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Artificial intelligence and the human learning process: A systematic review of international experiences

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Abstract:

We explained the successful fields of artificial intelligence in the empirical scientific evidence in the form of a conceptual model. The method used in the research was a systematic review (standard PRISMA). The field of research was the scientific articles related to artificial intelligence and its effectiveness in human learning, published in the years 2018 to 2022. We extracted articles from authentic databases such as Science Direct, Elsevier, Scopus, Eric, and Springer. We examined them with careful evaluation criteria and were sixty - five articles ready to enter the analysis. The results showed that 5 applicationand s in the field of artificial intelligence application in human learning can be extracted and explained, which is: The field of detection and identification, and field of expansion and optimization, the field of design and implementation and, evaluation, The field of psychological support, The field of supporting teacher activities. Below we explained the results with empirical evidence and made suggestions.

Keywords: Artificial Intelligence, Artificial Intelligence and Human Learning, Conceptual Model of Artificial Intelligence, Artificial Intelligence and Education, Artificial Intelligence and Educational Psychology.

Introduction:

With the extensive changes in today's world, the future of students is also undergoing fundamental changes, and in this sense, it is important and necessary to review and evaluate the evolution of technology trends that have come to help humans to achieve special educational goals (Şerban & Todericiu, 2020). The application of artificial intelligence in teaching and learning is a relatively new and young field, which we see every day expanding its boundaries in the sciences related to education (Chen et al., 2020). The field of education is experiencing a wide and profound transformation because artificial intelligence can be used and applied in many ways for learning purposes and has the potential to fundamentally change social processes in educational situations (Dai et al, 2021). Artificial intelligence is a knowledge project that evaluates knowledge as a goal and end, accesses knowledge, analyzes and explains methods of presenting knowledge, and uses these processes to achieve the effect of

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simulating intellectual actions. It is used by humans (Zang, 2021). There is a need for a clearer understanding of how humans can interact with artificial intelligence in ways that can ultimately lead to their well-being (Dafoe et al., 2021).

There is no doubt in this context that artificial intelligence has been able to redefine and configure the distribution of power between humans and machines, and therefore, new types of capabilities and skills are needed in this field (Luengo-Oroz et al., 2020). In newer definitions of artificial intelligence, it can be explained that computers perform cognitive actions and processes like the human mind, especially in the dimensions of learning and problem-solving (Dai et al, 2021). With the rapid and extensive development of artificial intelligence, the use of its capabilities in the field of education and learning has become a desirable and attractive research topic for interdisciplinary researchers and education specialists and has provided new opportunities for learning in educational environments (Chu et al., 2022). And this allows people to meet their needs in this field (Della Ventura, 2018).

The technology related to artificial intelligence with its specific techniques has been able to increase and improve different learning scenarios such as providing guidance or feedback (Chan and Zari, 2019). and make people more involved and independent in this educational process (Della Ventura, 2018). This has led to the expansion of study areas such as education (van der Scheer, & Visscher, 2018), online learning (Hwang et al., 2022), application in mathematics education (Tang et al., 2021), education in medicine and nursing (Chang et al., 2022) With the increasing scope of these technologies, researchers and educational educators must identify trends and platforms for the use of artificial intelligence (Woo et al., 2021). Artificial intelligence has provided modern technologies to accommodate the various characteristics of humans, which is an important step for the personalization of education (Bhutoria, 2022). For example, experimental evidence has shown that artificial intelligence-based educational systems help to moderate learning anxiety among learners by taking advantage of cognitive performance analysis and estimating a positive feedback loop (Huang et al., 2020).

We investigated the successful fields of artificial intelligence in teaching and learning by searching for reliable scientific sources and empirical evidence available in reliable journals. Most of the research was in the form of a systematic review and was often about the type of studies, years of publication, researchers, tools, journals, organizations, methods of use, etc. However, the researchers did not find any research that systematically reviewed the successful areas of artificial intelligence in the human learning process and reported the results of experimental evidence in a cumulative form. systematic review as quantitative methods such as meta-analysis by providing general platforms for gathering evidence and providing valuable assistance to the application, correct understanding,

design of interventions, needs assessments, and the formation of realistic goals about the subject under investigation. The advantage of addressing this issue with the mentioned method is to provide an integrated and comprehensive conceptual model of the latest results in the field of artificial intelligence application in human learning processes. which can reduce the research gap or the repetition of interventions or planning that causes a waste of money and resources. This itself can lead to more research and provide conceptual and empirical support for future and related research. Therefore, this research addresses the question of what are the successful fields of artificial intelligence in human learning processes?

Method:

The method used in the research is a systematic review. This method is a non-react.ve approach. In this method, the information is recorded and the researcher has some confidence in their validity. The purpose of review research is not only to inform but also to evaluate and interpret. One of the main advantages of this method is that the weight of the data prevents prejudice. And it is possible to summarize various research results with minimal error. The instructions of the preferred cases in the report of the systematic reviews and meta-analysis (standard PRISMA) were used for the systematic review report. which includes the stages of identification, screening, eligibility, and inclusion.

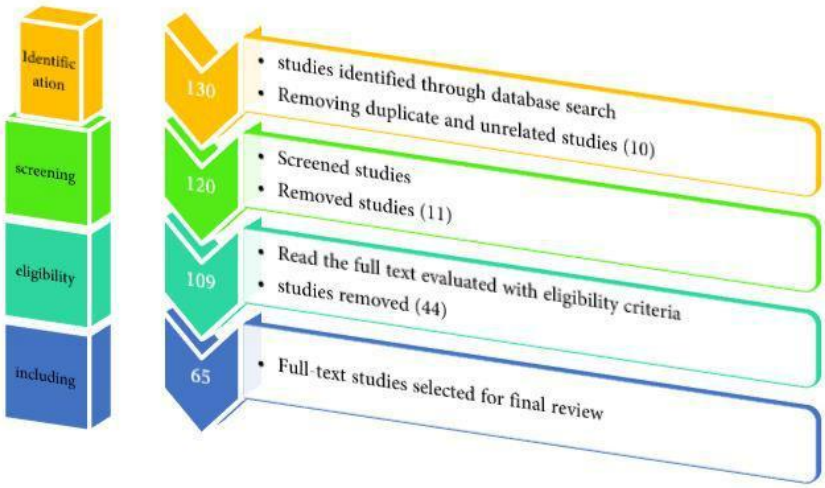
In the systematic review section, the field of research is all available scientific resources in the field of artificial intelligence and its application in teaching and learning. 65 articles Between 2018 and 2022 were selected and analyzed. Due to the fact that the sample volume at this level cannot be achieved in advance, the reviBecausef related texts and documents were done step by step. To search and find articles from databases such as Science Direct, Elsevier, Scopus, Eric, and Springer Used. Some of the criteria for entering the articles into the research was that the language of the articles should be English. Articles before 2018 were not accepted. Quantitative and qualitative research methods or both could enter the research. Applied areas of artificial intelligence were not acceptable except for the field of education and learning. The studied conditions should show the impact of artificial intelligence in teaching and learning. And finally, personal opinions and invalid articles could not be included in the research.

The keywords we used in the process of searching for articles were artificial intelligence (AI), artificial intelligence (AI) and learning, artificial intelligence (AI) and education, artificial intelligence (AI) and teacher, artificial intelligence (AI) and student, artificial intelligence (AI) and learning processes, artificial intelligence (AI) and School, artificial intelligence (AI) and university, artificial intelligence (AI) and educational

psychology, artificial intelligence (AI) and lessons, artificial intelligence (AI) and educational assignments.

From the total of 130 articles that could be included in the research, 65 of them were removed in the refinement stage and the final 65 articles were ready for analysis. In the information extraction phase of the articles, the names of the researchers, the title of the research, the year of publication, the research findings, etc. are extracted. To check the validity of the research, in addition to the fact that the data were selected and confirmed by studying the theoretical foundations, the background of the research, and the relationship and alignment with the purpose and question of the research, data were selected that were evident and descriptive and the researchers did not interfere in the content of the themes.

Figure 1: Systematic review process (standard PRISMA)



Results:

The findings obtained from this research, after separating and removing similar and similar themes that show the successful areas of artificial intelligence in education and learning, are in the form of 3 categories including basic scope, main and secondary organizing scope, and Overarching Scope The following tables are reported.

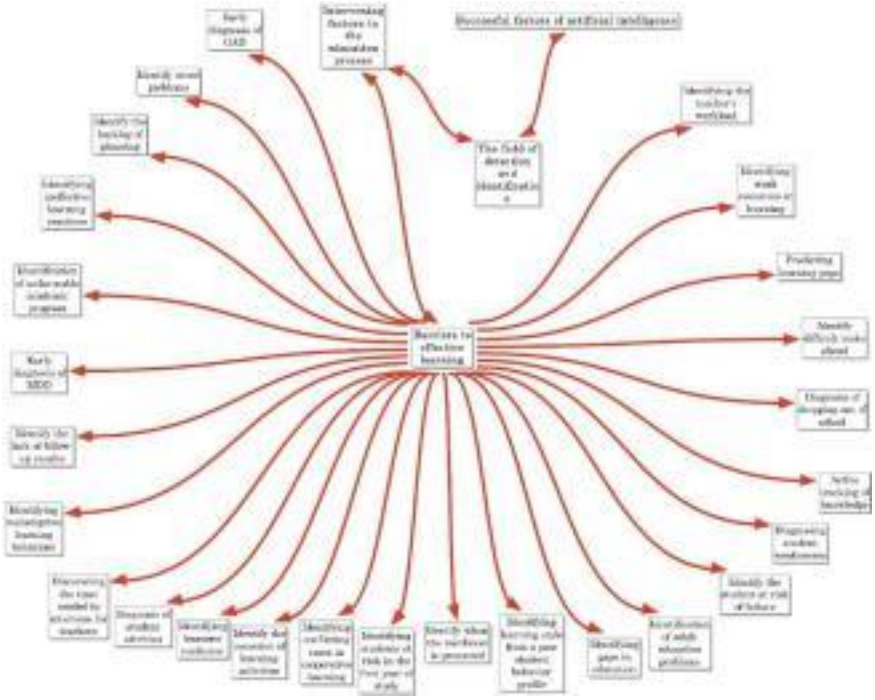
In the following, it has been tried to express the obtained findings separately by thematic and specialized areas, then draw the network of concepts presented in the form of a conceptual model and finally briefly discuss about it.

Table 1: of the successful fields of artificial intelligence: The field of detection and identification

Overarching scope		The scope of the main organizer	Sub-organizer scope	Basic scope
Successful factors of artificial intelligence	The field of detection and identification	Intervening factors in the education process	Barriers to effective learning	➢ Identifying ineffective learning emotions ➢ Identify the backlog of planning ➢ Identify the lack of follow-up results ➢ Identification of unfavorable academic progress ➢ Identifying maladaptive learning behaviors ➢ Identify mood problems ➢ Early diagnosis of MDD ➢ Early diagnosis of GAD ➢ Discovering the time needed to intervene for teachers ➢ Identifying learners' confusion ➢ Identify the cessation of learning activities ➢ Identifying conflicting cases in cooperative learning ➢ Diagnosis of student attrition ➢ Identifying students at risk in the first year of study ➢ Identify when the reinforcer is presented ➢ Identifying learning style from apoor student behavior profile ➢ Identifying gaps in education ➢ Identifying the teacher's workload ➢ Identification of adult education problems ➢ Identify the student at risk of failure ➢ Diagnosing student weaknesses ➢ Active tracking of knowledge

- Diagnosis of dropping out of school
- Identify difficult tasks ahead
- Predicting learning gaps
- Identifying weak resources in learning

Figure 2. Theme network and conceptual model of successful fields of artificial intelligence: the field of detection and recognition



The above conceptual model schematically shows the success of artificial intelligence in the field of diagnosis and recognition. As can be seen, the functions of artificial intelligence have been able to correctly evaluate and diagnose many common problems in the field of education and learning that stop effective educational processes. This finding shows that the traditional styles that have been used in educational processes to investigate the causes of the students' backwardness can now give way to more modern methods. Because artificial intelligence-based methods can detect them more quickly and accurately and avoid wasting time and energy for students and teachers. For example, from a cognitive, emotional, and behavioral point of view, it can be seen that artificial intelligence-related technologies have been able to identify and inform people about academic emotional problems, evaluate students' confusion in understanding the course material, and prevent behaviors that hinder It is desirable to inform about academic progress. for example,

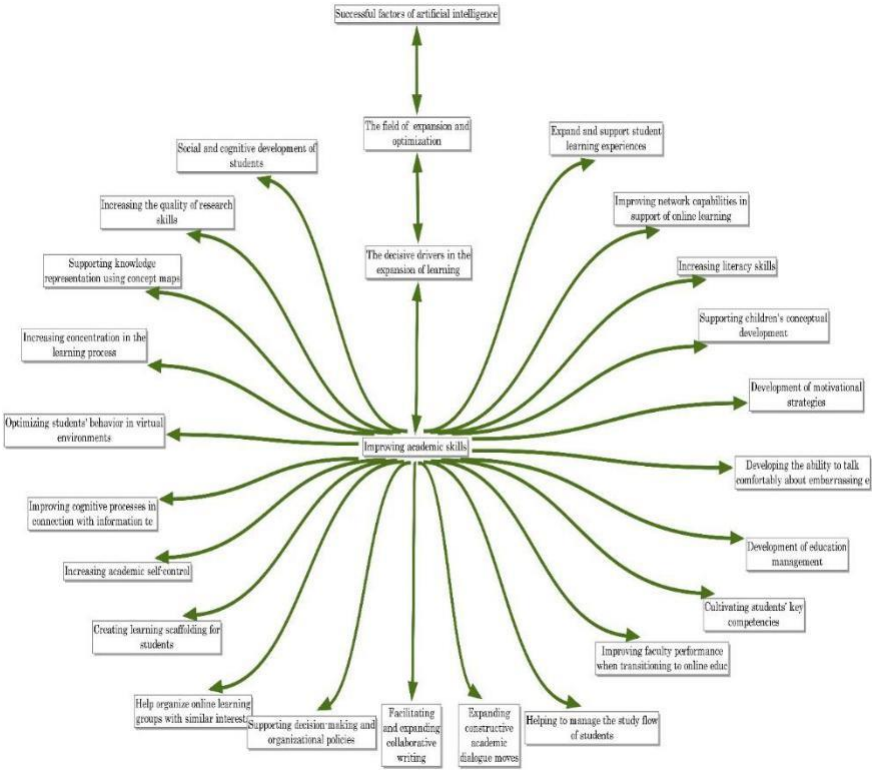
Jamebozorg et al (2022) In their study, they showed that these technologies can improve the fields related to learning processes.

Table 2: of the successful fields of artificial intelligence: The field of expansion and optimization

Overarching scope		The scope of the main organizer	Sub-organizer scope	Basic scope
Successful factors of artificial intelligence	The field of expansion and optimization	The decisive drivers in the expansion of learning	Improving academic skills	➢ Optimizing students' behavior in virtual environments ➢ Improving cognitive processes in connection with information technology ➢ Increasing concentration in the learning process ➢ Increasing academic self-control ➢ Increasing the quality of research skills ➢ Creating learning scaffolding for students ➢ Help organize online learning groups with similar interests ➢ Supporting knowledge representation using concept maps ➢ Supporting decision-making and organizational policies ➢ Helping to manage the study flow of students ➢ Facilitating and expanding collaborative writing ➢ Expanding constructive academic dialogue moves ➢ Expand and support student learning experiences ➢ Social and cognitive development of students ➢ Improving network capabilities in support of online learning ➢ Improving faculty performance when transitioning to online education in the wake of the pandemic

- ➢ Cultivating students' key competencies
- ➢ Development of education management
- ➢ Developing the ability to talk comfortably about embarrassing experiences
- ➢ Development of motivational strategies
- ➢ Supporting children's conceptual development
- ➢ Increasing literacy skills

Figure 3. Theme network and conceptual model of successful fields of artificial intelligence: The field of expansion and optimization



The above conceptual model schematically shows the successful areas of artificial intelligence in the field of expansion and optimization in learning processes. Among the capabilities of artificial intelligence in this field, it is possible to increase the necessary skills for more stable learning. The findings show that the scope of expanding academic skills or optimizing them is not only focused on cognitive or functional aspects but can be discussed and used as a scaffolding that can affect all dimensions. The organization of learning groups and the support of collective dialogue movements related to knowledge are among the best findings. On the other hand, developing motivational strategies in line with human social

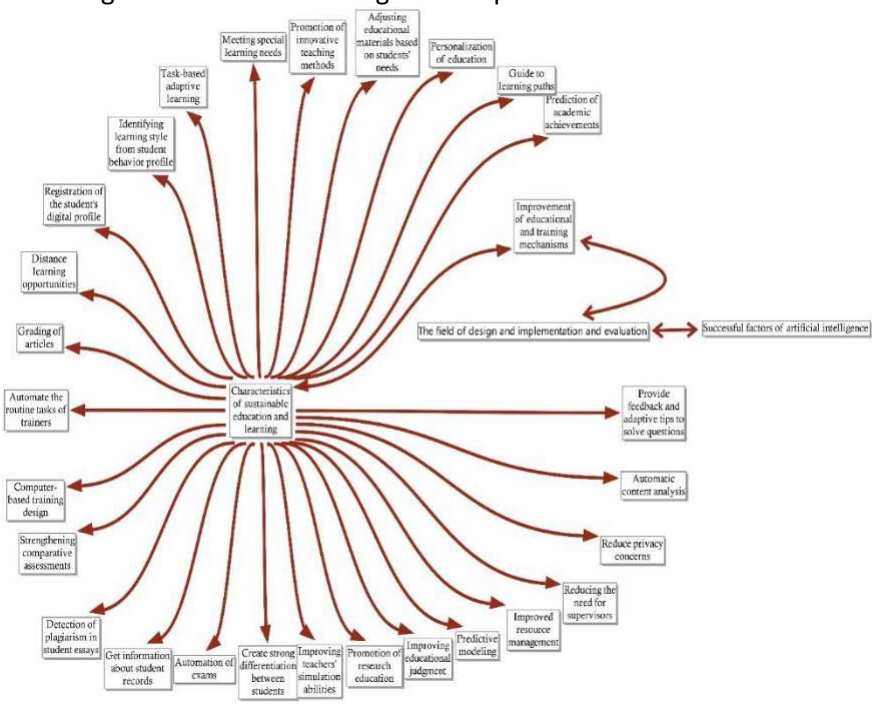
dimensions can be an attractive and useful field of study for applying artificial intelligence technologies for learning. For example, evidence has shown that artificial intelligence supports the learner's metacognitive processes in monitoring, reflection, and planning by benefiting from some learning tools that use data to create relationships (Bull, 2020).

Table 3: of the successful fields of artificial intelligence: The field of design and implementation and evaluation

Overarching scope		The scope of the main organizer	Sub-organizer scope	Basic scope
Successful factors of artificial intelligence	The field of design and implementation and evaluation	Improvement of educational and training mechanisms	Characteristics of sustainable education and learning	➢ Automate the routine tasks of trainers ➢ Strengthening comparative assessments ➢ Computer-based training design ➢ Detection of plagiarism in student essays ➢ Automation of exams ➢ Grading of articles ➢ Get information about student records ➢ Create strong differentiation between students ➢ Improving teachers' simulation abilities ➢ Promotion of research education ➢ Improving educational judgment ➢ Predictive modeling ➢ Automatic content analysis ➢ Improved resource management ➢ Reducing the need for supervisors ➢ Reduce privacy concerns ➢ Provide feedback and adaptive tips to solve questions

	➢ Adjusting educational materials based on students' needs ➢ Prediction of academic achievements ➢ Promotion of innovative teaching methods ➢ Personalization of education ➢ Distance learning opportunities ➢ Registration of the student's digital profile ➢ Identifying learning style from a student behavior profile ➢ Task-based adaptive learning ➢ Meeting special learning needs ➢ Guide to learning paths

Figure 4. Theme network and conceptual model of successful fields of artificial intelligence: The field of design and implementation and evaluation



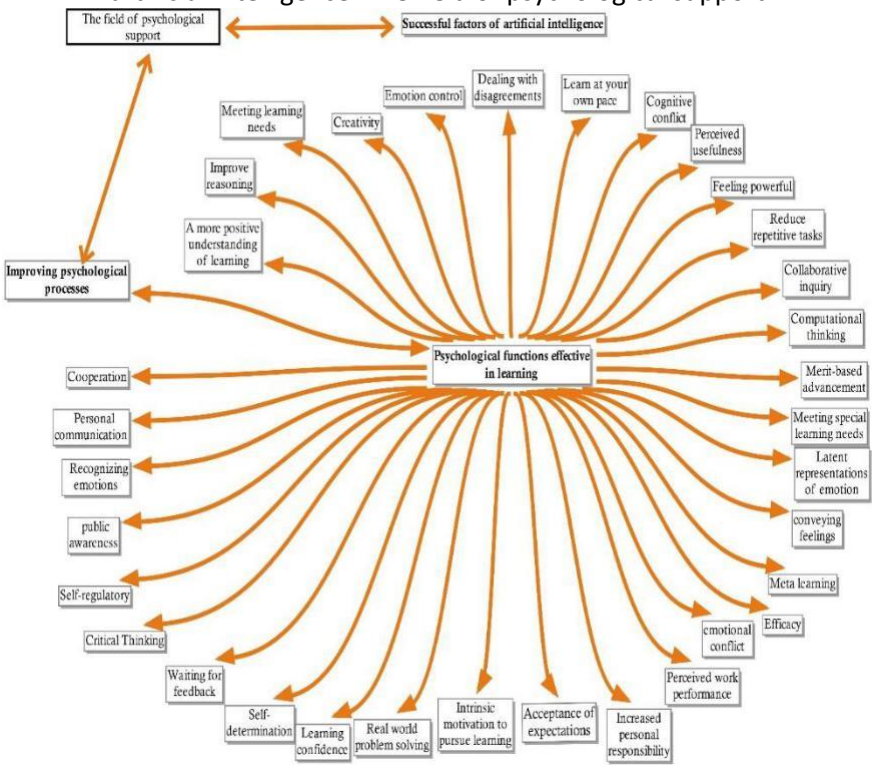
The above conceptual model schematically shows the successful areas of artificial intelligence in the field of design and implementation and evaluation in learning processes. One of the main mechanisms of the learning environment is to have a realistic and logical vision of learning goals and expectations for both students and teachers. This mechanism can be examined and considered in the form of three different stages design, implementation, and evaluation. The findings show that artificial intelligence can help teachers, educational designers, and all decision-makers in the field of education and learn functionally. For example, we can mention computer-based educational design. These capabilities can guide the learning path step by step and provide timely guidance. And on the other hand, by automating comparative evaluations or better understanding people's learning styles, adjust and present educational materials in subetter-undersbetter-understandingf academic progress is realized for learners. For example, there is further evidence that AI is being considered a powerful tool to facilitate new paradigms for instructional design, technology development, and educational research (Holmes et al, 2019).

Table 4: of the successful fields of artificial intelligence: The field of psychological support

Overarching scope	The scope of the main organizer	Sub-organizer scope	Basic scope
Successful factors of artificial intelligence	The field of psychological support	Improving psychological processes	Psychological functions effective in learning	➢ public awareness ➢ Personal communication ➢ Recognizing emotions ➢ Improve reasoning ➢ Cooperation ➢ Self-regulatory ➢ Critical Thinking ➢ Waiting for feedback ➢ Self-determination ➢ A more positive understanding of learning ➢ Meeting learning needs ➢ Learning confidence ➢ Real world problem solving ➢ Intrinsic motivation to pursue learning

- Creativity
- Emotion control
- Acceptance of expectations
- Dealing with disagreements
- Increased personal responsibility
- Perceived work performance
- Learn at your own pace
- Cognitive conflict
- emotional conflict
- Efficacy
- Meta-learning
- conveying feelings
- Latent representations of emotion
- Meeting special learning needs
- Merit-based advancement
- Computational thinking
- Collaborative inquiry
- Reduce repetitive tasks
- Feeling powerful
- Perceived usefulness

Figure 5. Theme network and conceptual model of successful fields of artificial intelligence: The field of psychological support



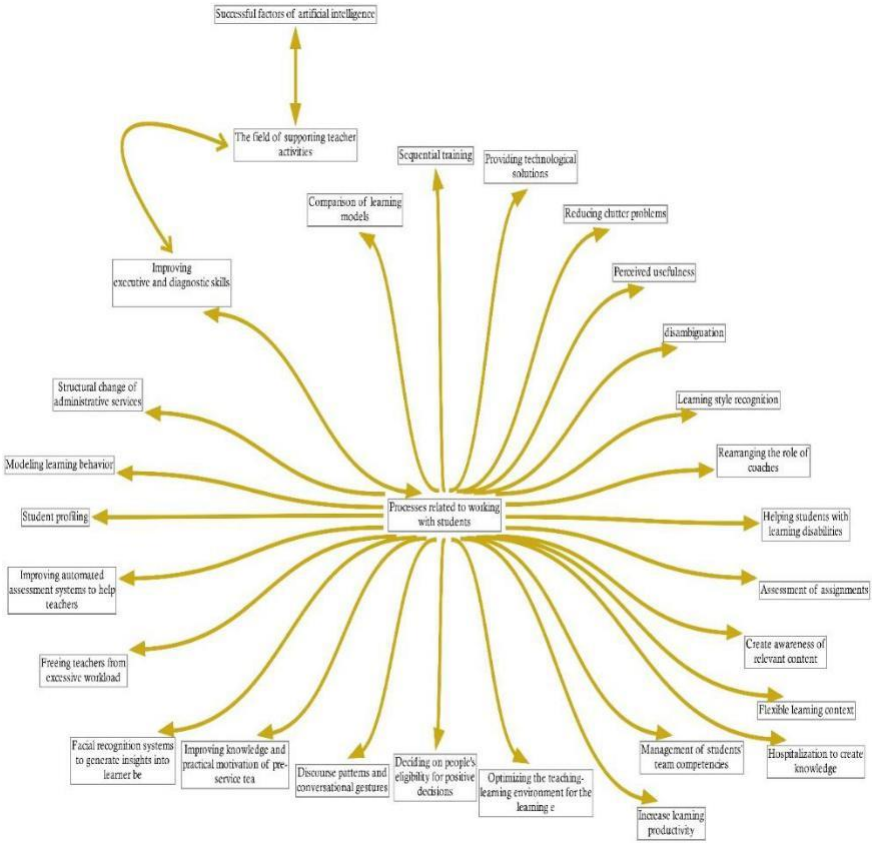
The above conceptual model schematically shows the successful areas of artificial intelligence in the field of psychological support in learning processes. Psychological processes are an integral part of human learning. The psychological dimensions of a person have a direct impact on his motivational and functional structures to try to achieve educational goals. Neglecting this important category can have many consequences for people. Experimental evidence shows, and the findings of this research confirm this, that technological environments dependent on artificial intelligence can improve and promote this category by creating attractive environments or desirable tools. This issue shows itself especially when it comes to expressing emotional emotions or interpersonal communication. On the other hand, by becoming more independent in learning with the help of artificial intelligence, the sense of responsibility or self-efficacy increases in people. For example, empirical evidence shows that teachers' designed emotional response is significantly correlated with students' emotional perception and management in the virtual learning environment (Jamebozorg, 2022).

Table 5: of the successful fields of artificial intelligence: The field of supporting teacher activities

Overarching scope		The scope of the main organizer	Sub-organizer scope	Basic scope
Successful factors of artificial intelligence	The field of supporting teacher activities	Improving executive and diagnostic skills	Processes related to working with students	➢ Student profiling ➢ Modeling learning behavior ➢ Freeing teachers from excessive workload ➢ Improving automated assessment systems to help teachers ➢ Facial recognition systems to generate insights into learner behaviors ➢ Structural change of administrative services ➢ Improving knowledge and practical motivation of pre-service teachers ➢ Perceived usefulness ➢ Discourse patterns and conversational gestures ➢ disambiguation ➢ Deciding on people's eligibility for positive decisions ➢ Comparison of learning models ➢ Reducing clutter problems ➢ Optimizing the teaching-learning environment for the learning experience ➢ Rearranging the role of coaches ➢ Learning style recognition ➢ Helping students with learning disabilities

	➢ Increase learning productivity ➢ Assessment of assignments ➢ Sequential training ➢ Providing technological solutions ➢ Management of students' team competencies ➢ create knowledge ➢ Flexible learning context ➢ Create awareness of relevant content

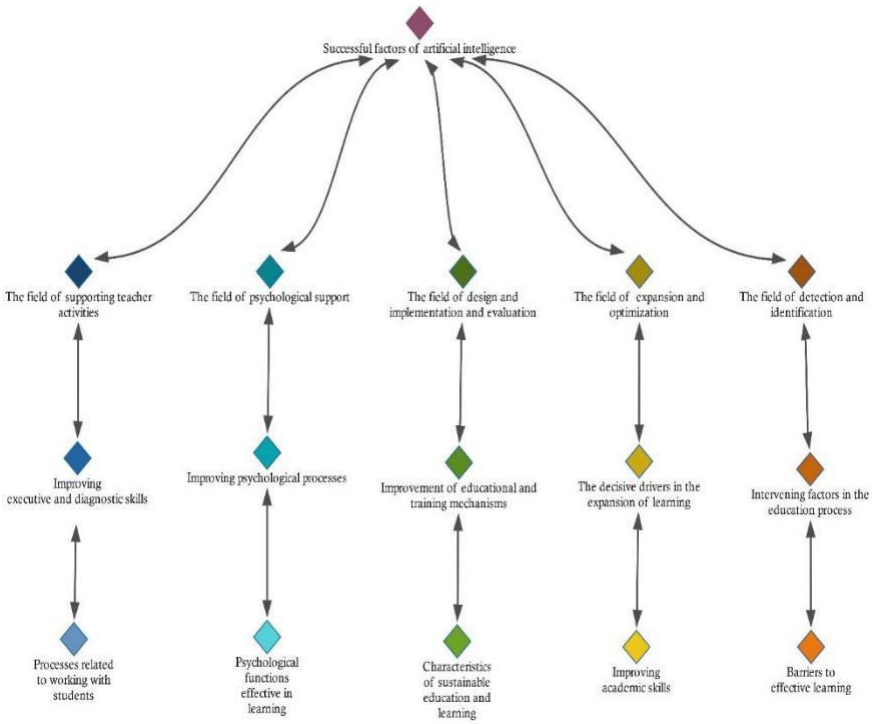
Figure 6. Theme network and conceptual model of successful fields of artificial intelligence: The field of supporting teacher activities



The above conceptual model schematically shows the successful areas of artificial intelligence in the field of supporting teacher activities in learning processes. Teachers have a special position because of their direct role in the learning of people and students. They are very strong information sources and guides for learners, and therefore paying attention to the teacher's activities is one of the basic necessities of the learning process. In this research, we found that artificial intelligence can face the role of

teachers in learning as useful supporters. and provide them with appropriate tools to interact with students. One of the main benefits of artificial intelligence in this field is the modeling of learner behavior, which is very useful information for teacher decisions. Also, by providing services such as diagnostic services or oriented solutions, it can strengthen its informational and social interaction with students, which is an advantage for both of them. For example, empirical evidence has shown that artificial intelligence not only increases the ability of students and teachers to absorb and transfer knowledge, respectively but also helps to create a symbiotic relationship with each other (Gandedkar et al., 2021).

Figure 7. Theme network and conceptual model of successful fields of artificial intelligence: The final model and thematic composition of effective fields



Discussion:

We derived a final model of successful AI domains from empirical evidence. As we expected, the model is completely correct and supports the theoretical foundations. We have shown that empirical evidence justifies the necessity of applying artificial intelligence in the human learning process. And it is very powerful in explaining the integration of technology with educational mechanisms. This in itself can cause fundamental changes in the balance of cooperation or decision-making in the education environment between the teacher and the student. We hope that this model can be put to the test and critiqued among different

researchers at the beginning of the work and can eventually be a guide and supporter of future research. This is just the beginning.

The difference and innovation in the extracted model compared to previous research is that our view of artificial intelligence processes was an educational view. This view has led to the creation of a model from which propositions related to education caeducationalelp the learner to make his learning path more attractive and flexible in the context of artificial intelligence. We do not consider artificial intelligence as a tool or mechanism in extracting the super conceptual model. Because artificial intelligence, with its increasing expansion, has reduced the view of it as a tool and looked at it as a form of teaching and learning. This presupposition has caused the successful areas of artificial intelligence to be extracted by looking at the human learning process in this research.

Conclusion:

In this research, the conceptual model of the successful areas of artificial intelligence in the human learning process was explained. The method used in the research is a systematic review. The results showed that the extracted conceptual model includes 5 general areas, which are completely consistent with the theories in educational psychology and educational technology. This model can be the beginning of related research activities in the future and can be criticized or tested.

The findings of the research can be explained by the various empirical evidence mentioned in the research. The emergence of artificial intelligence-based training as a domain creates new demands for educators, researchers, and educational policymakers to ensure its effective implementation in schools (Sanusi et al., 2022). There are many innovations by researchers to ensure that artificial intelligence is used among learners and learners at different levels. Such initiatives include the design of curriculum, tools, resources, and approaches that support artificial intelligence-based teaching and learning (Xia et al., 2022).

Chai et al (2021) showed that learners 'understanding of artificial intelligence-based learning for social interests is an important and fundamental explanation of students' readiness to learn artificial intelligence, so curriculum providers have opportunities to use artificial intelligence for artificial intelligence. Provide students with a way to solve real-world problems. Artificial intelligence in education can also provide grounds for interfering, attractive, and inclusive knowledge (Wang, 2021). Also, our findings were in line with the results of other research that showed that artificial intelligence could serve as a useful tool to serve psychological, monitoring, and planning processes (Bull, 2020, Jamebozorg, 2022).

There is also other evidence that artificial intelligence is considered a powerful tool to facilitate new paradigms for educational design, technology development, and educational research (Holmes et al., 2019).

It has many effects on the new definition of the role of trainer, personalized learning, and expansion of complex educational systems (Starcic, 2019). This helps to form and develop intelligent learning environments to detect behavior, build learning prediction models, and provide learning recommendations (Rowe, 2019). The use of technology should be closely linked to educational theory and learning to justify educational design and technology development. Since the different and different areas of educational technologies generally imply different educational theories, examining the different roles and areas of artificial intelligence technologies in education, takes into account existing educational theories and learning theories. It is considered (Hwang et al., 2020). In another example of empirical evidence from Cukurova et al. (2019) in their research, he explains an idea of human intelligence that is supported by artificial intelligence methods. They used the forecast algorithm and classification patterns to enhance the transparency of specialist teachers' decision-making trends for extensive reflections and feedback.

We suggest that the existing research vacuum of artificial intelligence approaches be used more in schools. We also suggest that artificial intelligence education interventions be examined. Artificial intelligence-based cards with preschool children and studies on them can enhance the beginning of human school learning activities. The application of qualitative study methods can also add to the research richness in this area at the same time as quantitative methods. It is also very important to apply artificial intelligence in the field of education management, so attention is paid to this.

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