

## Analyzing the Challenges and Opportunities of Artificial Intelligence in the Educational System with an Emphasis on the Professional Development of Teachers

Hafezali Deljoo <sup>1</sup>, Tooran Soleiman <sup>\*2</sup>, Sadraddin Sattari <sup>1</sup>

<sup>1</sup> Department of Educational Sciences, Ard.C., Islamic Azad University, Ardabil, Iran

<sup>2\*</sup> Department of Educational Sciences, Ard.C., Islamic Azad University, Ardabil, Iran

### Introduction

Teachers, as the primary agents of education, represent the most influential factor in implementing the curriculum and play a pivotal role in driving change, fostering development, and determining the success or failure of the educational system. They are not only among the elements that require change to improve the educational system but are also regarded as the very creators of change. This dual role has positioned teacher education as an increasingly dynamic and challenging field (Akhoondi & Safaei Movahhed, 2016).

Professional development constitutes a continuous and lifelong process of learning, resulting in improved teacher performance, enhanced decision-making skills when addressing classroom challenges, and a broader sense of scientific wisdom. Consequently, professional development can be regarded as the advancement of scientific wisdom, which underpins processes such as sound and ethical decision-making and positively influences educational practices (Maleki, 2018). Numerous studies highlight the necessity of professional development for teachers. Research demonstrates its impact on factors such as teachers' positive

Received: 2025/06/09

Accepted: 2025/07/22

**Citation:** Deljoo, H., Soleimani, T., & Sattari, S. (2025). Analyzing the Challenges and Opportunities of Artificial Intelligence in the Educational System with an Emphasis on the Professional Development of Teachers. *Qualitative Research in Educational Sciences*, 1(3), 134–160. <https://doi.org/10.71839/QRES.2025.1209419>

\* Corresponding author: [tsoleimani@iau.ac.ir](mailto:tsoleimani@iau.ac.ir)

 <https://doi.org/10.71839/QRES.2025.1209419>

perceptions (Harris et al., 2011); communication beliefs and behaviors (Sedova et al., 2016); deep mastery of challenging content, critical thinking, complex problem-solving, effective communication and collaboration, and self-direction (Darling-Hammond et al., 2017); self-efficacy (Pourrahim & Hosseinpour, 2020); motivation (Esmaili et al., 2020); as well as meta-conceptual awareness and experience-based cognitive systems (Talkhabi et al., 2020).

As artificial intelligence (AI) continues to evolve and transform the way students learn and teachers teach, it is essential to establish frameworks that ensure its ethical, responsible, and effective application (Pourkarimi & Ali Akbari, 2024). In a study by Al-Zyoud (2020), the development and contextual dimensions of AI—particularly in relation to its influence on teachers’ professional development—were examined. The research emphasized not only the technical applications of AI in education and the challenges associated with its adoption but also its broader significance in the field. The findings identified a range of intelligent applications and AI domains that can support teachers’ professional growth (Hosseinian et al., 2021).

Domestic research has predominantly focused on documenting artificial intelligence, whereas international studies have largely explored its practical and effective role in learning and teaching. Addressing the existing research gap, the present study aims to propose a model for identifying the opportunities and challenges of AI in the professional development of teachers. The findings of this study can serve as a foundation for further research in the country, potentially leading to outcomes such as enhanced success, expanded knowledge, improved learning outcomes, strengthened educational leadership, more effective teaching–learning processes, and overall improvement in the performance of the educational system.

In light of the aforementioned considerations regarding the challenges and opportunities of AI in education—with a specific focus on teachers’ professional development—the following research questions are posed:

- What are the challenges of artificial intelligence in the educational system, with an emphasis on teachers' professional development?
- What are the opportunities of artificial intelligence in the educational system, with an emphasis on teachers' professional development?

## Methodology

This study is an applied research employing a qualitative approach. The population includes professors, managers, and experts in education and training. Participants were selected through purposive sampling from 135 experts in Ardabil province, all familiar with artificial intelligence and experienced in the field. The sample size was determined by theoretical saturation, reaching 12 participants.

Thematic analysis was used to analyze interview data. This method extracts key information related to the research questions and reveals underlying patterns within the data. The six-step process by Braun and Clarke guided the analysis:

1. Familiarization with the data through repeated and active reading.
2. Generating initial codes; 62 codes were identified.
3. Searching for themes by grouping codes into potential themes, resulting in 10 themes.
4. Reviewing themes, including refinement and validation against the dataset.
5. Defining and naming themes, culminating in two main themes aligned with the research objectives.
6. Producing the final report by examining themes and their interrelations.

A total of 52 codes were recorded by the researcher and assistant, with 25 agreements between them. The inter-coder reliability, calculated via the stated formula, was 79%. Since this exceeds the 60% threshold, the coding process is deemed reliable.

## Findings

Thematic analysis was employed to analyze qualitative data from exploratory interviews. In this approach, the interpreter acts like an editor, identifying meaningful sections, adding or removing words or sentences, and eliminating unnecessary content. Coding is then performed to extract concepts from the interview data. In this study, coding was applied to generate meanings and form concepts. Reliability was assessed using the intra-subject or two-coder agreement method, yielding a rate of 79%. Since this exceeds the acceptable threshold of 60%, the coding reliability was confirmed, indicating the interview analysis is sufficiently reliable

To determine the priority and importance of research variables and items, the Friedman test was used. Given that the significance coefficient was greater than 0.05, the Friedman test was deemed appropriate for ranking the research variables. The ranking of the themes organizing the research is shown. As observed, the integration of technology with educational goals, job value creation, globalization of education, and educational networking capabilities were identified as the most important themes, respectively.

Based on the qualitative data analysis, a model illustrating the role of artificial intelligence in teachers' professional development was developed. This conceptual framework was presented to 12 experts (3 university professors, 4 school educational administrators, and 4 education activists) who completed a questionnaire covering all framework categories. Following the interviews and expert feedback, the final framework was revised and presented as Figure 1.

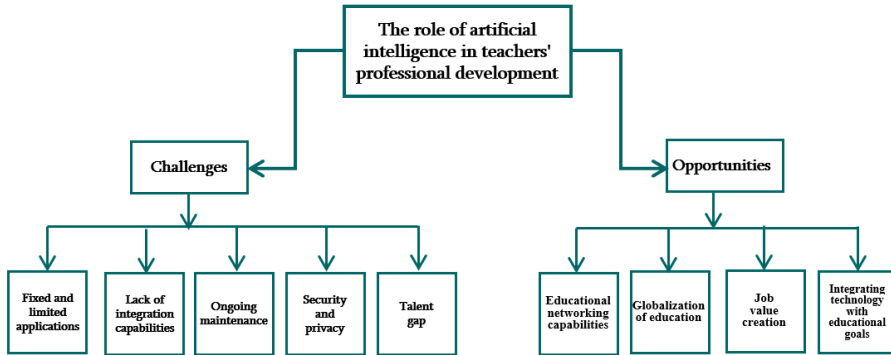


Figure 1. A Model of artificial intelligence's impact on teachers' professional development

## Conclusion

The present study aimed to explore the challenges and opportunities of artificial intelligence with a focus on teachers' professional development. Nine key themes emerged, encompassing both opportunities and challenges. Opportunities were classified into four main themes: integration of technology with educational goals, educational networking capabilities, globalization of education, and enhancement of teachers' job value. Challenges were identified in five areas: talent gap, security and privacy concerns for teachers and students, ongoing system maintenance, and lack of integration capabilities.

Drawing on these findings, a paradigmatic model was developed to illustrate the role of artificial intelligence in teachers' professional development. This model offers a strategic framework to guide the effective implementation and operationalization of artificial intelligence in teacher development programs.

## References

- Akhoondi, F., & Safaei Movahhed, S. (2016). The Effect of Perception of Professional Development on Job Involvement, Job Content Plateau and Job Burnout among Primary School Teachers in Kashan. *Management and Planning in Educational Systems*, 8(2), 83–104. [https://mpes.sbu.ac.ir/article\\_98420.html](https://mpes.sbu.ac.ir/article_98420.html) [In Persian]
- Al-Zyoud, H. M. M. (2020). The role of artificial intelligence in teacher professional development. *Universal Journal of Educational Research*, 8(11B), 6263–6272. <https://doi.org/10.13189/ujer.2020.082265>
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective Teacher Professional Development*. Palo Alto, CA: Learning Policy Institute. <https://learningpolicyinstitute.org/product/teacher-prof-dev>
- Esmaili, E., Sameri, H., & Hassnai, M. (2020). Effect of school organizational conditions, leadership perception and teacher motivation on improving teaching activity through

- the mediation of professional development of elementary teachers. *New Educational Approaches*, 14(2), 108–128. [in Persian]
- Harris, J., Cale, L., & Musson, H. (2011). The effects of a professional development programme on primary school teachers' perceptions of physical education. *Professional Development in Education*, 37(2), 291–305. DOI: 10.1080/19415257.2010.531973
- Hosseinian, B. S., Nili, M. R., Sharifiyan, F. (2024). Identifying the dimensions and components of teacher professional development model: The synthesis of professional development models. *Theory and Practice in the Curriculum*, 11(22), 89–132. [https://www.jstpicisa.ir/article\\_190319.html](https://www.jstpicisa.ir/article_190319.html) [in Persian]
- Maleki, S. (2018). Professional development of teachers. *Growing Tomorrow's School*, 18(4), 6–18. [in Persian]
- Pourkarimi, Javad & Ali Akbari, Zahra. (2025). The four areas of Artificial Intelligence governance in education: A meta-synthesis study. *New Advances in Educational Management*, 6(1), 81–97. Doi: 10.22034/njournal.2025.501570.1008
- Pourrahim, M., & Hosseinpour, R. (2019). The relationship between educational leadership and teacher self-efficacy with the professional development of primary school teachers in the 2<sup>nd</sup> district of Ardabil city. *Applied Educational Leadership*, 1(3), 65–76. [in Persian]
- Sedova, K., Sedlacek, M., & Svaricek, R. (2016). Teacher professional development as a means of transforming student classroom talk. *Teaching and Teacher Education*, 57, 40-56. <https://doi.org/10.1016/j.tate.2016.03.005>
- Talkhabi, M., Rahmati, Z., & Moradi, A. (2019). Teachers' professional development and conceptual change through knowledge building environment. *Journal of Cognitive Psychology Quarterly*, 8(1), 53–66. <http://jcp.khu.ac.ir/article-1-3250-fa.html> [in Persian]