans will be better for some time, e.g. leadership, empathy), machine-only activities (where clearly machine capacity is more effective than human capacity, e.g. prediction, iteration), and so-called hybrid activities. Hybrid activities include those where humans complement smart machines (Horváth, 2023:11). Among the tasks of educators, education and community building can be predominantly classified in the first group, measurement and evaluation in the second, and other tasks of education mostly in the third group. The advantage of such hybrid education, *e-learning 3.0,* is that after the impersonal and often demotivating traditional *e-learning* and *e-learning 2.0,* which only provides networking between participants, creates personalised education with continuous moderation of the learning material (online coaching) (Dietz, 2020).

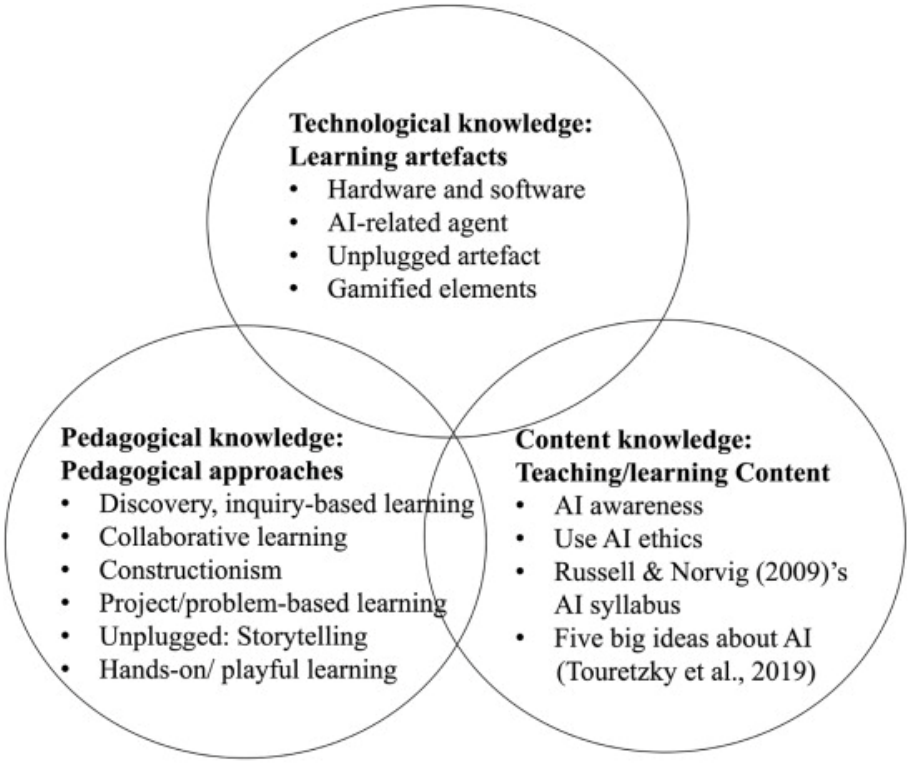
In the changed role of teachers, the roles of programmers, users and critics are at once present. It could be said that the teacher(candidate) is simultaneously learning and teaching about AI, with AI and because of AI - he/she has to learn how to use AI and then adapt this knowledge and teach it (Kollár, 2023; Szabóné Balogh, 2023).

According to *Mező and Mező* (2019), there are at least three approaches researchers can take to AI research. This division can also be applied to the educational use of AI. AI as a *research goal* refers to the teaching of the

technology and its applications. AI *as a tool* focuses on the use of AI for learning and teaching purposes. In the *impact-oriented* approach of AI, education should reflect on the social and ethical role of AI (Mező & Mező, 2019; Szabóné Balogh, 2023).

Ng and colleagues attempt to approach the issue of *AI Literacy* in pedagogy through the TPACK Model. According to this model, educators need to be equipped with up-to-date technological, pedagogical, learning theory and subject knowledge related to AI (Ng et al., 2021; Graham, 2011).

Figure 1. AI literacy in the TPACK framework (Ng et al., 2021:5)



Of course, these skills also interact technological opportunities and constraints redefine methodological concepts (e.g. mechanical test- or essay-based accountability is replaced by creative and critical thinking exercises, frontal knowledge transfer is replaced by interdisciplinary and applied projects, classroom communication becomes multimodal (oral, written, video, etc.). An interesting paradox in this context is that in many cases it is the development of digital technology that is (re)prioritising oral assessment.

According to *Demeter and Mező* (2023a, 2023b), the three basic models of AI-supported education are the *learner-focused* approach on individual knowledge*,* the *teacher-focused* approach on teaching knowledge and the *domain approach* on knowledge to be learned.

To prepare our students for the new challenges in teacher education, higher education must also be transformed: "not just an education base, but a research and intellectual workshop, a social, cultural and sports centre, an inspiring living space that develops personality alongside knowledge and

skills, and a favourable environment for networking with different events. (Dietz, 2020; Zhu, 2022)

For this purpose, the development of critical thinking and problem solving, the introduction of AI technology to students, the cooperation between human and artificial intelligences and the development of digital competences will become a priority in teacher education. It is important to emphasise that we need to educate students who are not programmers, but students who can parameterise and ask questions through research (Szűts, 2024).

In the schools (and universities) of the future, it will be increasingly common to reverse the way things have been done students will go home to study and come to school to "play", i.e. to meet peers, discuss and interpret what they have learned at home (with the support of a virtual assistant). The default definition of the flipped classroom is that what happens in the classroom in the traditional way now happens at home, and what happens at home happens in the classroom (Tóth, 2014:2).

Reflections at the start of a research project

"*One of the most important questions for the future of education is what narratives teachers and students adopt about the future role of AI in education*" (Bokor, 2023:120). According to Demeter and Mező (2023b), future teachers are open to the use of AI. In our research, we want to investigate to what extent this finding holds for students of the Faculty of Pedagogy of the Károli Gáspár University (KRE), majoring in kindergarten teacher education and teaching.

Our measure is an adapted version of *Yurt and Kasarci's* (2024) Questionnaire of Artificial Intelligence Usage Motivation (QAIUM). According to *Expectancy-Value Theory*, two key factors determine students' motivation, academic performance and activity choice: performance expectations and task values. In the measurement tool, we consider four basic dimensions of task value: *attainment* (the importance of completing the task); *utility* (the fit between the task and one's goals); *interest* (the pleasure and interest derived from the task); and *cost* (the effort, time and expense associated with completing the task).

In our research, the questionnaire is administered among students of the Károli Gáspár University studying in the lower and secondary teacher education programmes of kindergarten teachers, teachers and teacher training. As a control group, we also include students of KRE who are not majoring in education (law, theology, humanities, economics). Our research question is whether there is a significant difference in the attitudes of students with a teaching degree compared to non-teaching students. Of particular importance for the development of higher education content is the identification of motivational patterns and attitudes towards the knowledge and use of AI in different contexts and subpopulations. As educators, it is important to understand how to harness the motivational potential of students for effective training development.

In the light of the results, semi-structured interviews will be conducted with students and academics on general attitudes, usability in higher education and usability in public education.

Summary

In our study, we have tried to summarise the most important results and dilemmas of the educational usability of AI with a focus on teacher education. We have tried to identify the key factors that can help the paradigm shift in teacher education in the context of the social, professional and content changes that digital technology has brought about.

After taking stock of the effects and counter-effects of using AI for educational purposes, fears and expectations, the duality of creation and vulnerability, and dilemmas related to equal opportunities, we sought to explore the role models and attitudinal factors related to teaching and learning.

The aim of the research project of the *New Pedagogical Challenges research group* of the Faculty of Pedagogy of the Károli Gáspár University, *Fears and expectations of teacher candidates in the context of the educational use of artificial intelligence,* is to explore the attitudes of students and teachers towards AI and using them into the development of education. The analytical and critical approach to knowledge and innovations, and their placement in a professional context is essential because "*although age, place of residence and educational level are among the differentiating factors (...) in the question of attitudes towards AI, the most significant factor is prior experience, familiarity and trial and error with AI*" (Bokor, 2023:125).

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