

The Role of Artificial Intelligence in Higher Education: The Case of Armenia

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ABSTRACT Artificial intelligence in higher education has expanded worldwide with the growth of AI technologies. The emergent applications of artificial intelligence in higher education (AIED) in course preparation, delivery, and administration as well as in learning assistants and prediction for the sake of learners are widely considered important innovations that can change education worldwide. The Armenian case was examined via a survey that was conducted at the country's leading universities to investigate whether and how faculty use AIED. Although the results indicate that many Armenian teaching faculty use AIED in narrow capacities and acknowledge the potential usefulness of AIED in the practical administration of Armenia's higher education, the use of AIED is not deep.


AI has rapidly advanced in attention and use in recent years, gaining significant traction across various sectors, including education, as companies like OpenAI have set historic records in user enrollment worldwide (Hu 2023). AI in Education (AIED) offers the potential to transform the process of education by reducing administrative workloads, enabling predictive interventions, automating student evaluations, simplifying lesson planning, and providing personalized digital tutors for students.


However, the effective adoption and implementation of AIED at scale requires time, customization, and training, even in the best-case scenarios at the individual university level in high-income countries. Globally, the implementation of AIED encounters developmental challenges during its geographical spread.


Although it can be adopted at scale in middle-income countries and has the potential to accelerate local advancement, effective use and adoption remain difficult prospects.


In the context of uneven development, the case of AIED in Armenia highlights an important gap in the literature—specifically, the adoption and implementation of this technology in developing and middle-income countries (Crompton and Burke 2023). The implementation of effective AIED in Armenia's university system could be slower and less effective than that found in richer countries due to structural factors such as state and institutional weakness (Kassab 2015). Although the influence of developmental status or cultural differences on conscious technology adoption and industrial transformation is a complex topic addressed in other literature, it is widely acknowledged that change remains a challenging task, even when elevated to a state priority (Wade 1990).


Therefore, this study will retain a narrower focus on a part of the Armenian academy's self-reported attitudes toward and implementation of AIED. The present research seeks to investigate two primary questions: (1) What do Armenian social science teaching faculty think about AI integration into their workplace? and (2) To what extent and in what manner do they implement AIED in their classrooms? By exploring these questions, the purpose of this study is to shed light on the challenges and opportunities that are associated with the adoption of AIED in the context of a

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developing economy while contributing to a better understanding of the factors that influence the successful integration of AI in education systems worldwide.

AIED IN HIGHER EDUCATION AND THE ARMENIAN ACADEMY: A LITERATURE REVIEW

Artificial intelligence represents technology that mimics human intelligence in a manner that employs machine perception and learning as well as evolutionary algorithms to accomplish predefined goals. AIED specifically concerns the applications that assist

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in (re-)processing of information for comprehension by students, instructors, and administrators during a course's delivery, administration, and learning. Consequently, it is important to briefly mention four general AIED applications identified and studied in prior research. They involve (a) student profiling and performance prediction; (b) assessment, evaluation, and performance flagging; (c) spontaneous programming adaptations; and (d) smart tutoring systems (Crompton and Burke 2023; Zawacki-Richter et al. 2019). Research generally indicates that although AIED does not itself improve direct student learning outcomes, it instead serves a labor-saving role for faculty in administrative functions and highlights downward student performance for intervention and correction by instructors (Bates et al. 2020, 2).

But these applications have grown more prominent in advanced economies only recently and represent the most frequently used and researched applications of AIED in advanced economies (Crompton and Burke 2023; Zawacki-Richter et al. 2019). Initially, AIED was used almost exclusively by computer science departments, STEM fields, and by university administrations, whereas all others deployed it at peripheral levels. Teachers' use of AIED has grown only fairly recently (Hinojo-Lucena et al. 2019; Zawacki-Richter et al. 2019, 7–10). Prior to contemporary advances, teacher-facing and student-facing AIED alike remained relatively underdeveloped, possibly owing to their primary development and use by computer scientists (Akgun and Greenhow 2022; Bearman, Ryan, and Ajjawi 2023). Specifically, AIED in higher education today primarily serves teaching faculty during course preparation and administration, but it is often ignored or unused in class delivery or for collection of live student feedback (Bearman, Ryan, and Ajjawi 2023; Celik et al. 2022). As AIED is still gaining momentum and footholds within academia, its widescale use is anticipated in the future (Celik et al. 2022).

Faculty use cases must also be balanced and prioritized with students' access to AIED, but students also need to be educated carefully on its capabilities and limitations. Directing students to productive and enriching uses of AI ought to be encouraged as inoculation against its use as a crutch and/or replacement for their own studies (Jarrah, Wardat, and Fidalgo 2023; Popenici and Kerr 2017; Sullivan, Kelly, and McLaughlan 2023). In this vein, popularly, misuse of and poor education in the use of AIED can decrease student and academic integrity and increase misconduct during

completion of routine assignments and work and thus can threaten long-term outcomes. (Jarrah, Wardat, and Fidalgo 2023; Sullivan, Kelly, and McLaughlan 2023). However, efficiency gains for instructors and students contain risks of their own besides individual use.

When implemented and scaled within school districts across entire regions, AIEDs' mass algorithmic power risks homogenizing and abandoning students by applying solutions tailored to enriched and powerful social strata that are overidentified in models' training data as a society's "average" students (Holmes and Porayska-Pomsta 2022). This sampling error can yield penni-

cious, discriminatory outcomes that exacerbate and reflect real structural inequalities in the social world. However, such issues often go unstated within AIED models, as socially marginalized groups—especially racial and gender groups—are blocked from proper representation in the samples used during AIED training. Still worse, AIs and AIEDs are not static, and the varied use of other programs—such as facial and vocal recognition tools—can accentuate marginalization of discriminated groups and can perpetuate structural racial and gender biases (Benjamin 2019; Buolamwini 2023). These issues can further magnify existing biases in educational systems that already overwhelm youth, women, racialized, and minoritized student influence and stakes within such systems (Brossi, Castillo, and Cortesi 2023; Treviranus 2023).

Although AIEDs can work as "springboards" that could advance the (most catered) students, impoverished districts, populations, and regions could implement poorer quality and lower-tiered AIED models that compromise the application of their expected uses in the classroom via poorly fitted implementation, weaker pedagogical or programming suggestions, decreased privacy, and weaker nudging toward established expectations (Bartoletti 2023). Advancements in AIED by educational-technology corporations paired with governments seeking cost-cutting "solutions" potentially lead to disassembly, disempowerment, and elimination of teachers themselves, thereby corroding and potentially destroying critical nodes for communities' transfer of knowledge, skills, socialization, and socioeconomic transformation (Braverman 1974; Noble 1995, 2003).

Within Armenia, Soviet legacies and post-Soviet neoliberalization have affected the administrative and financial circumstances of the country's higher education institutions. Privatizations and mass withdrawal of state funding, alongside economic difficulty, have led state universities to endure large funding cuts amidst the establishment of private institutions and foreign branch campuses. By the late 2000s, total state funding accounted for an average of only 23% for all higher education institutions' budgets, with student tuition providing the remainder. At private institutions, student tuition filled 94%–100% of university budgets (Karakhanyan 2018, 61–62). Currently, 71,732 students study in Armenian universities, of which 59,169 hail from public universities and 12,563 reside in private universities (Statistical Committee of the Republic of Armenia 2023).

Nonetheless, many changes have transpired to drive the Armenian academy toward improved outcomes, quality, and international recognition. Many domestic reforms permitted interfacing with international institutions, linkage with Erasmus, engagement in international exchange and recruitment programs, and attention to research and innovation. There is also an increasing focus on the introduction of technology into higher education, including e-learning platforms, online courses, and other digital tools to improve the quality of education. This includes standardizing qualifications, degree structures, and credit systems under the rubrics of the European Credit Transfer and Accumulation System as well as quality assurance to facilitate the mobility of students and academic staff (Aperyan 2021).

The geographical and social position of Armenia also favor multilingual and multicultural education. Although Armenian is the main language of instruction in most universities in the country, the importance of knowing English and other foreign languages is noteworthy. The American University of Armenia notably delivers instruction in English, whereas the French University in Armenia and Russian-Armenian University deliver instruction in French and Russian. To attract international students, many universities, such as Yerevan State University, Armenian State University of Economics, the Mkhitar Heratsi Yerevan State Medical University, and others also offer various educational programs in English. Efforts toward educational reforms have also been made by the Government of Armenia (Dobbins and Khachatryan 2015). Current challenges facing higher education in Armenia include the status of public financing (Karakhanyan 2018), adequate infrastructure, and improved cooperation between the academy and employers (K. Atoyan, Babajanyan, and Atoyan 2021; Keryan et al. 2020). In addition, brain drain has also been a constant concern in recent decades, as many highly qualified professionals, including those from the academic field, leave the country in search of better opportunities abroad (V. Atoyan 2021).

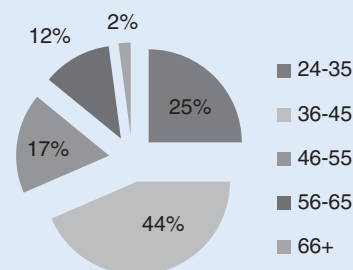
DATA AND METHODS

During 2021–2022, 17% of AI research in higher education globally focused on academia (Crompton and Burke 2023, 1). To contribute to this literature, the research group conducted a sociological survey during August–September 2023 among the social sciences educators of universities in Armenia. A comprehensive list of universities whose representatives have responded to the request is available in the appendix. The decision to focus on social sciences was driven by the unique role these disciplines play in understanding and shaping educational practices and policies within the country, including AIED use. Further surveys among educators in other disciplines remain to be completed.

The survey was initially designed as a Google Form and emailed to university faculty for ease of access. It included questions designed to gauge faculty perceptions, use, and concerns regarding AIED. The survey was disseminated via email to 892 faculty at various universities throughout Armenia. To increase participation across different age groups and ensure a comprehensive data set, printed versions of the survey were also distributed. The survey was intended to capture responses from at all universities in Armenia regardless of their status. Participants included faculty with graduate degrees, both with and without doctorates.

The selection of the sample was purposive, targeting educators in social sciences within higher education institutions across Armenia. A total of 184 faculty (20.6% response rate) from eleven

Figure 1
Respondents' ages



higher education institutions participated, representing a wide section of Armenian higher education, where the majority of postsecondary Armenian students study (81.5%). Responses were gathered from faculty at nearly all of the highest-ranked universities in Armenia. According to the latest national ranking, the leading universities in Armenia are Yerevan State University, Armenian-Russian University, and the M. Heratsi Yerevan State Medical University (NCET 2016). Other ranking criteria point to the Armenian State University of Economics and the Armenian National Agrarian University, among others (Yerevan State University 2017).

Although the survey was completed mainly by educators at state universities, it should be noted that educators at state universities also very often teach in nonstate universities. The ratio of the number of faculty of in Armenian universities is as follows: 9,574 educators teach in state universities and 1395 in nonstate universities (Statistical Committee of the Republic of Armenia 2023). The faculty who participated in the survey indicated their primary affiliation. Responses were excluded if they were incomplete or if the participants did not meet the criteria of being current social sciences educators in Armenian higher education institutions. Additionally, any duplicate responses identified through data cleaning were removed to ensure the accuracy and reliability of the data.

The survey responses were collected and analyzed to provide insights into the state of AI adoption in Armenian higher education. The demographic information of the respondents, including age and scientific degrees, is summarized in figures 1 and 2. It should be noted for clarification that the titles “Candidate of Sciences” and “Doctor of Sciences” are postgraduate degrees used in many post-Soviet countries. Although they are each similar to

Figure 2.
Scientific degrees of the respondents

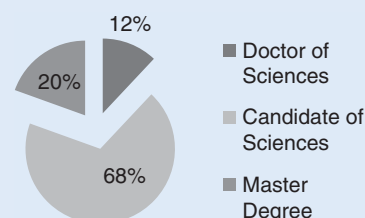


Table 1.
Faculty Concerns about AI

Survey question	--	-	~	+	++
Do you think AI-based technologies could displace humans in major areas of the labor market in the next 25 years?	No, 22.8%	-	I find it difficult to answer, 9.8%	Yes, but not in Armenia, 20.7%	Yes, 46.7%
Do AI jeopardize the future of human civilization?	No, 22.8%	-	I find it difficult to answer, 27.2%	-	Yes, 50%
Are you concerned that AI technologies will replace humans in performing many tasks within your profession or field in the future?	I'm definitely not concerned, 12%	I'd rather not worry, 38%	It's hard for me to answer, 3.3%	I'm more concerned, 29.3%	I'm definitely concerned, 17.4%
Do you believe that AI-based technologies will assume most of the professors' functions in universities over the next 25 years?	No, 32.6%	-	Difficult to answer, 21.7%	Yes, but not in Armenia, 21.7%	Yes, 23.9%

Table 2.
Faculty Use of AI in Courses

Item					
Do you use AI in the courses you teach?	No, 41.3%	-	-	-	Yes, 58.7%
What part of the learning process do you perform with the help of AI?	Zero, 40.2%	Small, 57.6%	-	Significant, 2.2%	Majority, 0%
How are AI technologies applied in the courses you teach?	AI technologies are not used in the courses I teach, 42.4%	Others, 5.4%	Checking assignments and assessing knowledge, 23.9%	Creation of educational applications, 6.5%	Organizing distance courses and exams, 21.7%

Table 3
Faculty Views toward AI Use

Survey question	Definitely does not help	Difficult to answer	Partially promotes	Definitely promotes
Do you believe that AI technologies enhance students' independent thinking and research skills in education?	22.8%	8.7%	58.7%	9.8%
Do you think the use of AI technologies contributes to a more comprehensive and intelligible presentation of educational material?	6.5%	12%	64.1%	17.4%
Do you think that the use of AI technologies contributes to a more objective assessment of students?	8.7%	19.6%	56.5%	15.2%
Do you think that AI technologies facilitate the learning process?	2.2%	6.5%	63%	28.3%
Do you believe that the opportunities offered by AI contribute to the advancement of the education system?	4.3%	7.6%	62%	26.1%
Do AI opportunities contribute to fostering dialogue between students and teachers?	29.4%	16.3%	47.8%	6.5%
Should the use of AI technologies be expanded in higher education in Armenia?	No, 22.3%	23.4%	-	Yes, 54.4%

the PhD and higher doctorate degrees used in Western countries, there are differences in their structure and significance. The Candidate of Sciences is an advanced research degree, similar to a PhD; whereas, the Doctor of Sciences is a higher doctorate awarded for exceptional scholarly achievements.

This study complies with the APSA Principles and Guidance for Human Subject Research. All participants were informed about the purpose of the research, and their consent was obtained before they participated in the survey. Confidentiality and anonymity of the respondents were strictly maintained throughout the study.

It is important to clarify that the age distribution of respondents, shown in figure 1, does not directly indicate the prevalence of AIED use among different age groups. The age data were collected to provide demographic context, and this information is not meant to be interpreted as an indicator of AIED adoption by age. The survey did not specifically cross-tabulate age with the usage of AIED technologies. Thus, any analysis on the correlation between the age of educators and their use of AIED would require a more detailed statistical examination beyond the scope of this study.

FINDINGS

Following the completion of the survey, which was designed to capture the attitudes of Armenian teaching faculty toward AIED and their extent use of the technology, the following results were captured.

1. Faculty Concerns about AI

As shown in table 1, rough parities among teaching faculty regard AIED as either not a threat or as a threat to their futures in academia, with clear pluralities emerging only where existential outcomes—such as the fate of human civilization (50%) or specter of mass unemployment (46.7%)—were concerned. In other questions, the major scale and perceived potential to transform society with its automating capabilities of AIED is regarded evenly as a threat or no threat to employment across the entire labor market, to academia, and to university faculty worldwide, as well as in Armenia.

Armenian educators acknowledge the usefulness of AIED in the practical administration of Armenia's higher education, but AIED adoption is not deep, even though it is widely used for limited applications.

2. Survey Findings: Faculty Use of AI in Courses

Table 2 shows respondents' use of AIED for teaching. In practice, 58.7% of respondents use AIED in their courses, but only to a "small extent" in mixed use cases. Course assessment, planning, and administration all emerged as prominent uses of AIED, with only 6.5% of respondents noting its direct use for educational applications. Roughly 40% eschewed use of the technologies in their courses.

3. Survey Findings: Faculty Views toward AI Use

Although participants expressed worry and lack of concern at roughly equal levels in prior questioning, attitudes are generally favorable regarding the potential of AIED use in Armenian classrooms to somewhat improve or aid their students' learning outcomes (table 3). Independent thinking and research skills, coherency of educational material, objective student assessment, facilitation of learning, advancement of national higher education, and moderately improved student-teacher dialogues all receive majorities of respondents that regard AIED as capable of bringing partial potential improvements.

CONCLUSION

Although some respondents expressed uncertainty or pessimism toward the use of AIED technologies in education, it appears to be

By addressing the identified barriers and investing in targeted training and infrastructure, the integration of AIED into Armenian higher education could be significantly improved, ultimately benefiting both educators and students.

evident that existential worries about their potential negative effects on human society can overlap with a positive perception of both cases for the use of technologies in higher education and

the use of AIED technologies in their courses. Although faculty use of AIED is limited in nature, given the number of self-reports indicating the use of AIED to "a small extent" in specific domains (table 2), Armenian teaching faculty acknowledged different uses for AIED and its positive potential and widespread but limited use. Consequently, both of our main research questions have been partially answered.

Moreover, further survey responses provide indications of the rapidity with which AIED has been adopted by Armenian teaching faculty as of late 2023, parallel to and in concurrence with other research completed simultaneously regarding the extent of use of AIED in the well-resourced environments of European and American universities. Evidently, the relatively wide adoption of AI indicates its potential for use by teaching faculty in developing countries, but the results regarding limited use and potential value of the technology at present correspond with those of other

research that has identifies deficiencies in AIED with respect to its fit or use in education beyond STEM fields and computer science (Zawacki-Richter et al. 2019, 9–10).

The results showed that Armenian educators acknowledge the usefulness of AIED in the practical administration of Armenia's higher education, but AIED adoption is not deep, even though it is widely used for limited applications. Further research remains to clarify the reasons Armenian teaching faculty report narrow use of the technology and to explore the reasons for nonuse by large numbers of remaining teaching faculty. It is possible that the two overlap in that existing AIED may be perceived as providing insufficient rewards to justify change. There may also be other reasons limited use.

Additionally, in light of the present findings, future research could focus in three further directions. The first direction should be developing training programs that equip educators with the skills to effectively use AIED in their teaching. Evaluating the influence of these technologies on learning outcomes should be the second field for future research. In this context, conducting continuing studies to assess the long-term effects of AIED on student learning outcomes and quality of education is important. Finally, exploring cross-disciplinary applications should be the third area for research. On this matter, it will be useful to investigate the use of AIED across different academic disciplines to identify best practices and potential challenges unique to each field.

Although Armenian educators recognize the potential of AIED in enhancing educational practices, significant efforts are required to bridge the gap between perceptions of utility and actual use.

By addressing the identified barriers and investing in targeted training and infrastructure, the integration of AIED into Armenian higher education could be significantly improved, ultimately benefiting both educators and students.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit <http://doi.org/10.1017/S104909652400115X>.

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DATA AVAILABILITY STATEMENT

Research documentation and data that support the findings of this study are openly available at the Harvard Dataverse at <https://doi.org/10.7910/DVN/BM3ZXD>.

CONFLICTS OF INTEREST

The authors declare no ethical issues or conflicts of interest in this research. ■

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