

Integrating AI Into Higher Education Curriculum in Developing Countries

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Abstract—This research-to-practice full paper describes the integration of Artificial Intelligence (AI) is included in higher education curricula in developing countries. As artificial intelligence (AI) continues to reshape societies worldwide, the demand for comprehensive AI education has grown significantly. Despite the widespread adoption of AI and machine learning technologies, there remains a substantial gap in AI education, particularly in developed and developing countries. A recent study highlights that only a small percentage (6%) of educators have integrated AI tools like ChatGPT outside of STEM fields, with many (32%) expressing the need for further familiarity with such technologies [1]. On the other hand, it is a stark reality that students age 7-17 are adopting and using AI technology daily faster than educators [1]. While growing support for AI in education among critical stakeholders, developing countries are searching for effective ways to integrate AI tools into the curriculum and enhance student learning experiences. As a case study, this research study focuses on Azerbaijan, as a developing country. This research focuses on two main subjects: understanding the barriers and challenges of educators and administrative leaders and exploring the effective ways to achieve positive integration of AI tools into the curriculum and enhance student learning experiences. The study involved undergraduate and graduate faculty members and administrative leaders from educational institutions in Azerbaijan. The participants represented public and private universities participated AI training and their AI knowledge and leadership confidence assessed through pre- and post-tests in three key categories: AI Foundation Knowledge, AI Knowledge of Ethical Behavior, and AI Leadership Confidence. The results demonstrated positive changes in participants' knowledge and confidence levels post-training, emphasizing the significance of providing educators with robust training to enhance their AI literacy and teaching competencies. This AI training program not only addressed the existing gaps in developing countries related to AI education but also paved the way for a more inclusive and effective learning environment, system thinking and process mapping that prepares students for an AI-driven future. By empowering educators with the necessary knowledge and skills, educational institutions can better integrate AI concepts into their curricula, ultimately equipping students with the tools needed to thrive in an increasingly AI-driven world. This research serves as a valuable case study for other developing countries seeking to enhance their AI education initiatives and underscores the importance of fostering a culture of continuous learning and innovation in education.

Index Terms—Higher-Education Curriculum; AI in Developing Countries; AI Ethics; Faculty Development; System Thinking.

I. INTRODUCTION: WHY DO WE NEED AI?

The 2024 Work Trend Index Annual Report, based on a survey of 31,000 individuals across 31 nations, highlights AI's rapid transformation of the global workforce [2]. As 79% of leaders recognize the need to integrate AI to stay competitive, a major concern arises with 60% stressing the importance of a clear plan for AI implementation within their organizations [2]. Furthermore, leaders show a strong preference for hiring individuals with AI skills (66%), even favoring less experienced candidates with AI expertise over seasoned professionals lacking such skills (71%). This data highlights the profound impact of AI's ascendancy on the workplace and job market, emphasizing the critical role of the education sector in preparing students and employees with the in-demand AI skills and competencies [2]. Witnessing how AI has become ubiquitous across industries, economies, and governments underscore the need for comprehensive AI education as it continues to revolutionize various aspects of society. Despite the widespread adoption of AI and machine learning (ML) technologies a substantial gap in AI education remains in both developed and developing nations. This need for AI enhancement is crucial in the context of the Fourth Industrial Revolution characterized by the strategic deployment of cutting-edge technologies such as artificial intelligence, robotics, 3D printing [3], reshaping production, management, and governance systems across various sectors [3], [4]. In this rapidly evolving job landscape, individuals must adapt to new soft skills and mindsets critical for success in the Fourth Industrial Revolution [3]. As job requirements shift from 2015 to 2025 towards skills like complex problem-solving, critical thinking, system thinking/process mapping and creativity, the enhancement of AI becomes imperative to thrive in this changing environment. AI technologies play a pivotal role in enabling automation, data analysis, decision-making, and innovation, equipping individuals and organizations with the tools needed to navigate the evolving job market and business landscape [3], [4]. By advancing AI capabilities, individuals can better prepare for the future of work, drive innovation, and foster sustainable growth across various sectors. AI advancement not only enhances productivity but also paves

the way for new solutions and opportunities for individuals to excel in emerging fields and industries shaped by the Fourth Industrial Revolution. To achieve the goal of integrating AI effectively into the curriculum, it is imperative to conduct rigorous research and understand the challenges educators' encounter. It is crucial to explore and implement effective strategies for incorporating AI tools into the curriculum to enhance student learning experiences. Collaborating with professionals from diverse institutions can offer valuable perspectives and insights on this critical subject [5], [6]. This scholarly paper aims to present an updated literature review of recent updates regarding AI integrations in the curriculum of both developed and developing countries. Furthermore, it seeks to analyze pre-and post-test data from this study involving faculty and administrative leaders in Azerbaijan as a selective representative developing country. The objective is to identify key issues and gaps in the progress of AI integration in developing countries' curricula and to experiment and recommend practical and effective methods to successfully integrate AI tools into the curriculum and enhance student learning experiences. The following research questions are explored: RQ 1: What is the current status of the integration of AI tools into higher education in Azerbaijan and what are the primary concerns of and constraints for higher education educators? RQ2: What are effective ways to achieve positive integration of AI tools into the curriculum and enhance student learning experiences?

II. AI IN HIGHER EDUCATION

In today's rapidly evolving world, it is increasingly indispensable to integrate Artificial Intelligence (AI) into various aspects of our lives [4], [5]. This integration also affects future job requirements, leading to the need for new soft skills and different mindsets that do not currently exist [4]. For instance, while in 2015, complex problem-solving, coordinating with others, and people management were the top three jobs, in 2020, complex problem-solving, critical thinking, and creativity took over [3], [4]. It is vital to note that government leaders have acknowledged the importance of AI and the need for skilled industry professionals. The 2021 National Security Commission on Artificial Intelligence (NSCAI) Final Report emphasizes the essence of digital infrastructure for national security and the need for swift acquisition of military AI readiness [4]. NSCAI prioritizes AI interoperability with allied forces to ensure a strong defense and investing in next-generation capabilities for future warfare by 2025 is a top priority [7]. AI is a crucial part of our world, and we need to adapt to this reality by placing ethical importance at the forefront of any comprehensive teaching curriculum [5], [8]. Educators and practitioners have a significant role in equipping students with technical skills, critical thinking abilities, and ethical decision-making capabilities. This holistic approach prepares students to be responsible stakeholders and global citizens, ensuring that the benefits of AI are harnessed sustainably and ethically [9], [10]. Despite the growing importance of

AI in education, the integration of AI tools into educational curricula is still in its early stages, even in developed countries. Recent studies highlight the limited adoption (6%) of AI tools such as ChatGPT outside of STEM fields by educators, with a significant portion (32%) expressing the need for more familiarity with such technologies [2]. Educators are not just key, but integral to bridging this gap, as they have the power to shape the future of education by embracing AI and finding effective strategies to embed these tools into curricula, thereby enhancing student learning experiences. By harnessing AI technology, educators have the opportunity to deliver tailored and personalized learning experiences to students, leading to significantly improved academic outcomes for both undergraduate and graduate students. This potential for enhancement should inspire educators, as it can lead to a more effective and engaging learning environment. Embracing these transformative changes can enable educational institutions to establish a more accessible and inclusive system that equips students with the necessary skills for success in the workforce.

III. AI INTEGRATION FOR DEVELOPING COUNTRIES

The adoption and integration of AI in the educational curriculum is common across all countries. While developed countries have already embraced AI and are reaping its benefits, many developing countries are still trying to catch up [5]. It is encouraging that developing countries are making significant strides in developing their AI capabilities. They are actively working towards adopting new policies, regulations, and practices for effectively utilizing AI [11]. This is a constructive approach towards embracing technological advancements and utilizing them to uplift their economies and improve the quality of life for their citizens [11]. Artificial Intelligence (AI) has the potential to revolutionize the economies of developing countries in several ways. Firstly, the rapid growth of local technology hubs in these countries is fostering the development of innovative solutions to address local challenges, which AI can further amplify [12]. Secondly, AI can help tackle chronic productivity deficits and labor shortages in businesses, which are major barriers to economic progress in developing countries [13]. The impact of AI on industries like financial services, telecommunications, and retail cannot be overstated. Through the use of AI, these sectors can experience substantial growth and generate new opportunities for employment and investment in developing nations [14]. This underscores AI's pivotal role as a catalyst for economic development and prosperity in developing countries. However, as the AI industry expands, developing countries also face several challenges related to development and market penetration. One of these challenges is the limited availability and questionable quality of AI datasets, which can result in inaccuracies in specific field projects. These issues are widespread in many developing countries [15], [16]. Additionally, establishing clear policies and regulations for the ethical use of AI, as well as promoting awareness and understanding of AI technology and its potential benefits, pose

significant challenges [11], [17]. Addressing concerns related to privacy laws and human rights increasingly critical as AI progresses [18], [19]. The importance of integrating AI into the education system cannot be emphasized enough. The integration is essential to ensure the responsible and beneficial incorporation of AI into society. According to a report by the World Economic Forum, institutions that integrate AI into their education systems can effectively prepare students for digital readiness, innovation, and competitiveness [13]. By equipping students with the necessary skills and knowledge to utilize AI, countries not only help them stay ahead in the digital economy but also contribute to the growth of their economies [15], [16]. Therefore, it is essential for countries, especially developing countries, to prioritize the integration of AI into their education systems.

IV. CURRENT STATE OF AI IN AZERBAIJAN

This study sheds light on the current state of AI implementation in higher education in developing countries, with a specific focus on Azerbaijan, a country located in the South Caucasus region of Eurasia. It is encouraging to see that Azerbaijan recognizes the importance of AI technologies and is making strides towards adopting and utilizing them [5]. According to Azerbaijan's Economy Ministry research reports (2022), over 15 businesses are providing consultancy services and conducting research in various sectors of AI, showcasing the country's commitment to advancing AI capabilities [20]. It is crucial to note that Azerbaijan's ranking of 65th in the AI Readiness Index for 2020, as reported by Oxford Insights, indicates that the country is ready to integrate AI into various sectors and compete globally [21]. While Azerbaijan's neighboring countries like Iran and Georgia have lower rankings, Azerbaijan has the potential to play a crucial role in spearheading the adoption and utilization of AI in the region [21]. Countries such as Turkey, Russia, and the United Arab Emirates serve as inspiring examples of motivated neighbors for Azerbaijan, as they have already integrated AI into their academic curricula across various disciplines and established a strong foundation for AI educational policies [21]. These developments highlight the significance of ongoing endeavors to incorporate AI across different sectors and underscore the potential economic, industrial, and societal benefits that AI can bring to Azerbaijan. Additionally, in 2023, the Director of the Fourth Industrial Revolution Analysis and Coordination Center under the Azerbaijan Ministry of Economy announced that AI is being used in various sectors in Azerbaijan [22]. The progress timeline in implementing AI is encouraging and showcases the country's commitment to advancing its technological capabilities. Azerbaijan has also implemented a strategic programming instrument called the Council of Europe Action Plan for Azerbaijan 2022-2025 to assist in the implementation of the latest Council of Europe Guidelines on AI and Data Protection and the Ethical Charter on using AI in judicial systems and their environment by 2025 [23]. In alignment with Azerbaijan's efforts to advance its technological landscape, Aliyev et al.'s (2020) provided a comprehensive

analysis of the legal framework governing cybersecurity policy in Azerbaijan, particularly in the context of foreign policy and international obligations. Their study underscored a critical observation regarding the lack of a clear and precise definition of information security within Azerbaijan's legislation, emphasizing the importance of addressing this gap to strengthen cybersecurity measures effectively. In 2023, the Director of the Fourth Industrial Revolution Analysis and Coordination Center under the Azerbaijan Ministry of Economy, F. Jafarov, reported that AI is being applied in various fields in Azerbaijan, including sports, agriculture (using drones), facial recognition, access to the system on the electronic government portal, and the oil and gas, engineering field [24]. It is worth noting that AI can be customized, including language recognition, and implemented in different fields. Jafarov also emphasized several ongoing comprehensive studies that will enable the intensive implementation of AI in Azerbaijan [14], [22], [24]. Azerbaijan has adopted a strategic programming instrument called the Council of Europe Action Plan for Azerbaijan 2022-2025, which aims to align the country's legislation, institutions, and practice with the standards set by the Council of Europe in areas such as human rights, the rule of law, and democracy [23]. The plan helps Azerbaijan fulfill its obligations as a Council of Europe member state. As part of this plan, the Council of Europe will also collaborate with Azerbaijan on artificial intelligence [23]. The Council will help Azerbaijan implement the most recent Council of Europe Guidelines on Artificial Intelligence and Data Protection in relevant areas and the Ethical Charter on using artificial intelligence in judicial systems and their environment by 2025 [23], [25]. This collaboration is expected to significantly shape Azerbaijan's AI policy and regulations in the future.

V. EFFECTIVE WAYS FOR INTEGRATING AI INTO HIGHER EDUCATION CURRICULUM

Educators play a crucial role in integrating AI tools into higher education. Comprehensive training and support are essential for them to effectively use AI tools in their teaching [26]. Creating a collaborative environment where educators can share experiences fosters a positive attitude toward AI integration. Professional development programs that enhance AI literacy and showcase real-world applications in education can better equip teachers for this transformative process [26]. A recent report by the Walton Family Foundation in May 2024, based on USA country data, reveals that over 58% of educators have not yet received training on AI but express a strong desire for it. The report highlights educators' primary concern about the lack of professional development (69%) in implementing AI in teaching [27]. Studies cited in the report demonstrate that educators who have undergone AI training save an average of 13 hours per week on routine work, allowing them to devote more time to teaching and providing valuable feedback to students [27].

However, the report also highlights that the lack of comprehensive training and clear policies remains a major concern among educators. Without proper guidance and support, edu-

cators may struggle to integrate AI tools into their teaching practices in a meaningful way. Addressing this challenge requires proactive measures to enhance educators' preparedness and provide them with more support and training [27]. According to another report from Oxford University Press (2023), based on UK country data, only 23% of UK educators feel adequately prepared for integrating AI into teaching [28]. This underscores the urgent need for targeted training programs to enhance educators' preparedness and prevent ad-hoc experimentation. Equipping educators with the necessary skills and knowledge to use AI tools facilitates a smoother transition towards a more technology-integrated learning environment. Furthermore, addressing educators' preparedness as a persistent challenge necessitates sustained effort and investment in professional development initiatives [28]. Accordingly, United Arab Emirates government leaders announced (July, 2024) the comprehensive program is critical to ensure the best outcomes and to achieve the desired long-term goals, and all educators will receive training on using advanced applications and integrating AI tools to automate tasks and personalize learning experiences [29]. In summary, the call to action is clear. The importance of training educators on AI cannot be overstated. Educational institutions must prioritize investing in comprehensive training programs to ensure that educators are well-equipped to navigate the digital age of education effectively. By fostering a culture of continuous learning and providing ongoing support, schools can empower educators to embrace AI as a valuable tool for enhancing teaching practices and improving student outcomes in the ever-evolving educational system.

VI. METHODOLOGY AND FINDINGS

This research study delves into using artificial intelligence (AI) tools within higher education institutions in developing countries, specifically focusing on Azerbaijan. In Azerbaijan, as in many other countries, there is an increasing recognition of the potential benefits of AI tools in augmenting the teaching and learning processes in higher education. The research aimed to address two primary issues pertinent to the Azerbaijani higher education system. First, it examined the current status of AI tool integration in Azerbaijan higher education and identified the main concerns and limitations that educators and institutional leaders encounter in embracing these technologies. Second, the research aimed to explore effective and practical strategies to facilitate a positive integration of AI tools into the curriculum and to enhance student learning experiences within Azerbaijani universities.

To tackle these research questions, a comprehensive literature review has been conducted to comprehend the existing knowledge on AI integration in higher education globally and specifically in Azerbaijan. Additionally, primary data for the first research question "What is the current status of the integration of AI tools into higher education in Azerbaijan and what are the primary concerns of and constraints for higher education educators?" was collected through surveys from educators and institutional leaders in Azerbaijani higher

education institutions. The surveys gathered data on the current status of AI integration, educators' perceptions of AI technologies, and the challenges they face. The data collected from administrative leaders and educators revealed interesting insights into their familiarity with AI tools (Figure 1). While a high percentage of administrative leaders have heard about AI tools, indicating a strong awareness of the technology, the adoption rate remains relatively low, with only 18% currently using AI tools. This discrepancy suggests a potential gap between awareness and implementation in administrative roles. Furthermore, most administrative leaders expressed a desire for more comprehensive knowledge about AI, highlighting a clear need for further education and training in this area. In contrast, educators exhibited a lower level of awareness of AI tools compared to administrative leaders, with only 42% indicating prior knowledge of such technologies. Moreover, the adoption of AI tools among educators is notably low, with only 7% currently using AI tools. However, 87% of educators expressed a strong need for more comprehensive knowledge about AI, underscoring the demand for training and resources to integrate AI tools into educational settings better. These findings emphasize the importance of addressing knowledge gaps and providing adequate support to facilitate the effective utilization of AI tools in both administrative and educational contexts.

Integrating artificial intelligence (AI) into higher education course curricula presents a range of challenges, as evidenced by responses from Administrative Leaders and Educators. In the survey of Administrative Leaders (n=52), several key concerns emerged. A notable issue was the need for adequate training and professional development on AI, with 27 respondents indicating they needed to receive sufficient preparation in this area. Additionally, a significant number of leaders (n=43) expressed frustration over the absence of clear guidance from their universities on effectively incorporating AI into their roles. Data privacy and plagiarism were also flagged as major worries by 12 respondents, underscoring the importance of ethical considerations in AI implementation. Moreover, a substantial portion of Administrative Leaders (n=41) cited the lack of established rules and regulations governing the use of AI tools in their job functions, pointing to a need for standardized protocols in this evolving domain. Concerns were also raised about the potential negative impact of AI tools on students' creativity (9) and the alignment of AI integration with specific local contexts, such as language and culture (n=38). Similarly, educators (n=97) expressed their challenges and apprehensions regarding AI integration in higher education. 86 educators noted a need for comprehensive training and professional development on AI, indicating a significant gap in upskilling efforts in this rapidly advancing field. Moreover, 81 educators highlighted the need for more guidance from their respective universities on effectively leveraging AI in their teaching practices, pointing to a need for institutional support and resources in this area. Concerns around data privacy and plagiarism were also prevalent among educators, with 64 respondents voicing worries about safeguarding sensitive

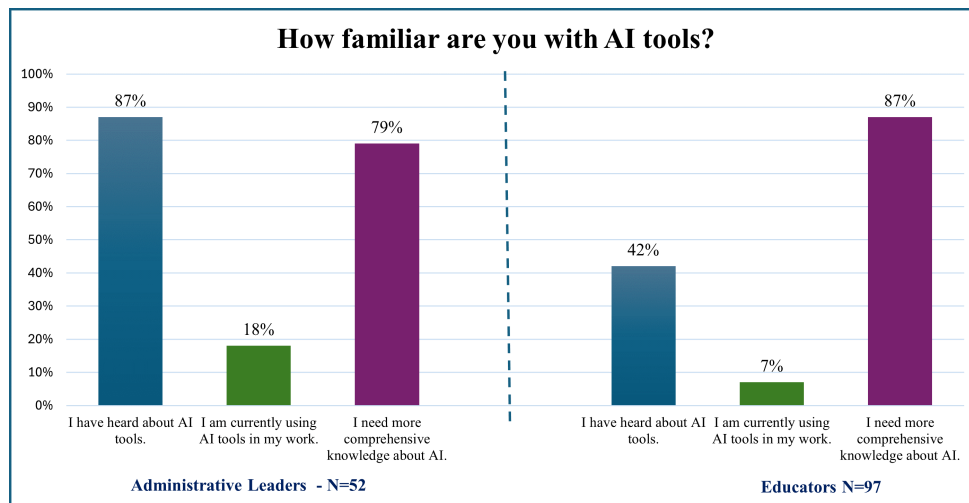


Figure 1: Administrative Leaders and Educators' AI Tools Familiarity

information and maintaining academic integrity in AI-driven educational settings. Notably, a vast majority of educators (n=93) expressed a critical need for clear rules and regulations governing the implementation of AI tools in their teaching methodologies, underscoring the importance of establishing robust frameworks to govern AI usage in educational contexts. Moreover, worries about the potential negative impact of AI tools on students' creativity (n=78) and the alignment of AI integration with specific local contexts (n=22) emerged as significant considerations for educators navigating the complexities of AI adoption in diverse educational settings. These findings underscore the multifaceted challenges and complexities of integrating AI into higher education environments in Azerbaijan. Addressing issues related to training, AI implication guidance, data privacy, regulatory frameworks, creativity, and contextual alignment is crucial to ensure AI technologies'

effective and ethical use in educational settings, ultimately enhancing teaching and practical experiences and outcomes for both administrative leader and educators.

Drawing upon a comprehensive literature review and insights gathered from Azerbaijani educators and administrative leaders to understand their primary concerns, researchers embarked on addressing research question 2, "What are effective ways to achieve positive integration of AI tools into the curriculum and enhance student learning experiences?" Through this inquiry, the researchers identified the need for tailored to the specific audience to support the successful integration of AI tools in Azerbaijani higher education settings. In response, the research team developed virtual training sessions designed explicitly for Azerbaijani educators, aimed at testing strategies to achieve positive integration of AI tools in the curriculum and enhance student learning experiences.

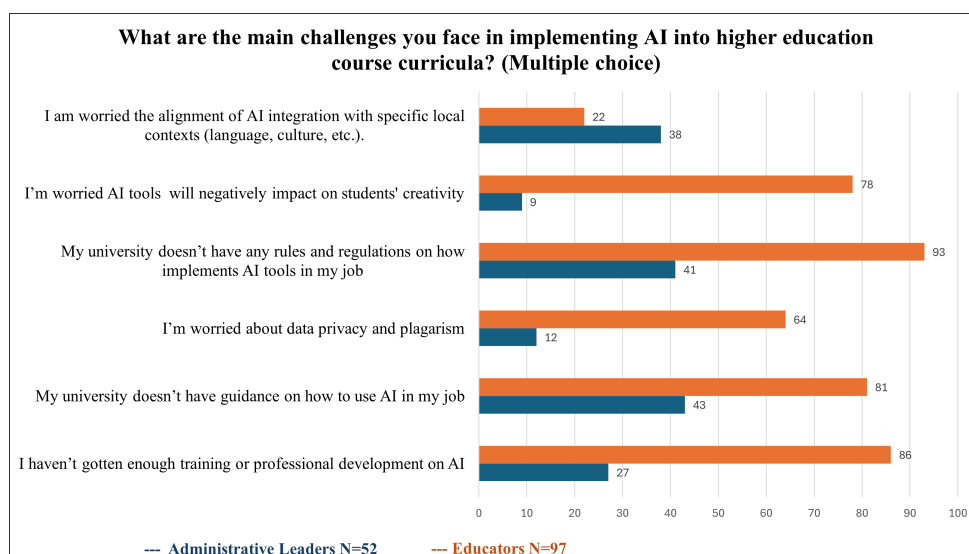


Figure 2: Main challenges Administrative Leaders and Educators face in Implementing AI into Higher Education

These training sessions were meticulously crafted to deepen the understanding of AI tools and their practical applications within the unique context of Azerbaijani higher education. By providing targeted training and support through these sessions, the research project aimed to address the identified challenges and facilitate the effective integration of AI tools in Azerbaijani universities, ultimately contributing to enhancing teaching and learning practices in the region.

Participants: The study enlisted participants from the Azerbaijani higher education sector, encompassing a mix of respected administrative leaders holding higher-level positions like vice presidents and provosts, alongside dedicated educators responsible for teaching undergraduate and graduate courses spanning a wide array of disciplines. These fields included but were not limited to architecture, medicine, oil and gas engineering, education, humanities, and social sciences, reflecting the diverse academic landscape of Azerbaijani universities. To ensure widespread participation, the researchers actively promoted the training sessions' date and time information by sharing it with institution leaders and educators across the capital city. A total of 108 enthusiastic individuals participated in the comprehensive training seminar program, with 11 administrative leaders and 97 educators voluntarily registering to enhance their knowledge and skills in integrating AI tools into the curriculum. This initiative aimed to equip participants with the necessary insights and strategies to leverage AI technologies effectively in their teaching practices and enhance student learning experiences. The diverse group of participants hailed from seven distinct public and private universities, bringing a rich tapestry of perspectives and experiences to the training sessions.

Training Development: The researchers recognized the importance of providing practical, hands-on training to Azerbaijani educators and administrative leaders to integrate AI tools into their educational practices effectively. Leveraging the expertise of a professor from the United States, a leading country in AI implementation, added valuable insights and perspectives to the training sessions. Following a thorough survey, tailored training materials were developed to address specific areas of concern identified by the participants. Following this, a two-day virtual AI education training session was organized, addressing the second research question and providing a total of 6 hours of instruction (3 hours each day). The session included pre- and posttests to measure the impact of the training. The study employed a one-group pretest and posttest design, with 108 participants engaging in the virtual training program. To ensure a comprehensive evaluation, researchers designed a pre-posttest evaluation focusing on three key dimensions: AI Foundation Knowledge, AI Knowledge of Ethical Behavior, and AI Leadership Confidence. Each dimension comprised five questions, totaling 15 questions in the assessment. Questions from each dimension were randomly assigned to either the pre- or posttest, ensuring a thorough evaluation of participants' knowledge and confidence levels in AI integration. The scoring methodology for the survey involved assigning 5 points to each correct answer, with a total of 15 points for all questions.

Each dimension (AI Foundation Knowledge, AI Knowledge of Ethical Behavior, and AI Leadership Confidence) consisted of 5 questions, contributing to a maximum score of 5 points per category. This structured approach aimed to quantitatively measure participants' proficiency and confidence levels in key aspects of AI education, providing valuable insights into the training program's impact on educators and administrators in the Azerbaijani higher education sector.

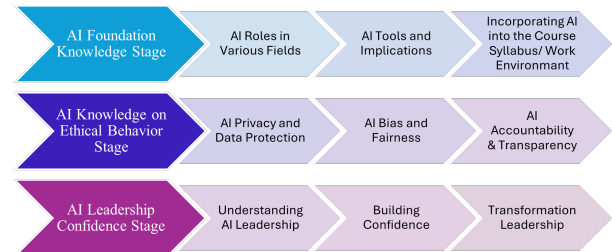


Figure 3: AI Virtual Training Model with Stages

Figure 3: AI Virtual Training Model with Stages presents a comprehensive framework guide for training in Azerbaijan through a series of key stages covering essential AI education and application topics. At the outset of the model is the AI Foundation Knowledge Stage, which serves as the foundational pillar for the rest of the training. This stage introduces learners to the core concepts, principles, and techniques that underpin AI technology, providing a solid grounding for subsequent learning. As learners progress through the AI roles in Various Fields, they gain insights into the diverse applications of AI across industries such as healthcare, finance, manufacturing, and more. This part highlights the transformative potential of AI and how it is reshaping various sectors and professions. The AI Tools and Implications delve into the practical tools, technologies, and methodologies used in AI development and implementation. Learners explore the implications of AI on society, gaining a deeper understanding of the opportunities and challenges associated with this rapidly evolving technology. Incorporating AI into the Course Syllabus is the last part of the AI Foundation Knowledge Stage, which focuses on strategies for integrating AI topics into educational curricula effectively. Educators and trainers learn how to design courses that equip students with the knowledge and skills to succeed in an AI-driven world. The AI knowledge on the Ethical Behavior Stage is a second and critical component that addresses the ethical considerations inherent in AI development and deployment. By exploring topics such as AI Privacy and Data Protection, AI Bias and Fairness, and AI Accountability and Transparency, learners are encouraged to foster responsible AI innovation and usage. Finally, the AI Leadership Confidence Stage is the third stage and focuses on developing and increasing the confidence level of administrative leaders and educators in the context of AI. Learners delve into Understanding AI Leadership, Building Confidence, and Transformation Leadership to cultivate the necessary qualities to lead AI initiatives successfully. This stage focuses on building self-assurance, decision-making skills related to AI, and the ability to navigate complex and

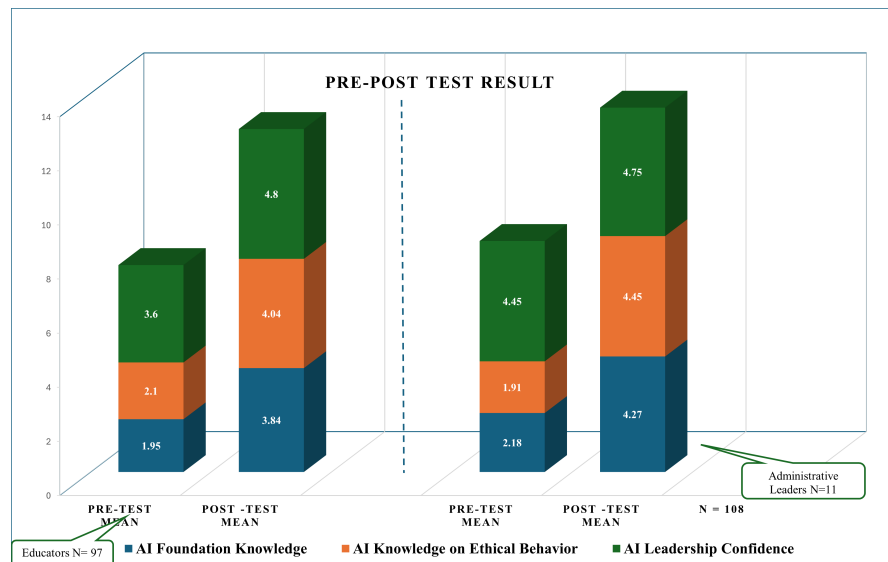


Figure 4: Administrative Leaders and Educators Performance: t-test result

evolving AI landscapes with confidence. By following this structured model, the researcher hoped learners can acquire a well-rounded understanding of AI, from its fundamental principles to its ethical implications and leadership requirements. This comprehensive approach can equip administrative leaders and educators with the knowledge and skills to leverage AI effectively while upholding moral standards and driving positive change in their respective fields.

Result: Enhancing administrative leaders and educators' performance - t-test analysis The training program conducted a pre-posttest analysis to measure its effectiveness in enhancing the performance of administrative leaders and educators in AI foundation, ethical knowledge, and leadership confidence. Figure 5 displays the training's pre-post test result. The results of the t-test analysis indicated significant improvements across all three key categories: AI Foundation Knowledge, AI Knowledge of Ethical Behavior, and AI Leadership Confidence following the training program. Educators showed an average improvement of $\bar{X} = 1.89$ in AI Foundation Knowledge, $\bar{X} = 1.94$ in AI Knowledge of Ethical Behavior, and $\bar{X} = 7.22$ in AI Leadership Confidence. Administrative leaders exhibited an average improvement of $\bar{X} = 2.09$ in AI Foundation Knowledge, $\bar{X} = 2.54$ in AI Knowledge of Ethical Behavior, and $\bar{X} = 6.63$ in AI Leadership Confidence. The comparative analysis between educators and administrative leaders revealed that educators exhibited a more substantial improvement in AI Leadership Confidence post-training, indicating the program's effectiveness in boosting educators' confidence in leading AI initiatives. As educators stand at the forefront of driving AI leadership forward, instilling confidence in their abilities is absolutely crucial. The decrease in standard deviations from the pre-test to the post-test scores further supports the training program's impact, suggesting greater consistency in participants' scores post-intervention. This signifies that the training successfully enhanced participants' competencies in

AI-related areas and AI-related leadership skills.

As a summary, the comprehensive analysis of the pre-post test data provides compelling evidence of the training program's efficacy in enhancing the competencies of administrative leaders and educators in crucial areas such as AI foundation, ethical knowledge, and leadership confidence. The results reveal a significant positive impact on participants, with notable improvements in their confidence levels to lead AI initiatives effectively. Moreover, the decrease in standard deviations between pre-test and post-test scores indicates a higher level of consistency in performance post-intervention, suggesting that the program not only enhanced individual skills but also contributed to overall group proficiency. The data highlights the program's resounding success in instilling greater confidence in educators to navigate the complexities of AI integration within educational and leadership contexts. By equipping participants with the necessary knowledge and skills, the training program has effectively prepared them to meet the challenges posed by the rapid evolution of AI technologies in the educational landscape. The enhanced competencies in AI foundation, ethical behavior, and leadership confidence underscore the program's ability to empower educators and administrative leaders to drive AI integration forward and create more impactful learning experiences for students. As emphasized in existing literature, a well-crafted comprehensive training program is essential for successfully integrating AI tools into the curriculum and improving the student learning experience. The results of the pre-posttest analysis not only validate this assertion but also provide concrete evidence of the program's success in enhancing participants' competencies and skills in AI-related areas. By fostering professional growth and developing critical leadership skills, the training program has positioned educators and administrative leaders to embrace the opportunities presented by AI technologies and lead the way in shaping the future of education.

Sharing Best Practices Upon completing the training, the researchers invited all training participants a week later to share best practices with other educators worldwide using AI in their syllabi. A small group of 45 participants from diverse fields convened to facilitate the sharing of best practices tailored to specific fields. During this session, the researchers presented examples of AI implementation in the US curriculum to the participants. This interactive session allowed participants to engage in discussions and exchange valuable insights, fostering a collaborative environment where educators and administrative leaders could learn from each other's experiences with AI integration. The presentation of real-world examples served as a practical guide for the participants, providing concrete instances of successful AI implementation in educational settings. The tailored approach of sharing best practices based on specific fields ensured that participants could gain relevant and applicable experience for their respective areas of expertise, thus maximizing the potential impact of the session. Encouraging collaboration and a system thinking approach can be highly beneficial when it comes to implementing AI effectively into the course curriculum [30]–[32]. A system thinking approach to leadership helps understand the interconnectedness of various components within an institution and how they can collectively support the successful adoption of AI into the course curriculum [32]. Overall, sharing best practices with colleagues and universities is another effective way to achieve positive integration of AI tools into the curriculum and enhance student learning experiences.

VII. STUDY LIMITATION

While the research appears thorough and well-organized, it is essential to acknowledge certain limitations:

Generalizability: A larger sample size would bolster the study's statistical power and its ability to be generalized to a broader population.

Self-selection bias: Given that participants voluntarily registered for the training sessions, it's important to note the potential for self-selection bias. This bias means that those who chose to participate might have had pre-existing interest or familiarity with AI tools, potentially leading to more positive outcomes. The training program was evaluated immediately after the sessions, offering only a snapshot of participants' foundation, ethical knowledge, and confidence levels at that specific moment.

Study Scope—Conducting: long-term follow-up evaluations is not just a suggestion but a necessity. They would provide valuable insights into the sustainability of the training's impact over time. Addressing these limitations could further strengthen the research's validity and relevance in higher education.

VIII. PRACTICAL IMPLICATION

Integration AI Education with Systems Thinking Implementing a system thinking approach in integrating AI education can lead to significant practical implications [31]. By fostering collaboration between professors and administrative

leaders, a comprehensive training program can be developed that provides students with a holistic understanding of AI concepts and ideas. Through the application of systems thinking, discussions between stakeholders such as professors, students, and industry leaders can help pinpoint the exact placement of a problem within the larger system [33]. This collaborative approach empowers professors to frame concepts within a broader context using a system thinking lens when designing or evaluating course syllabi, ultimately enriching students' conceptual grasp of the subject matter [34].

Practical implications for educators regarding the integration of AI into education: **Professional Development:** Educators should prioritize continuous professional development to stay updated on AI technologies, trends, and best practices in AI education. Attending workshops, seminars, and training programs can help educators enhance their AI knowledge and skills. **Curriculum Enhancement:** Educators should review and update their curriculum to include AI-related topics, projects, and assignments that develop students' AI skills and competencies. Integrating real-world applications of AI can make learning more engaging and relevant for students. **Ethical Education:** Educators should prioritize teaching students about the ethical implications of AI technologies, including topics such as bias, privacy, and accountability. Integrating ethical discussions and case studies into the curriculum can help students develop critical thinking and ethical decision-making skills.

Practical implications for stakeholders regarding the integration of AI into education: **Stakeholders** play a crucial role in shaping the future of AI education. By working closely with educators, they can ensure that AI education initiatives align with industry needs and standards, thereby feeling empowered and influential in the process. **Policy Support:** Stakeholders can make a significant impact by advocating for policies that support the integration of AI into educational systems. This includes allocating resources for AI training programs and updating curriculum guidelines to include AI education.

IX. CONCLUSION

Given the rapid advancement of artificial intelligence globally, integrating AI into higher education curricula in developing countries is a critical and timely endeavor. This research study, focusing on Azerbaijan as a case study, highlights the need for enhanced AI education to bridge the gap in AI literacy. The positive outcomes observed in pre-post-training results underscore the importance of providing educators with robust training to enhance their AI knowledge and teaching competencies. By empowering educators with the necessary skills and knowledge, educational institutions can effectively integrate AI concepts into their curricula, thereby equipping students with the tools needed to thrive in an increasingly AI-driven world. The successful implementation of a virtual AI training program not only addresses existing gaps in AI education in developing countries but also fosters a more inclusive and effective learning environment. This research serves as a valuable case study to enhance AI education

initiatives, emphasizing the significance of continuous learning and innovation in education. The study's findings underscore the transformative potential of integrating AI tools into higher education curriculum and highlight the importance of preparing students for the demands of the Fourth Industrial Revolution. In conclusion, fostering a culture of AI education and innovation in developing countries is essential for preparing the workforce of tomorrow. By prioritizing AI integration in higher education curriculum and providing educators with the necessary support and training, countries can empower their citizens to excel in a technology-driven future and contribute meaningfully to the global AI landscape.

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