| Research Article / Araştırma Makalesi|

Preparing Teachers for a ChatGPT-Influenced Workforce

Öğretmenleri ChatGPT'den Etkilenen İşgücüne Hazırlamak

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Abstract

Purpose: In the 21st century, unique changes have become apparent in our lives. These changes have affected numerous fields, and education is no exception. Innovations in education have progressed rapidly, particularly with the prevalence of Artificial Intelligence (AI) applications. Higher education institutions play a crucial role in these developments due to their capacity to shape professional competencies and raise societal awareness. This study discusses the impact of AI applications on higher education and their significance in teacher training.

Design/Methodology/Approach: The study explores AI applications in higher education, particularly in preparing prospective teachers for AI-driven work environments. A review of literature and current educational practices was conducted to assess the integration of AI into teacher training programs. The study focuses on AI literacy, curriculum adaptation, and professional development.

Findings: AI applications have started to transform higher education by enhancing pedagogical methods, improving access to educational resources, and redefining the skill sets required for future educators. However, there remains a gap in AI literacy among pre-service teachers. Higher education institutions must incorporate AI-based courses and digital competencies to prepare teachers effectively.

Highlights: The study emphasizes the need for AI literacy in teacher training programs to ensure future educators can effectively utilize AI technologies in their profession. Recommendations include updating curricula, integrating AI-driven tools, and fostering interdisciplinary collaboration in higher education.

Öz

Çalışmanın Amacı: 21. yüzyılda yaşamımızda önemli değişimler meydana gelmiştir. Bu değişimler birçok alanı etkilediği gibi, eğitim alanında da önemli dönüşümler yaşanmıştır. Yapay zekâ uygulamalarının yaygınlaşmasıyla birlikte, eğitimde inovasyon hız kazanmıştır. Yükseköğretim kurumları, profesyonel becerileri şekillendirme ve toplumsal farkındalık oluşturma konularında kritik bir rol üstlenmektedir. Bu çalışma, yükseköğretimde yapay zekâ uygulamalarının etkisini ve öğretmen eğitimi açısından önemini ele almaktadır.

Materyal ve Yöntem: Çalışmada, yükseköğretimde yapay zekâ uygulamalarının öğretmen yetiştirme sürecine entegrasyonu incelenmiştir. Literatür taraması ve mevcut eğitim uygulamalarının analizi yapılarak, öğretmen adaylarını yapay zekâ destekli bir iş gücüne hazırlamak için gerekli stratejiler değerlendirilmiştir. Yapay zekâ okuryazarlığı, müfredat adaptasyonu ve mesleki gelişim odak noktaları olarak ele alınmıştır.

Bulgular: Yapay zekâ uygulamaları, yükseköğretimde pedagojik yöntemleri geliştirerek, eğitim kaynaklarına erişimi artırarak ve öğretmenlerin sahip olması gereken becerileri yeniden tanımlayarak önemli bir dönüşüm sağlamaktadır. Ancak, öğretmen adayları arasında yapay zekâ okuryazarlığı konusunda hala eksiklikler bulunmaktadır. Yükseköğretim kurumlarının, öğretmenleri daha etkin bir şekilde hazırlayabilmesi için yapay zekâ temelli dersleri ve dijital yeterlilikleri müfredata dahil etmesi gerekmektedir.

Önemli Vurgular: Çalışma, öğretmen eğitimi programlarında yapay zekâ okuryazarlığının gerekliliğini vurgulamaktadır. Geleceğin eğitimcilerinin yapay zekâ teknolojilerini etkin bir şekilde kullanabilmesi için müfredatın güncellenmesi, yapay zekâ destekli araçların entegrasyonu ve disiplinler arası iş birliğinin teşvik edilmesi önerilmektedir.

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INTRODUCTION

In the 21st century, unprecedented changes have occurred in professional and personal lives (Davenport & Ronanki, 2018). These have affected numerous trajectories such as health, transport, and tourism, as well as spheres of education. Innovations in education have been progressing rapidly in recent years in particular with the advent of artificial intelligence (AI) applications. Whilst artificial intelligence applications continue to progress without slowing down, higher education institutions are gaining a special importance in their competence in guiding the said processes (Southworth, et al., 2023). This is on account of the fact that higher education institutions offer through which professional skills and competencies are acquired. Further to this, teacher training and many other professions that shape society are carried out through programs in higher education institutions (Leander & Burriss, 2020). From this perspective, it would be fair to say that higher education institutions are uniquely positioned to raise societal awareness. Due to their sui generis being, higher education institutions, need to be constantly kept up-to-date (Robinson, 2020) since as long as higher education institutions remain up-to-date, individuals will be able to respond more quickly to the needs of the dynamics of this changing world. In this regard, artificial intelligence applications, which have come to the fore recently, should be taken into consideration by the relevant stakeholders (Kandlhofer et al., 2016).

Prior to ensuring the implementation of artificial intelligence applications in higher education, artificial intelligence literacy should be gained by the related agents (Luckin et al., 2022). As a matter of fact, artificial intelligence is no longer just an imaginary product created from science fiction. It is becoming an indispensable part of our lives that is progressing daily (Wong et al., 2020). For this very reason, individuals who have graduated from higher education should have developed sufficient literacy in artificial intelligence (Cantú-Ortiz et al., 2020). That said, even though artificial intelligence applications have started to be widely used worldwide, they have not yet attained the desired prevalence at the higher education level (Vincent-Lancrin & Van der Vlies, 2020). A line of literature points to that artificial intelligence applications are not sufficiently included in the curriculum of both undergraduate and graduating students (Cantú-Ortiz et al., 2020; Dai et al., 2020; Southworth, et al., 2023). At the same time, in the studies conducted by educational researchers, it is italicized that artificial intelligence literacy is indeed a skill that must be acquired during higher education (Ng et al., 2021; Su et al., 2022).

In this direction, it would be a positive step to involve artificial intelligence applications in higher education programs and hence curricula (Dai et al., 2020). Merely in this way can it be assured that higher education graduates have the adequate knowledge along with skills in the age of technology. Artificial intelligence literacy to be gained in higher education will help prepare learners in a more qualified way for their future viz. for the real life outside and professional lives (Long & Megerko, 2020; Rodríguez-García et al., 2021). The dimensions of artificial intelligence literacy prepared by Ng et al. (2021, p.5) according to Bloom's taxonomy, which should be acquired in higher education, are presented in Figure 1 below.
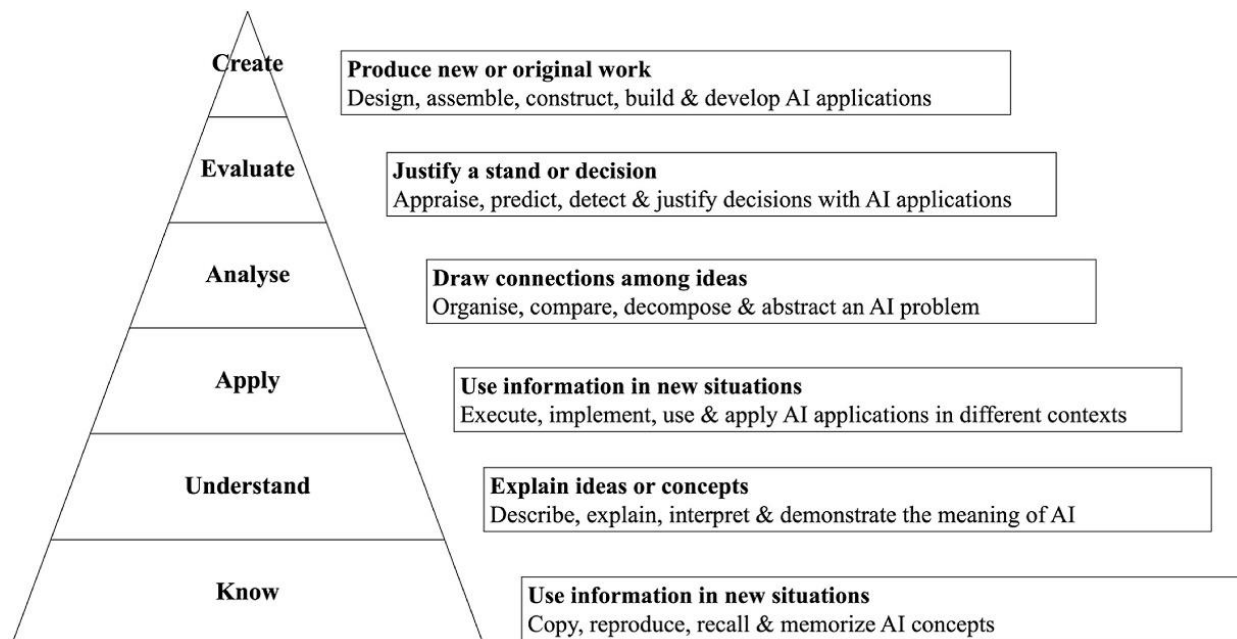
Figure 1. Artificial intelligence literacy and Bloom's taxonomy dimensions

Apparently, the skills become more complex from bottom to top. This hints at the fact that skill competence develops from the bottom to the top of the pyramid. It is noteworthy that in today's world of digital transformation, plentiful skills have started to be directly and indirectly associated with artificial intelligence applications. This realm has brought along the adaptation of artificial intelligence literacy to whatever is encountered in daily life and thereupon in the overcoming of problems. To this end, artificial intelligence literacy in higher education should be examined within the framework of TPACK (Koehler et al., 2013). In this respect, the application framework by Ng et al. (2021, p.5) is given in Figure 2.
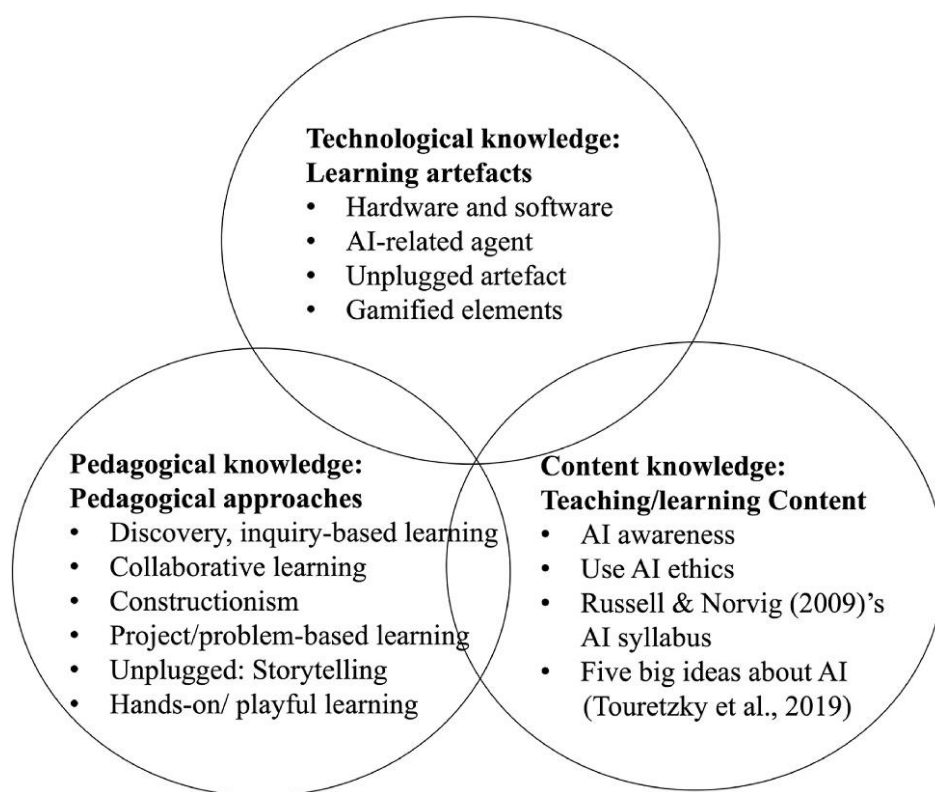
AI Literacy TPACK Framework

Figure 2. Artificial intelligence literacy and TPACK framework

It seems that artificial intelligence literacy at higher education level is effective in the fields of software, hardware, and gamification within the framework of technological knowledge. Within the framework of pedagogical knowledge, it mainly supports individuals in terms of the methods and techniques.

When the domain knowledge is scrutinized, one can comfortably state that it contributes to students in artificial intelligence awareness, ethical usage framework, course content creation and the creation of big ideas. These advantages provided by artificial intelligence literacy in higher education are especially important in the teacher training process and in warranting teachers start their professional lives in an equipped fashion.

A Review of the Literature - Why resort to Artificial Intelligence in Higher Education?

Artificial intelligence applications were first used in tasks such as data analysis, image identification and natural language processing after the year 2000 (Ahmad, 2019). Over time, these applications have continued to be in use with the development of technological applications, the production of autonomous vehicles, the creation of smart homes and devices, and the realization of digital applications that work with voice commands (Corwin et al., 2017). Today, artificial intelligence applications can be encountered in innumerable ways (Hu et al., 2019). According to a study, solely 33% of individuals consciously use artificial intelligence for a task (PEGA, 2022). This implies that one-third of society has already started to use artificial intelligence applications.

In the accumulated literature, it is clear that artificial intelligence applications are used at a limited level in higher education though (Chen et al., 2020). These applications are frequently used in data search, data analysis, data classification, industrial applications, and engineering. Howbeit, using artificial intelligence applications as an alternative development tool is not recommended much. Instead, it is emphasized that it would be more effective to integrate artificial intelligence applications in the existing curriculum in higher education and make them a part of the education process (Buckingham Shum & Deakin Crick, 2016; Markauskaite et al., 2022; St Louis et al., 2021).

The above feedback has been acted on and some applications have been made to include artificial intelligence applications in existing curricula and to make sure interdisciplinary development (Larson & Miller, 2011). In this frame of reference, Southworth et al. (2023) conducted a curriculum development study on the transformation of higher education. Accordingly, artificial intelligence applications are handled in five different categories. These are classified as access to artificial intelligence applications, ethical use, measurement-evaluation and creativity, application/use, and knowing/understanding. The practicum encompasses artificial intelligence courses, literacy, and competencies. Figure 3 portrays the curriculum arrangements for artificial intelligence applications (Southworth et al., 2023, p.6).
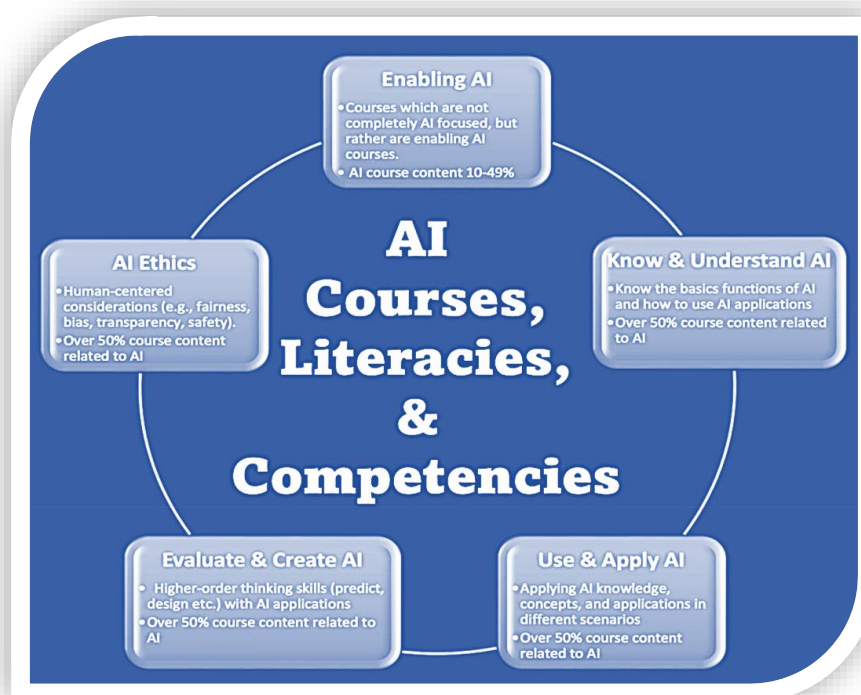
Figure 3. Curriculum arrangements for artificial intelligence applications

It is worth noting herein that a novel concept has emerged in the process of including artificial intelligence applications in curricula at the higher education level. This is entitled *"readiness to use artificial intelligence"* (Jöhnk et al., 2021). That being said, the readiness components for artificial intelligence applications have not yet been completed, they continue to be developed. Alongside this, artificial intelligence readiness studies have begun in the field of educational sciences and in the business sector (Luckin et al., 2022). This depicts that artificial intelligence applications gain more importance professionally.

Another area that should be given importance with regard to the notion of readiness for the use of artificial intelligence in higher education is without doubt teacher training as teachers are the individuals who influence the development of their students to a great extent. On this basis, they should receive a good artificial intelligence education during their higher education studies and have a certain degree of competence.

Several artificial intelligence applications used in the field of education can make judgement like humans to a certain extent. More precisely speaking, these perform a kind of simulation of human behavior via copying it. Albeit it should not be forgotten that artificial intelligence applications have some features that differ from traditional technologies. Traditional technologies give full control to humans, but artificial intelligence applications perform some of the control autonomously by distributing tasks (Damerji & Salimi, 2021). At this juncture, the term "readiness" needs to be revisited and interpreted from a different perspective for educators. It is observed that there exists a bulk of studies on artificial intelligence readiness for educators in higher education. Jöhnk et al. (2021), for instance, interviewed 25 artificial intelligence experts in their study.

Within the scope of the research, an artificial intelligence readiness framework was created. This designated framework has strategic alignment, use of resources, adequacy of knowledge levels (artificial intelligence awareness, skills, ethics), culture formation and use of digital data. In another study, Luckin et al. (2022) conducted a more comprehensive study and adapted artificial intelligence preparedness to education. In this study, which consists of seven different steps, there are the stages of dealing with the idea of artificial intelligence, identifying the challenges that need to be solved in education, identifying, and collecting data to address the challenges, applying artificial intelligence techniques for data analysis, and using the results of artificial intelligence. In another study conducted by Karaca et al. (2021), a scale was developed and students' readiness for artificial intelligence applications in higher education was explored.

When the sub-dimensions of the developed scale are examined, it is obvious that there are cognitive preparation, competence to use artificial intelligence, having a vision of artificial intelligence and ethical use skills. When the studies on artificial intelligence applications are further investigated, readiness materializes as an eminent factor. With this being said, most of the existing studies are at the theoretical and conceptual level. This is an indicator that artificial intelligence applications in higher education need to take place in the education process (Brouillette, 2019; Felix, 2020). Considering the studies in the theoretical pathways, it can be put forward that there are few studies that inspect the effects of artificial intelligence applications in the field of teacher training in higher education to speculate about their effects on the development of prospective teachers (Bhargava et al., 2021; Chounta et al., 2022).

In the 21st century, innovations in science and technology have affected the types of competences and skills that teachers should possess as they graduate. This has led to the formation of new areas of expertise and the adoption of distinct approaches in the formation of the workforce (Buckingham Shum & Deakin Crick, 2016; Kandlhofer et al., 2016). The World Economic Forum (2022) defined the Fourth Industrial Revolution as "the unification of the physical, digital and biological worlds and the renewal of technologies". It should be noted that this does not underline an utterly positive idea. It has also been stressed that this development may have negative aspects and dangerous problems may occur. Thence, necessary preparations should be made to prevent the negative consequences of artificial intelligence applications.

Following this, the United States has taken precautions against the national security sector to create a workforce ready for artificial intelligence and with the aimed advanced digital literacy by the year 2025 (NSCAI, 2021). Aside from this, the ultimate goal of higher education institutions in the United States has become addressing students in the qualified workforce and making them ready for this. For this purpose, colleges and universities are constantly being reviewed and their curricula are being renewed in line with the needs and expectations of the professions (Ahmad, 2019; St Louis et al., 2021). This is valid for teacher training as well. In order to be able to overcome the challenges of the 21st century and to create a qualified workforce, it is deemed vital to educate individuals who have a good command of artificial intelligence applications (NSCAI, 2021).

STRENGTHS and WEAKNESSES of ARTIFICIAL INTELLIGENCE USE in HIGHER EDUCATION

Artificial intelligence applications have been used more extensively in higher education in recent years. These applications are produced by a variety of companies and work independently of each other (Lim et al., 2023); however, it is known that they own a set of similar technical infrastructures. The most popular amongst these is the ChatGPT application produced by OpenAI and released in November 2022. This application reached one million users in five days. Apart from this, it broke the consumer application record by reaching 100 million users within two months (Hu, 2023). The most powerful aspect of the ChatGPT application is that it supports multiple languages and can yield tremendous results in providing structured human-like responses. This feature was highly appreciated by the users and made it attractive to be used for dissimilar purposes, especially at higher education level. As has been mentioned earlier on, while artificial intelligence applications make many positive contributions to higher education, they can also cause many negative consequences. It is frequently criticized against issues like evaluation, authenticity, and ethical violations (Chatterjee & Dethlefs, 2023; Stokel-Walker, 2022). Some countries are not only concerned about this issue, but also prohibit the use of artificial intelligence-supported applications (Lukpat, 2023; Nature, 2023).

Another catalyzing effect of the use of artificial intelligence applications in higher education is for sure the Covid-19 pandemic. With the Covid-19 pandemic, long-term lockdowns were carried out worldwide and many educational activities were transferred to digital environments. This has caused the shareholders to develop digital literacy and interact with technologies more often. Especially at the higher education level, the usages of online tools and the realization of interactive applications have led to the development of this situation. All in all, these have shortened the adaptation and preparation process of people to artificial intelligence applications (Lim et al., 2022).

Considering the tension situation that came up with artificial intelligence applications in the field of higher education, it is seen that anxiety and excitement should be handled in a balanced manner. When approached with a critical discourse, the questions of "is there a need" or "at what level is needed" for artificial intelligence applications may come to mind. There are varying schools of thought as to the advantages and disadvantages of artificial intelligence applications in higher education. In fact, four different paradoxes are explained in the literature. These paradoxes are expressed by Lim et al. (2023) as follows:

1. Are artificial intelligence applications friend or foe?

2. Are AI applications capable/productive or dependent/limited?

3. Do AI applications increase or restrict accessibility?

4. Should AI applications be banned or popularly used?

When the first paradox case is analyzed, it is understood that artificial intelligence applications facilitate users to obtain information in higher education. Features such as writing codes, developing creative ideas, facilitating the writing of articles and theses attracted attention in a short time and were used extensively (Chatterjee & Dethlefs, 2023). On the other hand, this has led to the preparation of assignments of unknown origin in a short period of time and the production of papers and dissertations/theses that are highly similar to one another (Terwiesch, 2023). The applications allow for the writing of a book chapter within minutes. This has created uneasiness about justice, plagiarism, accountability and equality in higher education, and at present, artificial intelligence detectors have started to be placed in many plagiarism control applications resulting in a rather ironic case because these control mechanisms themselves operate as part of AI platforms.

Considering the second paradox, it is argued that artificial intelligence applications such as ChatGPT are quite capable in many fields and produce successful results. It is worthwhile to articulate that this efficiency is linked to the ratio of the information pool and data size. In other words, artificial intelligence applications are far from being independent- at least for now. They only produce human-like responses using an advanced algorithm (Rychen & Salganik, 2003).

The third paradox is among the most frequently questioned situations. The leading companies in the artificial intelligence sector (OpenAI) pronounce that these programs are prepared for the benefit of humanity (OpenAI, 2023). As a matter of fact, this has been made freely accessible in order to universalize knowledge and to be used by all people (Pavlik, 2023). With this initiative, equality in education has been targeted and innovative studies have been designed to enhance accessibility. Especially international students need to eliminate the language barrier so as to easily adapt to higher education (Cheddadi & Bouache, 2021). Artificial intelligence applications offer positive opportunities such as language editing and translation, producing creative content, and eliminating unintentional plagiarism. However, in addition to these positive contributions, applications such as ChatGPT can be kept open for free and at full capacity for a certain period of time. After some time, it restricts accessibility by switching to a paid subscription system. Some services that are accessed free of charge have begun to be offered with slower and more restrictive information over time.

The last paradox is about the prohibition of artificial intelligence applications or the continuation of their popular use. There are many different practices in this sense. To illustrate, the Australian states of New South Wales, Queensland and Victoria have announced that access to ChatGPT will be banned for security reasons (ABC News, 2023; Jaeger, 2023). A similar situation took place in public schools in New York City (Lukpat, 2023). Although these bans include a certain period of time, they may have a great(er) impact on the shaping of the laws that countries will prepare in the long term. The prohibition of artificial intelligence, especially at the higher education level, may in turn lead to counter-formations. For example, the attempt to censor, hide or remove it may cause the society to show more tendency and increase interest in it (Jansen & Martin, 2015). Namely, by creating reverse psychology, individuals may wish to illegally access these applications.

Although there are paradoxes in connection with the use of artificial intelligence in higher education, it is also referred to in many other fields. Especially the preparation of personalized learning environments provides a great advantage (Kong et al., 2021). In the education of disadvantaged groups, these learning environments can create positive results thanks to accessibility (Pechenkina, 2023). At the same time, innovative applications are implemented with smart teaching systems (O'Connor & ChatGPT, 2023). This provides continuous and instant feedback for students. Creating alternatives to course materials from time to time, providing material richness and personalized performance applications can be shown among the positive developments (Holden et al., 2021). Moreover, chatbots and virtual assistants can be used for students who want to receive psychological and social support. These applications, which respond to students without judgement, can actually provide support in many ways. Another positive feature of artificial intelligence applications is that they perform measurement and evaluation procedures and support researchers in the data analysis process (Dibble, 2023). The use of artificial intelligence and chatbots in higher education alters the role of teachers and students in the classroom from time to time. In traditional education, teachers are more active, yet artificial intelligence applications begin to individualize the learning process over time and reduce the dominance of teachers in the classroom (University, 2023). In parallel with this, students tend to learn individually and become more active (Hammer, 2023). However, this progresses positively up to a certain point. Because the ability of artificial intelligence applications to produce content is (currently) limited. Therefore, it is not possible to fully replace instructors for now and whether doing so would be ethical or feasible is yet another question. However, supporting teachers and students in the education process can be seen as a positive development. There is not yet an international law or frame on the use of artificial intelligence applications in higher education and on the legal limits. It is known that preparations are being made by some countries though. This also brings up the ethical use of artificial intelligence applications (Becker et al., 2018). Artificial intelligence applications can make positive contributions to the performance of students and academics, back up their gaining experience, and most importantly, help develop creative thinking skills, with the negative effects they might bring about (Jalal et al., 2021). The fact that there is no law, law or regulation for artificial intelligence applications paves the way for the use of these applications at times in unlimited and illegal ways (Holmes et al., 2021). Even though artificial intelligence applications attempt to help people improve their mental skills it is declared that they cause behavioral changes in students after a certain period of time and make them more impatient and less thinking individuals (Borenstein & Howard, 2021). Artificial intelligence and chatbots can also affect international students' learning experiences and their ability to access education. In this context, especially students with language deficiencies and communication problems can be easily included in the process. At the same time, learners with special needs can overcome their disabilities with interactive applications offered by artificial intelligence applications and receive education in universities. This creates positive results for equality in higher education (Zhai, 2022).

An INVESTIGATION of ARTIFICIAL INTELLIGENCE in HIGHER EDUCATION towards TEACHER TRAINING

There are many different professional practice areas in higher education. Among these fields, teacher training has its own place. Teacher training programs intend for the training of qualified teachers working at many different levels from pre-school to high school and for the creation of a high-level workforce (Babic, 2017). Teacher training programs constitute an arena that needs to be constantly kept up-to-date and technological competencies should always be on the agenda in their curricula (Buckingham Shum et al., 2019). Bearing in mind this, prospective teachers should be well-trained and graduate with the skills required by the age. It is well known that pre-service teachers take information and technology courses in university environments globally (Chi et al., 2011). However, the majority of these courses lead to the acquisition of rather basic literacy skills. What is more, existing programs may be insufficient in view of the ethical uses of technology and on the subject of ethical practices (Duffy & Azevedo, 2015). On top of everything, there is no legal regulation or restriction on the uses of artificial intelligence. This may cause pre-

service teachers to use artificial intelligence applications unethically. With a view to preventing these situations, it is essential to prepare laws and regulations for higher education and to plan awareness trainings for prospective teachers. At the same time, the inclusion of elective and compulsory courses within the scope of these regulations may also appear as alternative practices (Nazaretsky et al., 2021) so when they teachers begin their professional lives these help them to be more successful (Weston-Sementelli et al., 2018). In addition to the existing curriculum in higher education, professional development areas should also be supported e.g., technology and computer literacy, coding, software, and big data analysis can be prepared as additional applications where artificial intelligence applications are active.

In higher education programs, teacher candidates are aimed to be equipped with many different skills. These skills include critical, creative (Ayyıldız & Yılmaz, 2021) and inquisitive thinking, problem solving, leadership (Ayyıldız & Yılmaz, 2023), decision making and reasoning (Yang et al., (2018). However, in the WEF (2022) meeting, it was announced that new and different skills may be required by the years 2025 and 2030. These skills cover software and coding, artificial intelligence literacy, algorithm generation, multi-criteria decision making and stress management. Thus, teacher training programs need to be renewed according to the needs of the age and transformed to adapt to the popular areas of the future, especially artificial intelligence applications.

Highlighted Results and Suggestions for the Future

The present study can be interpreted in two main tracks so that it can shed light to the future. The first track points out to the studies that will concentrate on AI in and for higher education. In the matter of research on AI, it would be both meaningful and purposeful for scholars from distinct disciplines to cooperate and collaborate to open the way for multidisciplinary, interdisciplinary, and transdisciplinary research, which is extremely important to focus on the divergent angles i.e., societal, andragogical, psychological and political angles of this inherently complex issue. As for the aforementioned second track we would like to accentuate that decision making bodies, policy makers and authorities need to work together to establish the required infrastructure, intellectual capital and ethical schemes for AI to be best integrated into the idiosyncratic world of higher education.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author received no financial support for the research, author-ship, and/or publication of this article.

Statements of publication ethics

I hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

Since This research is a literature review study, ethics committee permission is not required.

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