



The role of artificial intelligence in teachers' classroom effectiveness

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Abstract

In the era of technological developments and the significant growth of artificial intelligence technologies, educational systems are also forced to adapt to these changes. One of the most important components of quality in the educational system is the effectiveness of teachers' classroom management. The aim of this study was to study the role of artificial intelligence in the effectiveness of teachers' classroom management. This study was conducted using a qualitative-content analysis method. The research field included the information domain of artificial intelligence and the method of purposive sampling to the point of data saturation. A number of 38 units of conversation with artificial intelligence were selected for the study using a screening method (search keywords, meaningfulness of information, relevance of information, accuracy of information, quality of information). The method of collecting information was questioning from Chat GPT and Jasper. Data analysis was based on the classification of open concepts, main categories, and comprehensive concepts. To ensure the validity and validation of the data, the reliability, confirmability, and transferability methods were used. In general, the results showed that the role of artificial intelligence in the effectiveness of teachers' classroom management at five levels (cognitive, managerial, educational, motivational-psychological, and evaluation) is significant.

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Introduction

In the contemporary world, educational systems are faced with numerous challenges in improving the quality of teaching and enhancing the effectiveness of classroom management more than ever before. Effective classroom management, as one of the key components of success in the teaching-learning process, requires skills such as time management, effective interaction with students, control of classroom behavior, continuous assessment, and responsiveness to the diverse needs of learners. In the meantime, the emergence of new technologies, especially artificial intelligence, has provided new capacities for improving educational processes and improving teacher efficiency. With the ability to analyze big data, predict learning behaviors, personalize content, manage classes in real time, and provide intelligent feedback, artificial intelligence can play an important role in improving the quality of teaching and the effectiveness of classroom management. Recent studies show that the use of artificial intelligence tools and algorithms in classrooms has improved student participation, improved classroom management, and increased the quality of teacher decision-making (Smith et al., 2023). However, in many educational systems, including Iran, there is still no sufficient scientific evidence and localized models regarding the role and function of artificial intelligence in improving the effectiveness of teachers' classroom management. Research gap of this study It should be said that despite the increasing growth of artificial intelligence-based technologies and its widespread application in various fields, including education, studies show that the majority of studies conducted in the field of artificial intelligence in education have focused on topics such as: designing smart education systems, personalizing learning, assessing student performance, and producing educational content (Zawacki-Richter et al., 2019). In contrast, the direct role of artificial intelligence in improving the effectiveness of teachers' classroom management, as one of the most important components of successful teaching, has received less attention. On the other hand, most of the existing research in this field has been conducted in the field of online and virtual education or in smart schools in developed countries, and field and local studies in the educational systems of countries such as Iran are very limited. This is despite the fact that the nature of face-to-face classes, cultural and educational characteristics, technological facilities, and teachers' teaching styles in the Iranian education system are different from those in other countries and require localized studies in this field.

Also, so far, no comprehensive and evidence-based model or pattern has been presented in the research literature to explain the role of artificial

intelligence in improving the effectiveness of teachers' classroom management, and most studies have limited themselves to generalizing the capacities of technology in education. This has caused administrators, policymakers, and teachers to face confusion and ambiguity in the effective use of artificial intelligence tools in educational environments.

Therefore, the existing research gap can be explained in three main areas:

1. The lack of studies that specifically address the role of artificial intelligence in the effectiveness of teachers' classroom management.
2. The lack of local and field research in the Iranian educational environment with regard to local infrastructure and challenges.
3. Lack of a conceptual and practical model or pattern for utilizing artificial intelligence to improve classroom management and enhance teachers' teaching skills.

This research has attempted to identify these gaps and empirically examine the issue, and to provide appropriate solutions to improve the effectiveness of teachers' classroom management in the era of smart technology.

Educational and learning activities have been influenced by new technologies (Elgohary, & Al-Dossary, 2022), especially since with technological developments and the significant growth of artificial intelligence technologies, educational systems are also forced to adapt to these changes. One of the most important components of quality in the educational system is the effectiveness of teachers' classroom management, in such a way that teaching methods, classroom management, interaction with students, and evaluation of their performance play a vital role in achieving meaningful learning (Sha'bani, 2015). On the other hand, the use of artificial intelligence and educational data analysis can create a major transformation in better understanding students' needs, identifying learning weaknesses, and designing personalized learning paths. According to a study by Koderger, Booth, and Klaher (2015), effective classroom management has always been one of the most important concerns of educational systems around the world. With the advancement of new technologies, artificial intelligence has emerged as a powerful tool for analyzing behavioral patterns, learning, and student performance. Data analysis allows teachers to leverage information accumulated in digital educational environments for intelligent decision-making (Mohammadi et al., 2023).

However, in many educational systems, especially in developing countries, the use of AI capabilities in teachers' classrooms is still in its early stages, and there are challenges such as weak infrastructure, lack of technological knowledge among teachers, lack of localized analytical

algorithms, and resistance to change (Arya & Verma, 2024).

According to a study (Wu & Yang, 2022) by collecting and analyzing data such as participation rate, time spent on activities, responses to tests, and type of interaction with content, teachers can be provided with accurate information about each student's learning status. These analyses help teachers identify each student's strengths and weaknesses, personalize activities, and provide targeted interventions.

In this regard, the question arises as to how artificial intelligence and data analytics can be used to improve teachers' classroom effectiveness?

Theoretical Framework:

This research is designed based on adaptive learning theory and learning analytics. These two approaches are based on the use of educational data to better understand the learning process and provide targeted feedback. Adaptive learning theory is one of the new approaches in education that uses technology to personalize the learning process for each learner.

Adaptive Learning Theory

Adaptive learning is an educational approach in which the content, method, and learning path are adjusted and updated based on the needs, abilities, learning styles, and progress of each learner. Unlike traditional education, which provides the same version for all learners, this approach attempts to provide a personalized experience to make learning more effective and sustainable (Pardo, & Simons, 2014). In this theory, technology plays a key role; especially the use of artificial intelligence, data analytics, and machine learning algorithms that are able to analyze learner behavior and adjust the educational path according to individual needs (Brusilowski, & Milan, 2007). According to Chen, Chen, Lin (2020), the key principles of adaptive learning are: 1. Continuous detection of learning level: Using data (scores, study time, errors, response style), the student's level of understanding is analyzed. 2. Content adjustment: Depending on the level and progress of the learner, the educational content, the difficulty of the exercises and the feedback are adjusted. 3. Providing immediate and targeted feedback: Adaptive systems can provide appropriate feedback immediately after the learner's response. 4. Offering different learning paths: Instead of a linear path, the learning path can be dynamic, branching and personalized (Simons, 2012).

Link with Artificial Intelligence:

In recent years, adaptive education systems have been heavily integrated with artificial intelligence. With the help of AI, these systems can analyze student behavior patterns, deliver the right

content at the right time, and even play the role of a supplementary teacher through chatbots and intelligent assistants. The benefits of adaptive education heavily integrated with artificial intelligence include increasing learner engagement and motivation, improving the quality of individual learning, early identification of strengths and weaknesses, and facilitating instruction in heterogeneous classes (Ferguson, 2012).

Learning Analytics

Learning analytics is the process of collecting, analyzing, and interpreting data about learners and learning environments with the aim of better understanding and improving the learning process (Chatti et al., 2012). This field is a combination of data science, educational science, and information technology, and has grown significantly in recent years, especially with the spread of digital education and learning management systems (LMS). According to the definition of the International Association for Learning Analytics, "learning analytics is the measurement, collection, analysis, and reporting of data about learners and their learning contexts in order to understand and optimize learning and the environment in which it occurs" (Slade, & Prinsloo, 2013). The goals of learning analytics include: identifying learners' learning patterns, predicting academic performance, personalizing education based on the real needs of each learner, providing immediate feedback to teachers, students, and educational administrators, and optimizing course content and teaching methods. The study (Cheng & Wang, 2021) showed that the steps of learning analytics include 1. Data collection: from sources such as LMS, educational platforms, online tests, class activities, clicks, study time, and student interactions. 2. Data preprocessing: cleaning, classifying, and preparing data for analysis. 3. Analysis and modeling: using statistical techniques, machine learning, and data mining to extract patterns. 4. Interpretation and decision-making: providing reports and visual dashboards for teachers and administrators to take corrective action (Lukin, Holmes, Griffin, & Forcier, 2016). The study by Simons and Long (2011) showed that early identification of students at risk of academic failure, analyzing the level of engagement and participation in classes, providing automated educational recommendations for each student, and evaluating the quality of educational content and teachers' teaching methods are among the practical applications of learning analytics. This is while some of the challenges to consider include data privacy and security, misinterpretation of data without understanding the educational context, and the need to train teachers in analyzing and using the results (Zawaki-Reicher, Marin, Bond, & Gouverneur, 2019).

Background of the research

Today, with the spread of new educational technologies, the use of learning analytics and artificial intelligence tools in classrooms, especially in examining the cognitive dimensions of student learning, has become doubly important. Learning analytics, as a scientific tool for extracting, interpreting, and using student behavioral data, plays an effective role in identifying the level of conceptual understanding, cognitive engagement, and mental processes of learners (Simons and Long, 2011). Researchers believe that data from digital learning environments, such as time spent, number of clicks, and response patterns, can provide meaningful indicators of a student's cognitive status and learning style (Pardo and Simons, 2014).

In this regard, Chen et al. (2020), in a review of research related to artificial intelligence in education, stated that AI-based adaptive learning systems are able to identify different cognitive styles and adjust educational content accordingly. This capability has paved the way for data-driven classroom management, where teachers can modify and optimize their teaching decisions based on cognitive feedback (Strong, 2018). In the domestic research space, Fitria (2023), emphasizing the application of learning analytics in virtual education, showed that data analysis algorithms can identify behavioral and cognitive patterns of learners and be used in designing personalized education. On the other hand, Sasikumar (2012) also pointed out in his book "Classroom Design and Management" the importance of recognizing mental needs and cognitive differences in the classroom management process and considered the role of analytical tools to be very key in better understanding learners.

A systematic review (Zawaki-Reicher, Marin, Bond, & Gouverneur, 2019) of 146 global studies also found that AI has a positive impact not only on personalizing content, but also on improving learners' critical thinking skills, problem-solving, and conceptual understanding. This evidence reinforces the importance of data analytics and AI as a complement to traditional classroom methods and a tool for more accurate cognitive understanding of students.

In a review of research related to AI in education, Chen, Chen, & Laban (2020) stated that AI-based adaptive learning systems are able to identify different cognitive styles and adjust educational content accordingly. This capability has paved the way for data-driven classrooms, where teachers can refine and optimize their teaching decisions based on cognitive feedback.

Nasir et al (2024) also pointed out the importance of recognizing mental needs and

cognitive differences in the classroom process and considered the role of analytical tools to be very key in better understanding learners.

The results of Dimartini, Sciascia, Bosso, and Manori (2024) showed that the use of this approach increased conceptual learning, reduced dropout, and improved classroom management by teachers.

The results of Pani, Steiner, Baird, and Hamilton (2017) showed that personalized learning, which focuses on meeting the individual learning needs of students while taking into account their interests and preferences, is a facilitating practice for effective learning, and in recent years, the adoption of personalized learning models at the school level has become more common for schools. Personalized learning is an important factor for individualized student learning, competency-based academic achievement, and flexible use of staff, space, and time.

Kanter et al.'s (2013) study showed that positive teacher emotion motivates students in the classroom, which makes learning more engaging.

Wolf (2010) explains that teachers in classrooms equipped with adaptive learning systems can use smart dashboards to track student performance in real time and make more immediate and accurate decisions. This style of classroom management is based on data and feedback and makes educational management more targeted.

Wong Hong, and Huang (2021) results showed that the use of AI-based learning dashboards has increased teachers' self-awareness, motivation, and modification of teaching behaviors. These tools play an important role in self-reflection, immediate feedback, and reducing teachers' cognitive load.

Koushik's (2024) results showed that using AI algorithms, educational content is dynamically adjusted based on the level, need, and learning style of the student. This personalization makes the student feel that the education is designed for him/her, and as a result, his/her motivation and participation increase, which leads to the development of adaptive learning for students in the teaching process.

According to the study by Al-Alanzi (2024), students were employed to evaluate the impact of adaptive learning intervention on students' learning, engagement, and attitude. The findings showed that the use of AI system improves students' performance, especially in terms of low performance and student satisfaction. However, at the same time, the study highlighted the problems related to technological advancement, teacher preparation, and students' IT literacy that need to be addressed to increase the efficient and equitable use of such technologies in learning.

The results of Holmes, Bylik, and Fadel (2019) showed that the participation of learners and teachers in the educational process increases in the context of AI-based technologies, especially

through adaptive and interactive learning; Because these technologies enable content personalization, real-time feedback, and two-way interaction.

Research Questions

1. What is the role of artificial intelligence in the effectiveness of teachers' classroom management?
2. What model can be developed to explain the role of artificial intelligence in the effectiveness of teachers' classroom management?

Research Methodology

This study was conducted using a qualitative-content analysis method. The research field included the information domain of artificial intelligence and the method of purposive sampling until data saturation. A total of 38 units of conversation with artificial intelligence were selected for the study using a screening method (search keywords, meaningfulness of information, relevance of information, accuracy of information, quality of information). The method of collecting information was questioning from GPT Chat, Jasper. The questions continued gradually and based on the type of answers provided from artificial intelligence Chat and Jasper. The first question to start the conversation with artificial intelligence was how artificial intelligence can be effective in teachers' classroom management? The reliability, confirmability and transferability methods were used to validate the data. Therefore, in this study, in the credibility method, the data extracted from the conversation units made from the GPT chat were sent to the Jasper artificial

intelligence, and the data collected by the researcher from the GPT chat conversation units were verified. In the transferability method, the generalizability of the research results to a wider scope was examined, which was determined that due to the limitations of the research field, the research results are not possible with other regions and areas and can only be generalized to the studied field. In the confirmability method, the data extracted from the conversation units from the artificial intelligence were retrieved and checked based on the opinions of two expert professors, and the agreement of both was examined in relation to the extracted data, who agreed with all the extracted data except for three cases. In a reliability approach, by sending the data extracted from the conversation units from AI to two expert professors, the repeatability of data extraction was examined from their point of view, as both expert professors also agreed with the data to be repeated. The data obtained from the conversation with AI systems were examined using the qualitative content analysis method and through three-stage coding. In the first stage, the initial codes (open concepts) were extracted from the text. Then, these codes were categorized into main categories. Finally, by combining and interpreting the categories, overarching concepts (themes) were identified, which formed the basis for the final interpretation of the data.

Findings

Research Question One

1. What is the role of artificial intelligence in the effectiveness of teachers' classroom management?

Table 1. The role of artificial intelligence in teachers' classroom effectiveness: educational level

| Comprehensive concepts | Main category | Open concepts |
|---|-------------------------------------|--|
| The role of artificial intelligence in teachers' classroom effectiveness: educational level | Data- driven teacher | Transformation in teachers' teaching methods (Discussion Unit 1), data-driven teaching (Discussion Unit 1), continuous collection and analysis of learning data (Discussion Unit 1), educational decisions based on real evidence (Discussion Unit 29), monitoring classroom performance (Discussion Unit 2), the level of participation in learning (Discussion Unit 2), individual progress (Discussion Unit 2), interactive feedback (Discussion Unit 2), adaptive teaching with the help of artificial intelligence (Discussion Unit 3), tailoring the education path based on the level of ability (Discussion Unit 3), adjusting the pace of learning (Discussion Unit 4), choosing the cognitive style of each student (Discussion Unit 4), personalizing learning (Discussion Unit 4), increasing student engagement (Discussion Unit 4), improving the quality of learning (Discussion Unit 4), utilizing blended learning (Discussion Unit 4), dynamizing the classroom (Discussion Unit 5), learning based on the real needs of students (Discussion Unit 5), intelligent analysis of learning/teaching data (Discussion Unit 5), real-time feedback and accurate reports on the educational situation (Discussion Unit 5), targeted adjustment of the teaching process (Discussion Unit 5), the role of Teacher professionalism (Discussion Unit 5), Strengthening learning analytics (Discussion Unit 28), Adaptive teaching (personalized (Discussion Unit 6), Content personalization with artificial intelligence (Discussion Unit 6), Adjusting the content level based on student ability (Discussion Unit 6), Matching teaching style with learning style (Discussion Unit 6), Using data analysis to choose the appropriate method (visual, auditory, practical) (Discussion Unit 6), Individual learning path (Discussion Unit 7), Designing a different educational path for each student with the help of AI algorithms (Discussion Unit 7), Matching content and teaching method to each student's level and learning style (Discussion Unit 12), Improving time and content management (Discussion Unit 7), Optimal adjustment of teaching time (Discussion Unit 8), Analyzing system feedback (Discussion Unit 8), Increasing student participation (Discussion Unit 8), Improving learner motivation and interaction (Discussion Unit 9), Teaching tailored to individual needs (Discussion Unit 9), Teacher professional decision-making (Discussion Unit 9), Transforming teachers into data analysts (Discussion Unit 10), Learning designers instead of mere transmitters (Discussion Unit 11), Conversation 10), Improving the quality of teacher feedback (Conversation Unit 28), Providing accurate and immediate data-based feedback (Conversation Unit 10), Modifying learner behavior (Conversation Unit 10), |
| | Adaptive (personalized) teaching | |
| | Instant feedback system | |
| | Setting an individual learning path | |
| | Professionalization of learning | |

Based on the findings in Table 1, the role of artificial intelligence in the effectiveness of teachers' classroom management at the educational level was categorized into 5 main categories (data-

driven teaching, adaptive teaching, immediate feedback system, individual learning path setting, and professionalization of learning).

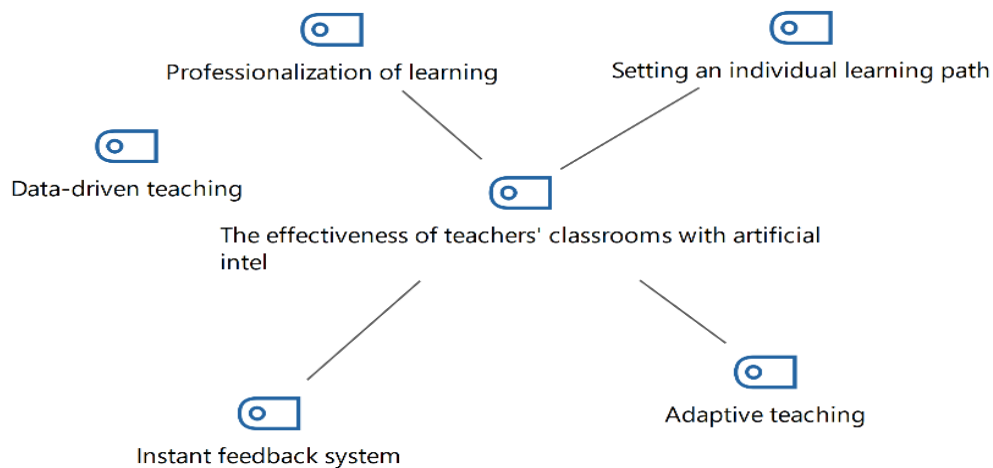


Figure 1. The role of artificial intelligence in teachers' classroom effectiveness: educational level

Table 2. The role of artificial intelligence in teachers' classroom effectiveness: Management level

| Comprehensive concepts | Main category | Open concepts |
|--|---------------------------------|---|
| The role of artificial intelligence in teachers' classroom effectiveness: Management level | Decision-making data analysis | Predicting academic performance (Conversation Unit 11), Continuous monitoring and evaluation (Conversation Unit 11), Supporting teacher decision-making (Conversation Unit 11), Reflective teacher learning (Conversation Unit 11), Increasing interactive learning (Conversation Unit 12), Data-driven decision-making (Conversation Unit 12), Continuous collection and analysis of learning data for better decision-making (Conversation Unit 27), Continuous observation of learner behavior and correction of teaching path in real time (Conversation Unit 12), Early identification of academic failure and support with predictive algorithms (Conversation Unit 13), Using intelligent interactive tools to enhance active participation in the classroom (Conversation Unit 27), Identifying students' emotions and moods through facial analysis (Conversation Unit 29), voice or text (Conversation Unit 13), Helping teachers analyze their performance through analytical reports of AI systems (Conversation Unit 13), Using AI tools to optimize scheduling (Conversation Unit 13), Analyzing student academic progress patterns (Conversation Unit 13), Teacher educational decision-making based on Accurate data base (Discussion Unit 14), Teacher feedback system based on learner data (Discussion Unit 14), Analysis of learner strengths and weaknesses (Kaftago Unit 14), Analysis of class progress strengths and weaknesses (Kaftago Unit 14), Analysis of teacher performance strengths and weaknesses (Kaftago Unit 14), Analysis of learning participation rate (Discussion Unit 14), Analysis of learning task completion rate (Discussion Unit 14), Selection of teaching strategy according to learner analysis (Discussion Unit 15), Assignment of homework, videos, tests based on data analysis (Discussion Unit 15), Providing learning tasks to students according to ability (Discussion Unit 15), Selection of teaching strategy according to learner analysis (Discussion Unit 15), Increasing mental engagement with interactive digital education (Discussion Unit 15), Using AI tools to better adjust the class schedule (Discussion Unit 16), Improving the learning environment by analyzing classroom behavioral data (Discussion Unit 16), Accurate and automatic feedback to correct methods (Discussion Unit 16), |
| | Participatory data analysis | |
| | Timing data analysis | |
| | Process data analysis | |
| | Learning behavior data analysis | |

Based on the findings in Table 2, the role of artificial intelligence in the effectiveness of teachers' classroom management was categorized at the management level based on 5 main categories (decision data analysis, collaborative data analysis, scheduling data analysis, process data analysis, and learning behavior data analysis).

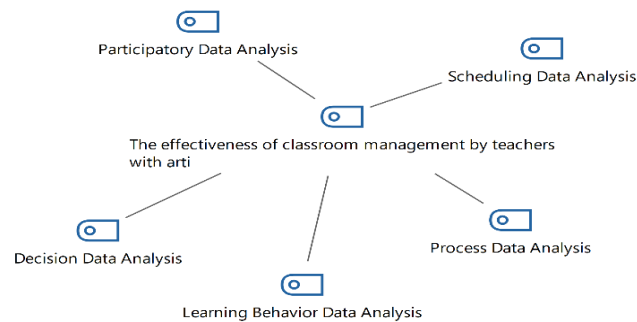


Figure 2. The role of artificial intelligence in teachers' classroom effectiveness: management level

Table 3. The role of artificial intelligence in teachers' classroom effectiveness: motivational-psychological level

| Comprehensive concepts | Main category | Open concepts |
|--|----------------------|--|
| The role of artificial intelligence in teachers' classroom effectiveness: motivational-psychological level | Cognitive engagement | Attendance, participation in discussions (Discussion Unit 17), activity in educational systems (Discussion Unit 17), homework completion, emotion analysis tools in chats or written responses (Discussion Unit 17), the level of emotional involvement of the student (Discussion Unit 17), examining motivational fluctuations (Discussion Unit 17), preferred learning style, the level of effective interaction (Discussion Unit 17), appropriate content for the level of motivation, dynamic learning space (Discussion Unit 17), interactive and purposeful (Discussion Unit 17), asking questions (Discussion Unit 26), participation in activities (Discussion Unit 17), the level of mental involvement with the course content (Discussion Unit 17), cognitive participation (Discussion Unit 26), behavioral participation (Discussion Unit 18), personal interest in learning (Discussion Unit 18), emotional participation (Discussion Unit 18), emotional connection with the class and teacher, external stimuli for learning (Discussion Unit 18), tailoring the learning environment to needs (Discussion Unit 18), learning satisfaction, predicting the process of participation, motivation decline (Discussion Unit 17). Conversation 25), Recognition of emotions and facial expressions (Conversation Unit 18), Progress report (Conversation Unit 19), Learning progress report (Conversation Unit 19), Physical activities (Conversation Unit 19), Identification of motivation measurement indicators (Conversation Unit 19), Student participation using educational data (Conversation Unit 19), Mastery of content and adaptation to individual needs (Conversation Unit 19), Motivational nature of artificial intelligence in the classroom (Conversation Unit 19) |
| | Emotional conflict | |
| | Psychomotor conflict | |

Based on the findings in Table 3, the role of artificial intelligence in the effectiveness of teachers' classroom management at the motivational-psychological level was categorized based on 5 main categories (cognitive engagement, emotional engagement, psychomotor engagement).

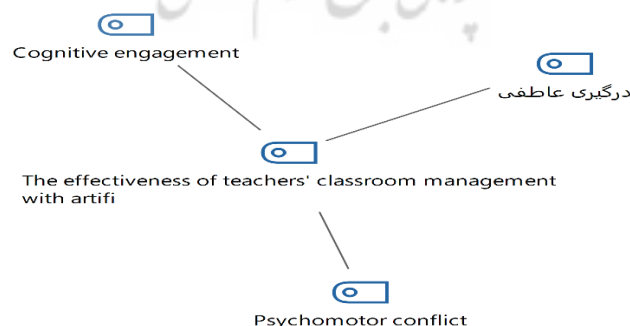


Figure 3. The role of artificial intelligence in teachers' classroom effectiveness: motivational-psychological level

Table 4. The role of artificial intelligence in teachers' classroom effectiveness at the cognitive level

| Comprehensive concepts | Main category | Open concepts |
|---|--|---|
| The role of artificial intelligence in teachers' classroom effectiveness at the cognitive level | Accessibility of cognitive tools | Providing new tools and technologies (Discussion Unit 20), Improving classroom management knowledge (Discussion Unit 24), Ability to understand, analyze, and process student information (Discussion Unit 20), Learning data analysis (Discussion Unit 20), Identifying behavioral patterns (Discussion Unit 24), Continuous assessment of academic performance (Discussion Unit 20), Ability to identify students' cognitive strengths and weaknesses (Discussion Unit 21), Targeted and individualized education (Discussion Unit 21), Optimization of the teaching process (Discussion Unit 21), Deeper and more meaningful learning for students (Discussion Unit 21), Availability of a powerful tool for learning (Discussion Unit 21), Improving the cognitive quality of learning in the classroom (Discussion Unit 22), Strengthening problem-solving skills (Discussion Unit 22), Promoting critical thinking and increasing conceptual understanding (Discussion Unit 22), More opportunities for effective interaction (Discussion Unit 25), Asking deep questions and guiding educational conversations (Discussion Unit 22), Developing multisensory learning experiences (Discussion Unit 21), Improving cognitive processing (Discussion Unit 22), Using artificial intelligence in the classroom (Discussion Unit 22), providing learning support tools (Discussion Unit 22), teacher cognitive partner (Discussion Unit 22), providing educational insights (Discussion Unit 22), strengthening the decision-making process (Discussion Unit 22), creating a more effective learning environment (Discussion Unit 23), a more appropriate environment for students' mental needs (Discussion Unit 23), |
| | Accessibility of meaningful learning | |
| | Increase conceptual understanding | |
| | Identifying cognitive strengths and weaknesses | |

Based on the findings in Table 4, the role of artificial intelligence in the effectiveness of teachers' classrooms at the motivational-psychological level was categorized based on 4 main categories (accessibility of cognitive tools,

accessibility of more meaningful learning, increased conceptual understanding, and identification of cognitive strengths and weaknesses).

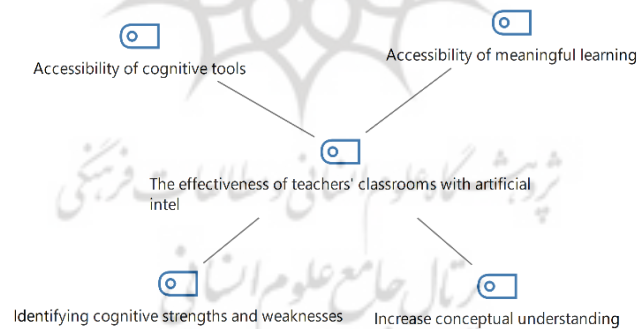
**Figure 4. The role of artificial intelligence in teachers' classroom effectiveness at the cognitive level**

Table 5. The role of artificial intelligence in the effectiveness of teachers' classroom management at the evaluation level

| Comprehensive concepts | Main category | Open concepts |
|--|---|---|
| The role of artificial intelligence in the effectiveness of teachers' classroom management at the evaluation level | Personalized evaluation | Learning style analysis (Conversation Unit 30), student learning speed analysis (Conversation Unit 30), tests tailored to individual abilities (Conversation Unit 30), adaptive assessments (Conversation Unit 30), data collection related to student performance (Conversation Unit 31), identification of student learning patterns (Conversation Unit 31), academic progress or decline (Conversation Unit 31), grading students in multiple-choice, written, and even oral tests (Conversation Unit 31), impartial correction (Conversation Unit 32), preventing graders from being attrited in tests (Conversation Unit 32), providing accurate and rapid feedback to students (Conversation Unit 31), analyzing student weaknesses (Conversation Unit 33), identifying cheating cases with the help of advanced algorithms such as recognizing similarities in answers or unusual behaviors during the test (Conversation Unit 33), evaluating student behavioral data (Conversation Unit 33), analyzing data from participation in discussions (Conversation Unit 34), and analyzing data from participating in discussions (Conversation Unit 35). Discussion 34), Evaluating student project activities (Discussion Unit 34), Evaluating online interactions (Discussion Unit 35), Fair evaluations (Discussion Unit 35), Person-centered evaluation (Discussion Unit 35), Data-centered evaluation (Discussion Unit 35), Increasing accuracy and integrity in scoring (Discussion Unit 36), Analyzing the text of responses with natural language processing algorithms (Discussion Unit 36), Continuous possibility of reviewing evaluation data (Discussion Unit 36), Integrity in scoring (Discussion Unit 37), Eliminating human bias (Discussion Unit 37) |
| | Academic Progress Analysis | |
| | Auto-correction and neutrality | |
| | Immediate and constructive feedback | |
| | Fraud detection | |
| | More comprehensive evaluation with complementary data | |

Based on the findings in Table 5, the role of artificial intelligence in the effectiveness of teachers' classroom management was categorized at the evaluation level based on 6 main categories (personalized evaluation, academic progress

analysis, automatic and impartial correction, immediate and constructive feedback, fraud detection, more comprehensive evaluation with supplementary data).

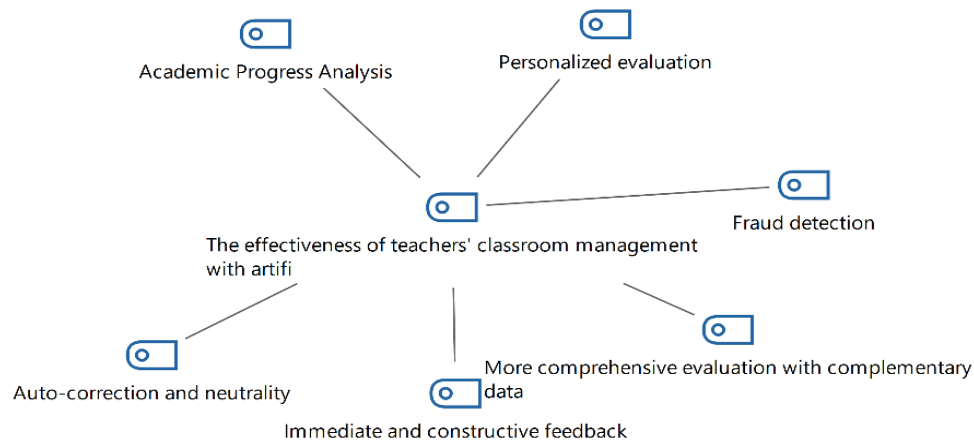


Figure 5. The role of artificial intelligence in the effectiveness of teachers' classroom management at the evaluation level

2. What model can be developed to explain the role of artificial intelligence in the effectiveness of teachers' classroom management?

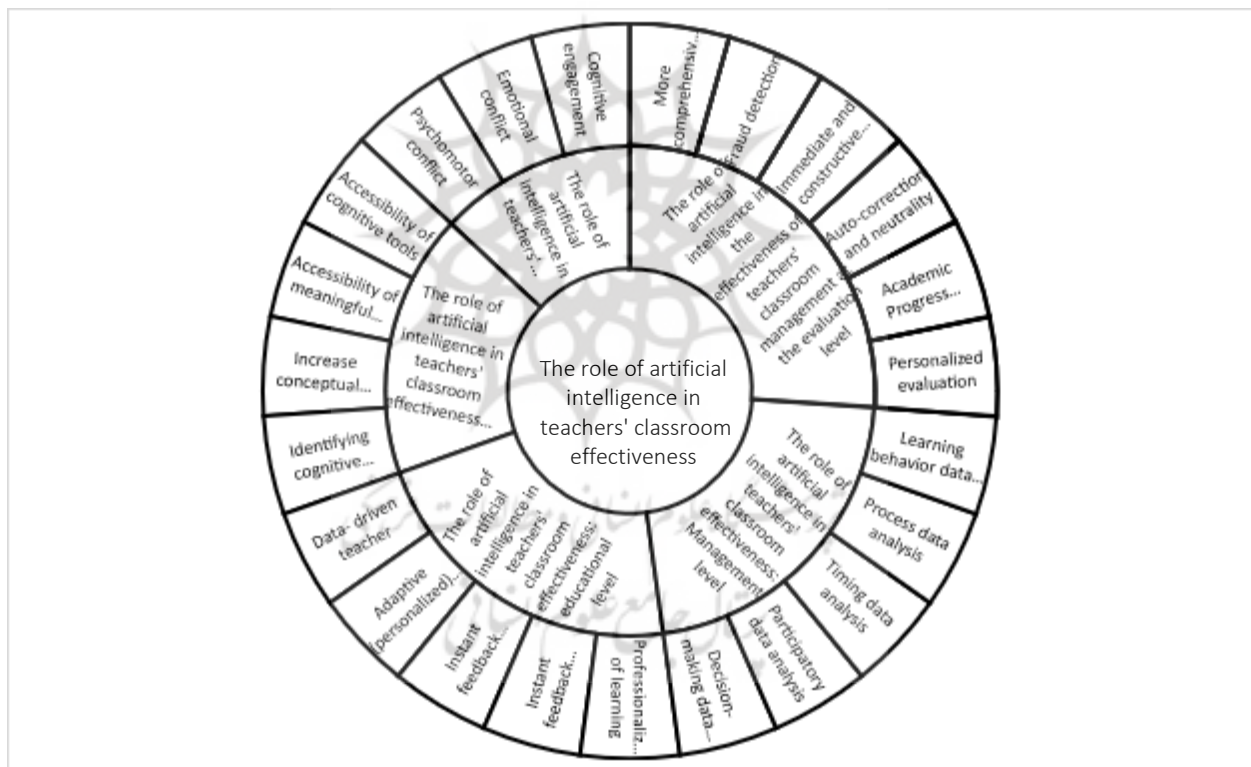


Figure 1A model for explaining the role of artificial intelligence in teachers' classrooms

Discussion and Conclusion

Artificial Intelligence (AI) has become one of the transformative tools in the education system in recent years. One of the most important areas of its impact is improving the effectiveness of teachers' classroom management (VanLehn, 2011, Sunday et al, 2025). Classroom effectiveness refers to the teacher's ability to manage the teaching-learning process, create effective interaction with students,

and guide them towards deep and sustainable learning. In this context, AI can play a role as a powerful assistant for teachers. According to the findings, one of the key roles of AI in improving the effectiveness of teachers' classroom management is at the educational level (Al Nabhani, Hamzah, M. & Abuhassna, 2025).

The use of AI has led to a transformation in teaching methods; in such a way that teachers can

use it to adapt their teaching methods to the individual needs and talents of students and adjust learning activities in a targeted manner.

Adaptive learning is an educational approach in which the content, method, and learning path are continuously updated and adjusted based on characteristics such as the needs, abilities, learning styles, and progress of each learner. Unlike traditional education, which provides the same version for all learners, this approach attempts to provide a more personalized and effective experience that leads to sustainable and deeper learning (Attwood, Bruster, & Bruster, 2020). In this regard, artificial intelligence plays an important role in components such as providing real-time feedback, producing accurate reports of educational status, purposefully adjusting the teaching process, strengthening the professional role of teachers, promoting learning analytics, and ultimately realizing adaptive teaching. Content personalization is also achieved through intelligent algorithms and analysis of learner data by artificial intelligence. The findings of this research are consistent with the results of studies by Pardo and Simons (2014) as well as Rasta, Chen, et al. (2020), who have emphasized the role of artificial intelligence in improving the teaching and learning process through the analysis of educational data.

According to the findings, one of the roles of AI in the effectiveness of teachers' classroom management is at the management level. In addition to educational roles, AI at the management level of the classroom also has significant effects on the effectiveness of teachers' classroom management (Li, , & Wang, 2021; Al Darayseh, 2023). The management level refers to the processes that are related to planning, organizing, directing, and monitoring classroom activities and provide the basis for effective learning. By providing modern analytical and management tools, AI helps teachers manage the classroom in a more purposeful and efficient manner.

Among the applications of AI at this level, we can mention the continuous monitoring of classroom behavior and student academic performance. By collecting and analyzing behavioral and educational data, intelligent systems enable teachers to be aware of the overall state of the classroom and the individual status of students in real time and to make more effective management decisions (Bates, 2015, Lamos, , Mintz, & Qu, 2021) The role of AI in the effectiveness of teachers' classrooms at the management level includes components such as predicting academic performance, continuous monitoring and evaluation, supporting teacher decision-making, teacher reflective learning, increasing interactive learning, data-driven decision-making, continuous collection and

analysis of learning data for better decision-making, continuous observation of learner behavior and real-time correction of teaching paths, early identification of academic failure, and support with predictive algorithms. The research results are in line with studies (Strong, 2018; Zawaki-Reicher, Marin, Bond, & Gouverneur, 2019).

The research findings show that one of the important dimensions of the role of artificial intelligence in the effectiveness of teachers' classroom management can be observed at the motivational-psychological level. This level includes factors such as increasing motivation, improving self-confidence, reducing learning anxiety, strengthening the sense of participation and self-efficacy of students, all of which play a decisive role in the learning process. The intelligent use of artificial intelligence-based technologies can effectively affect these psychological factors. One of the most important possibilities of artificial intelligence in this field is the provision of motivational and personalized feedback. Intelligent systems can provide feedback tailored to each student's performance based on their individual progress, which leads to an increased sense of success, reduced frustration and greater internal motivation. Unlike traditional methods, this type of feedback is not only evaluative, but is designed to encourage, support emotionally and strengthen self-confidence.

AI also enhances cognitive and emotional engagement with content by designing interactive, engaging learning environments that are tailored to students' interests and learning styles. Using gamification elements, intelligent simulations, and augmented reality in education, with the help of AI tools, provides an environment for students to attend class with positive feelings, high motivation, and enjoyment of learning. At the teacher level, AI also provides analytical data on students' psychological and motivational states, enabling teachers to provide more targeted psycho-educational support by more accurately understanding the emotional and motivational states of learners. This strengthens the teacher-student relationship and shifts the classroom atmosphere toward support, empathy, and motivation. According to the findings of this study, the results are consistent with previous research such as Chen et al. (2020) and Pardo and Simons (2014) and show that the use of smart technologies affects not only education, but also the psychological aspects of the learning process. The findings of this study showed that the role of artificial intelligence in the effectiveness of teachers' classrooms at the motivational-psychological level includes components such as attendance, participation in discussions, activity in educational systems, homework completion, emotion analysis tools in chats or written

responses, the level of student emotional involvement, examining motivational fluctuations, preferred learning style, the level of effective interaction, appropriate content for the level of motivation, a dynamic, interactive and purposeful learning environment, asking questions, participation in activities, the level of mental engagement with the course content, cognitive participation, behavioral participation, and personal interest in learning. (Wong Hong, & Huang, 2021; Dimartini, Sciascia, Bosso, & Manori, 2024; Kaushik, 2024) has been consistent. Some of the components of the role of artificial intelligence in the effectiveness of teachers' classroom management at the cognitive level include providing new tools and technologies, improving classroom management knowledge, the ability to understand, analyze, and process student information, analyzing learning data, identifying behavioral patterns, continuously assessing academic performance, the ability to identify students' cognitive strengths and weaknesses, and targeted and individualized education.

Finally, according to the findings, one of the roles of artificial intelligence in the effectiveness of teachers' classrooms is at the level of evaluation. Evaluation, as one of the main pillars of the educational process, plays a fundamental role in identifying the extent to which learning goals are being achieved and providing appropriate feedback to learners. By using advanced algorithms and analyzing student performance data, artificial intelligence provides teachers with the possibility of continuous, accurate, and personalized evaluation. This technology is able to analyze students' responses, response times, behavioral patterns, and learning paths to provide more comprehensive and in-depth reports than traditional methods (Zhang, 2022). Artificial intelligence can also provide targeted and corrective feedback to learners in real time and help teachers design and modify educational processes. In addition, artificial intelligence-based evaluation systems are able to detect biases, human errors, and inequality in assessment and help improve educational equity by providing data-driven analysis. Some of the components of the role of artificial intelligence in the effectiveness of teachers' classrooms at the evaluation level include learning style analysis, student learning speed analysis, tests tailored to individual abilities, adaptive assessments, collecting data related to student performance, identifying student learning patterns, academic progress or decline, grading students in multiple-choice, written, and even oral tests, impartial correction, no attrition of correctors in tests, providing accurate and rapid feedback to students, analyzing student weaknesses, identifying cheating with the help of advanced algorithms such as recognizing similarities in answers or unusual

behaviors during the test, evaluating student behavioral data, and analyzing data from participation in discussions. The results of the study are consistent with (Lukin, Holmes, Griffin, & Forcier, 2016; Pani, Steiner, Baird, & Hamilton, 2017, (Greenhow, & Lewin, 2016, Lin, 2022).

Learning analytics is the process of collecting, analyzing, and interpreting data about learners and learning environments with the aim of better understanding and improving the learning process (Chatti et al, 2012).

Suggestions

Based on the findings in Table 1, it is suggested that in order to develop artificial intelligence in the effectiveness of teachers' classrooms, data-driven teaching strategies, adaptive teaching, immediate feedback system, individual learning path adjustment, and professionalization of learning should be provided to them.

Based on the findings in Table 2, it is suggested that in order to develop the role of artificial intelligence in the effectiveness of teachers' classrooms, they should be provided with the necessary training for decision-making data analysis, participatory data analysis, scheduling data analysis, process data analysis, and learning behavior data analysis.

Based on the findings in Table 3, it is suggested that in order to develop the role of artificial intelligence in the effectiveness of teachers' classrooms, efforts should be made to ensure that teachers have as much cognitive, emotional, and psychomotor engagement with artificial intelligence tools as possible.

Based on the findings in Table 4, it is suggested that for motivational classrooms using artificial intelligence tools, cognitive tools for more meaningful learning should be made available to teachers.

Based on the findings in Table 5, it is suggested that artificial intelligence should be used for more efficient evaluation and that necessary training be provided to teachers in this regard.

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