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Analytical review of the use of artificial intelligence in the diagnosis and prevention of teacher burnout in inclusive settings

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Abstract

In the era of digital technologies, the use of artificial intelligence is becoming an integral part of the diagnosis and prevention of professional burnout among teachers. Kazakhstan is at the initial stage of development in this area. Over the past five years, Kazakhstani researchers have published a limited number of works on this topic, which emphasizes the need to incorporate international experience. The aim of this study is to review publications on the diagnosis and prevention of professional burnout among inclusive education teachers using AI. To identify articles published from 2015 to February 2025, international databases Scopus, Web of Science, and JSTOR were used. The study employed theoretical methods to conduct an in-depth analysis, with research tasks RQ1-RQ4 defined. The PRISMA2020 reporting standard was used to present the results. It was found that all three databases demonstrate increasing interest in the use of artificial intelligence in inclusive education. The level of publication representation varies: 45% in Scopus, 35% in Web of Science, and 20% in JSTOR. The study confirmed the high relevance and potential of AI technologies in the diagnosis and prevention of professional burnout among teachers, and also identified promising areas for future research. The authors concluded that the research results obtained are of significant value to the Kazakhstani scientific community and can serve as a methodological basis for developing effective teacher support systems in Kazakhstan aimed at reducing professional burnout among teachers within the national educational environment.

Keywords: Analytical review, Artificial intelligence, Inclusive education teachers, Professional burnout, Students with special needs, Teacher burnout.

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Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
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1. Introduction

In recent years, the influence of artificial intelligence (AI) on societal development has been growing rapidly. On the global stage, the United States and China have emerged as leaders in AI technology development, successfully showcasing their respective practices. The United States has developed over a hundred AI models, including foundational, multimodal, language, visual, audio, and specialized architectures, produced by major companies such as Google, OpenAI, Facebook, Microsoft, NVIDIA, among others [1]. In China, more than 250 large-scale AI models have been developed by companies such as Alibaba, Baidu, Tencent, Huawei, and iFlytek [2].

Kazakhstan is only beginning to take its first steps in this domain. The country has identified artificial intelligence as a key driver of economic growth, as reflected in the official Concept for the Development of Artificial Intelligence for 2024-2029. This Concept outlines priorities such as the development of AI infrastructure, human capital, scientific research, regulatory frameworks, and accelerator programs. Particular emphasis is placed on the creation of a national AI platform, the expansion of data processing centers, the construction of a supercomputer, and the integration of AI into priority sectors of the economy. The overarching goal is to increase the number of AI-based products by a factor of five by the year 2029. Currently, 24 higher education institutions and research centers across the country are engaged in AI-related research and development [3]. Since 2023, AI research has been officially recognized as a priority area in the national scientific agenda. Within this framework, one of the strategic directions for AI development is the funding of scientific research and experimental design initiatives in the field of artificial intelligence.

As part of Direction 4 of the AI Development Concept, our team's project titled "Development of a Model for Predicting and Preventing Teacher Burnout in Inclusive Education Settings Using Elements of Artificial Intelligence" received funding. This research aims to address the prevention of professional burnout among teachers working in inclusive education environments. One of the key objectives of the project is the development of a Telegram bot powered by artificial intelligence, designed to diagnose teacher burnout and provide personalized recommendations for its prevention. The first task of the project involves the analysis of scientific and methodological literature on the topic in order to establish a theoretical and methodological foundation for the burnout prediction model in inclusive education using AI technologies.

To achieve this, we selected the scientific databases Scopus, Web of Science, and JSTOR, as they serve as powerful tools for investigating and analyzing issues related to teacher burnout, particularly in the context of inclusive education. These databases offer access to current, peer-reviewed, and validated literature, as well as cutting-edge research in the fields of technology and artificial intelligence as applied to the diagnosis and prevention of burnout. These platforms are unique in their ability to provide access to high-quality, peer-reviewed publications from leading international academic journals, offering a broad foundation for in-depth analysis. The aim of this literature analysis is to identify key trends, methodological approaches, and major studies focused on the issue of teacher burnout in inclusive education, with a specific emphasis on the application of artificial intelligence technologies.

The authors conducted a keyword-based analysis of the research topic to identify publications by Kazakhstani scholars in the Scopus, Web of Science, and JSTOR databases. Over the past five years (2020-2025), Kazakhstani researchers have published only three articles on the topic of *teacher burnout in inclusive education* within these databases Table 1.

Table 1.
Publications by Kazakhstani Scholars on Teacher Burnout in Inclusive Education (2020-2025).

Database	Number of Publications
Scopus	3
Web of Science	≥1
JSTOR	0

The analysis revealed that Makoelle and Burmistrova [4], in their study *"Teacher Education and Inclusive Education in Kazakhstan"*, the authors examined the phenomenon of burnout among teachers working in inclusive education settings. By analyzing the factors that either support or hinder the preparation of future teachers for inclusive practice, they concluded that there is no consistent and clearly articulated strategy in Kazakhstani pedagogical universities for preparing teachers to work in inclusive environments.

The article by Bilyalov et al. [5] *"Barriers to Inclusion: Insights from Special Education Teachers in Kazakhstan"* focuses on the issue of teacher burnout in the context of inclusive education in Kazakhstan. The authors identify six major barriers: lack of resources and time, difficulties in communicating with parents, insufficient methodological support, inadequate organizational capacity, complex documentation requirements, and the unpredictability of managing students with behavioral disorders. The findings emphasize the urgent need for systemic reforms, including targeted policy measures to improve resource availability, comprehensive professional development programs tailored to the needs of special education teachers, collaborative frameworks for stakeholder engagement, simplification of administrative processes, and increased access to practical training opportunities for teachers.

The study by Grobler et al. [6], *Perceived Burnout: School Teachers' Experiences within the Context of Cultural Identity*, indexed in the Scopus database, is also considered relevant. The study focuses on perceived burnout as experienced by teachers themselves, with their experiences analyzed, described, and interpreted through the lens of their cultural identity.

In the Web of Science database, only one relevant entry was identified – a conference abstract presented at ICERI 2024 titled *"Professional Factors of the Occurrence of Emotional Burnout Syndrome"* [7]. This study addresses the

importance of fostering a positive working atmosphere as a preventive measure against emotional burnout among staff members.

No publications by Kazakhstani researchers specifically dedicated to teacher burnout in inclusive education settings were found in the JSTOR database.

The literature review revealed that, over the past five years, Kazakhstani scholars have published virtually no research on the prediction and prevention of teacher burnout in inclusive education using elements of artificial intelligence in the Scopus, Web of Science, and JSTOR databases Table 2.

Table 2.
Publications by Kazakhstani Scholars on the Prediction and Prevention of Teacher Burnout in Inclusive Education Using AI (2020-2025).

Database	Number of Publications	Note
Scopus	0	Includes publications on inclusion, but not specifically on burnout + AI
Web of Science	0	Similar: inclusion-related, but not addressing burnout with AI
JSTOR	0	No relevant articles found

The databases also include the articles by Assanbayev and Makoelle [8]*"Practices Promoting the Inclusion of Adult Students with Disabilities in the Classroom: A Case of a Technical Vocational Education and Training College in Kazakhstan"*, and Aubakirova et al. [9] *"Improving Psychological and Educational Support for University Students with Disabilities in Kazakhstan"*, which focuses on inclusive education and psychological support, but does not address the combination of burnout and AI. There are also studies that examine teacher readiness for inclusive education, but they do not include components related to burnout or AI. One such example is the work by Kerimbayev et al. [10]*"Intelligent Educational Technologies in Individual Learning: A Systematic Literature Review"*.

Thus, based on the analysis of publications by Kazakhstani scholars, the authors conclude that the topic of this research represents an emerging field in Kazakhstan. While interest in inclusive education and educational technologies is growing, the specific intersection of teacher burnout, inclusive education, and artificial intelligence remains underexplored. Accordingly, the authors set the objective of examining international scholarly and methodological literature on the subject in order to develop the theoretical and methodological foundation for a model that predicts teacher burnout in inclusive education settings using AI technologies. This literature analysis makes it possible to identify key findings and determine future research directions in the field of teacher burnout within inclusive educational environments.

2. Literature Review

2.1. Teacher burnout

Teacher burnout remains one of the most pressing challenges in the field of education [11-13]. Teacher burnout can have a negative impact on the field of education and the quality of student learning [14, 15]. This phenomenon occurs when a teacher faces stressful factors in the work environment that they find difficult to cope with. The sources of professional burnout are emotional exhaustion, depersonalization, and low professional self-realization [16]. Recent studies have indicated that Burnout is often associated with high workloads and job-related stress [17], increased attention to student performance [18, 19], a lack of resources, and insufficient professional support [20], interpersonal conflicts, administrative bureaucracy, and low wages [21]. Research shows that teachers may suffer from burnout due to their inability to adapt to an unfavorable environment [22] and begin to experience feelings associated with low self-esteem [23] and a sense of underestimation of their profession [24].

This issue is particularly acute among teachers working with children with disabilities, who experience heightened emotional strain due to the specific demands of inclusive educational settings [25, 26]. The responsibility for students with special educational needs [27, 28] contributes to the accelerated onset of burnout among educators. Timely prediction and prevention of burnout, as well as ensuring teacher well-being and job satisfaction [29], can help reduce vulnerability to burnout. Teacher training in stress management techniques, along with the promotion of a supportive institutional culture and organizational change [30, 31], plays a critical role in burnout prevention. Training programs and exercises aimed at enhancing resilience and emotional regulation [32] are often tailored to the specific needs of educators, helping them to develop self-regulation tools [33].

Notably, the study by Wang et al. [34] emphasizes collaborative approaches to teacher training and support, including teamwork and mentoring systems. Maslach and Leiter [35] argue that effective burnout prevention must consider both individual needs and broader professional demands. In addition to the previously mentioned studies, some scholars propose personalized learning approaches, technological tools for monitoring well-being, and emotional support [36] and the development of a sustainable, inclusive environment as part of their preventive strategies.

2.2. Artificial Intelligence

With the advancement of technology, artificial intelligence (AI) has emerged as an important tool in diagnosing and preventing teacher burnout, particularly in the context of inclusive education. AI offers innovative possibilities for real-time monitoring of educators' mental health and well-being. Research into the capabilities of AI for monitoring teachers' conditions and preventing burnout is gaining momentum globally [37]. In the United States, AI is used in pilot projects in California schools, where platforms have been implemented to monitor teacher well-being [38]. A similar initiative is underway in Shanghai, China, where AI technologies are used to forecast burnout based on analyses of teaching loads and

time spent with students with special needs [39]. These practices aim to automate the assessment of stress levels, track emotional states, and provide personalized recommendations for improving teachers' psychological health.

Given the increasing demands placed on educators, AI can analyze data and generate tailored recommendations, making it a valuable resource for supporting teachers, especially those working with students with disabilities. AI-driven data analysis enables the identification of stressors and burnout factors [40] as well as the causes of emotional exhaustion [41]. Algorithms for assessing burnout levels among teachers based on their working hours, workload, and interactions with students [42]. Along with the use of AI to collect and analyze data on teachers' well-being and cognitive load experienced while working with students with special needs, it can contribute to reducing feelings of isolation and burnout [43].

Of course, teachers with a higher level of resilience and motivation are more likely to use artificial intelligence applications effectively [44]. AI tools can adapt to the needs of various educational environments by providing timely support and predictive analytics [45]. Moreover, AI can analyze student data to create personalized learning pathways [46] tailor instructional content and pace to individual comprehension levels, support classroom management, and offer recommendations for improving teaching methods [47]. By reducing administrative burdens, AI also frees up educators' time for personal and professional growth [48].

AI is increasingly applied to analyze large datasets related to teachers' workloads, interactions with students, and stress levels. Adaptive AI-powered assessments can adjust questions in real time based on teacher responses, enabling a deeper exploration of stress-related factors. For example, Xie et al. [49] describe the use of adaptive questionnaires that restructure themselves based on participants' answers, making burnout diagnostics more accurate and less burdensome. Such tools are particularly effective in inclusive schools, where educators face high emotional demands and require precise monitoring. In the study by Wu et al. [50], AI technologies are used to analyze teachers' speech and written text to monitor mood and stress levels. These AI algorithms are capable of detecting burnout-related patterns based on sentiment analysis of messages.

The use of AI in the diagnosis and prevention of teacher burnout opens new opportunities for creating more supportive and sustainable learning environments. These technologies not only improve teaching processes but also enhance the engagement and success of both educators and students with disabilities. In this context, analyzing international practices and applying insights from global experts can help establish comprehensive support systems for teachers in Kazakhstan, ultimately reducing their exposure to stress and burnout.

3. Methodology and Methods

3.1. Search Strategy

The research methodology involves the application of four interconnected approaches. The process begins with *Approach I* – Preparatory Stage, which focuses on selecting an appropriate methodology and research tools, as well as developing a detailed plan to initiate the project. The second phase, *Approach II* – Desk Research, includes a comprehensive literature review and the examination of relevant materials and documents. At this stage, the study also aims to explore international experience related to teacher burnout in inclusive education settings and the application of AI technologies for diagnostics. *Approach III* – Analytical Stage involves the systematic analysis and processing of all collected data and literature to identify patterns, insights, and gaps in the current body of knowledge. The final phase, *Approach IV* – Presentation of Research Results, includes the verification of key findings, discussion of future directions, and provision of support to stakeholders in prioritizing further research areas to effectively implement the proposed recommendations Table 3.

Table 3.
Project Implementation Stages.

Stages	Description	Period
Stage 1	Preparation for research, selection of methodology and tools, preparation of the work plan	Week 1
Stage 2	Desk research, literature review, research of materials, International Experience Study	Week 2-4
Stage 3	Analysis of materials and literature, data processing	Week 5-7
Stage 4	Checking key questions, suggesting promising directions for further research	Week 8

3.2. Inclusion and Exclusion Criteria

Theoretical methods applied in this study include: literature searches in academic databases; formulation and combination of keywords and phrases; filtering by disciplines and categories; restricting publication dates; applying additional filters; using citation and reference tools; conducting searches by authors and institutions; and performing analysis and synthesis of the collected data.

The literature search (covering the period from 2015 to February 2025) in the academic databases Scopus, Web of Science, and JSTOR represents a key stage in the in-depth analysis of the issue of teacher burnout in inclusive education settings. This process involved several methods and strategies designed to identify the most relevant and high-quality publications. The first step in the literature search was the formulation of keywords and phrases that most accurately reflect the research topic. For instance, in studying teacher burnout in the context of inclusive education, keywords such as "teacher burnout at work" were used. The combination of keywords using logical operators (AND, OR, NOT) helped to narrow or broaden the search area. For example, the query "teacher burnout AND inclusive education" enabled the retrieval

of studies that specifically address teacher burnout within inclusive learning environments. Filtering by subject areas and categories allowed the selection of publications related to the use of artificial intelligence in monitoring teacher burnout in inclusive education, thus enhancing the focus on the most relevant research. Date range restrictions were also applied. Considering temporal boundaries is important when analyzing trends; setting a specific publication date range allowed for the selection of more current and relevant studies. Additional filters included: Type of publication (articles, reviews, conference proceedings), Accessibility (open access vs. subscription-based), and Country of publication. The use of such filters helped to better target the search and improve the quality of the retrieved materials. Citation and reference tools were employed to identify key studies in the field of teacher burnout and to trace the development of the topic over time. Searching by authors and institutions enabled the identification of works by prominent researchers actively contributing to the field. Similarly, searching by affiliated universities or research institutes allowed the study to focus on institutional research output. These methods of literature search in Scopus, Web of Science, and JSTOR contributed to a more comprehensive understanding of the topic of teacher burnout, ultimately supporting a deeper analysis and synthesis of the findings.

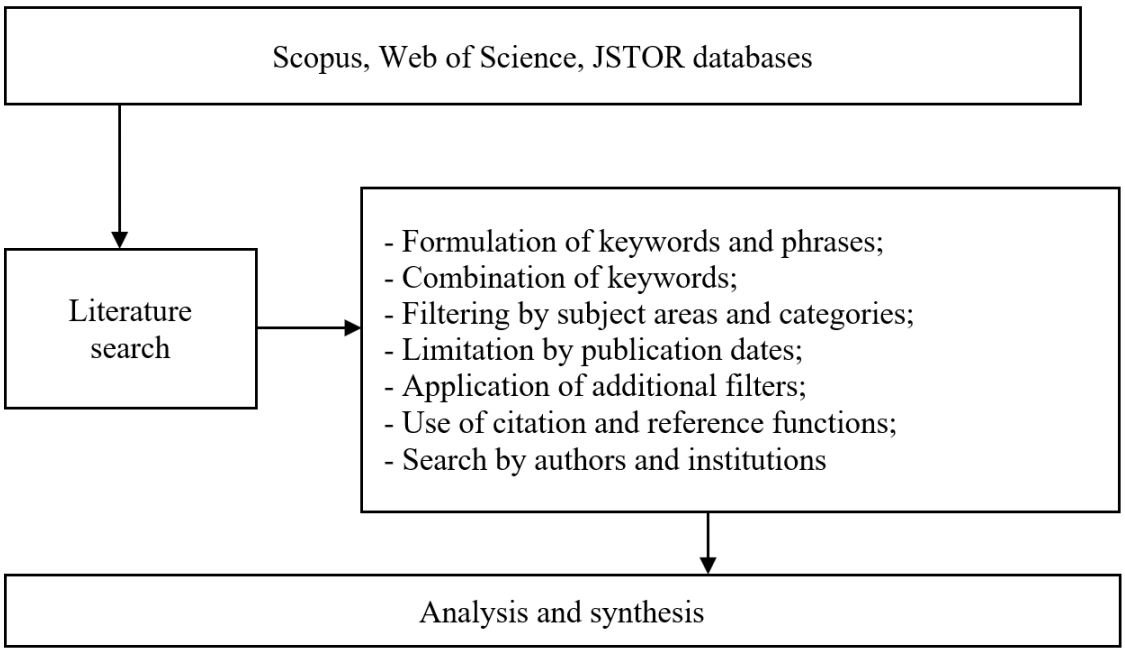


Figure 1.
Structure of Theoretical Research Methods.

3.3. Selection of Studies and Data Extraction

To conduct an in-depth analysis, we formulated a set of research questions aimed at identifying the role of artificial intelligence in supporting teachers' well-being in the workplace:

RQ1: To determine the role of artificial intelligence in diagnosing and predicting teacher burnout.

RQ2: To explore the potential of artificial intelligence in diagnosing and preventing teacher burnout in inclusive education settings.

RQ3: To assess the strengths and weaknesses of using AI in the diagnosis and prevention of teacher burnout.

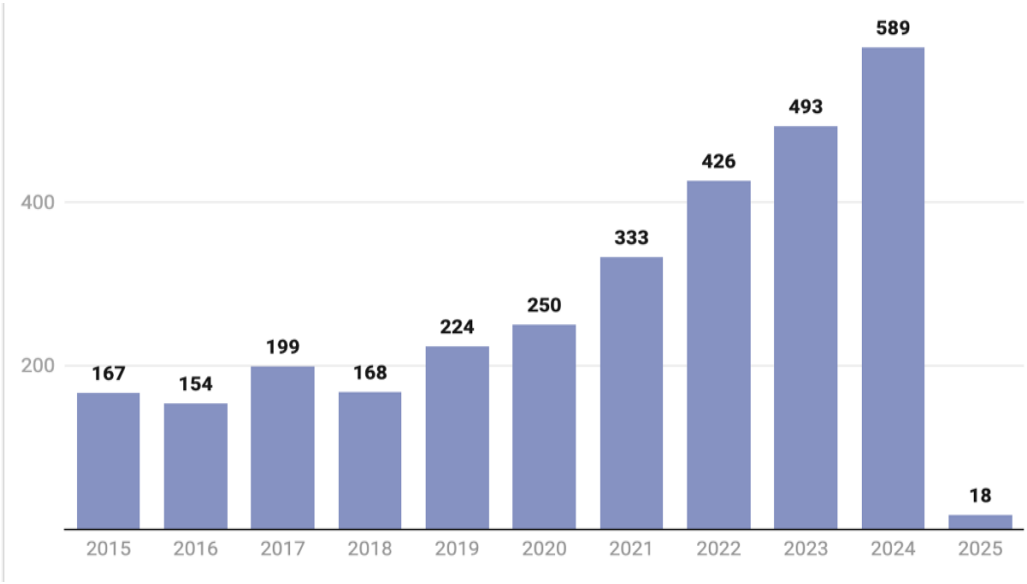
RQ4: To identify promising directions for future research.

For the structuring of the analysis, the PRISMA 2020 reporting standard [51] was employed, which requires detailed documentation of the review results. The PRISMA flow diagram ensures transparency of the core procedures of the systematic review and provides a standardized visual representation. The Shiny web application was used to generate the diagram.

4. Results

4.1. Scopus

Scopus contains the highest number of publications on the topic under investigation. As of now, approximately 3,021 research articles related to burnout are indexed in the Scopus database, of which 516 are specifically focused on teacher burnout. This number includes original research articles, reviews, and books. A graph showing the distribution of publications by year may appear as follows:



Query: "teacher burnout at work», research articles

Figure 2.

Number of Publications in the Scopus Database.

Current publication trends indicate a growing interest within the academic community in the issue of teacher burnout. For instance, studies focused specifically on the diagnosis of teacher burnout account for approximately 150 publications. The Maslach Burnout Inventory (MBI) is referenced in 70 articles. Recognized as the "gold standard" in burnout research, the MBI is widely used to assess the severity of burnout and to inform the development of preventive strategies. Stress assessment questionnaires are featured in 46 publications, primarily in the context of their application within educational institutions. Preventive measures aimed at reducing teacher burnout remain a significant area of research. According to Scopus, approximately 120 publications focus on various prevention strategies. Among them, three key areas stand out: resilience-building programs, addressed in 50 publications, explore approaches aimed at strengthening teachers' stress resistance. Mentorship and supervision practices, covered in 30 publications, examine the impact of mentoring and professional support on reducing burnout risks.

A particularly notable upward trend is observed in studies exploring the use of artificial intelligence (AI) technologies for the diagnosis and prevention of burnout in inclusive educational environments. Digital platforms and technological solutions are discussed in 34 publications, focusing on online services and applications for real-time monitoring of teachers' psycho-emotional states. Training programs for stress management are presented in 16 publications, including evaluations of workshops, training sessions, and coaching aimed at enhancing teachers' self-regulation skills and preventing stress. A summary of these findings is illustrated in Figure 3.

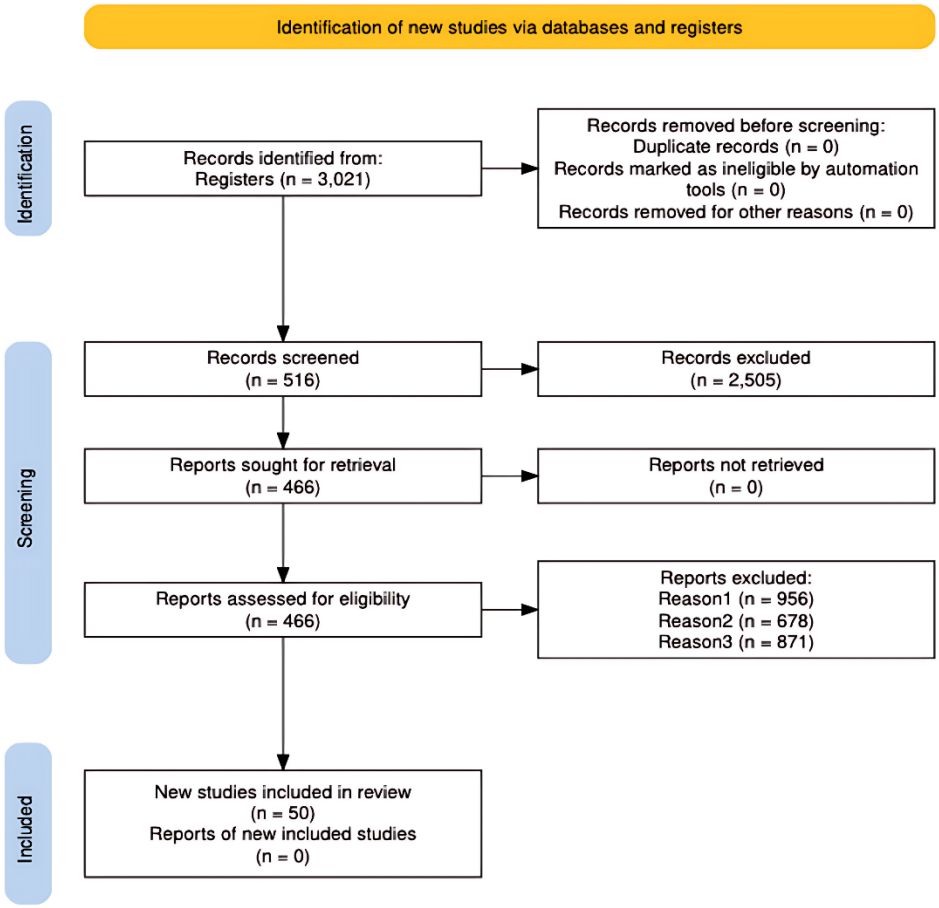


Figure 3.
PRISMA Flow Diagram Based on the Scopus Database.

On average, scientific publications devoted to the application of artificial intelligence (AI) for the diagnosis and prediction of occupational burnout demonstrate a citation rate ranging from 10 to 50, indicating the high scholarly significance and relevance of this research area. For example, the article *"AI and Teacher Burnout: A Machine Learning Approach"* has been cited more than 30 times, which confirms the sustained interest of the academic community in the potential of AI technologies to address burnout-related challenges in the educational sector. Research in this field is actively conducted across various countries. The United States has recorded the highest number of publications (over 25) in which AI is examined as a tool for diagnosing burnout among educational professionals. In Europe, significant contributions have been made by Germany and the United Kingdom, with approximately 15 academic papers published collectively. China also demonstrates growing interest in this topic, with 10 publications focusing on the specific features of the teaching profession amid a rapidly transforming educational landscape.

An analysis of publications indexed in the Scopus database indicates that the use of artificial intelligence (AI) for diagnosing and forecasting teacher burnout constitutes a rapidly evolving and promising scientific domain. It encompasses a wide array of methodological approaches, including machine learning, analysis of behavioral and physiological data, as well as the integration of AI into digital platforms for monitoring the well-being of educational staff. These trends reflect increasing scholarly interest in leveraging AI for the assessment and prediction of burnout among teachers. The research in this domain spans various aspects of technology application aimed at evaluating educators' conditions and developing effective prevention strategies.

4.2. Web of Science

The *Web of Science* database contains approximately 1,050 publications on teacher burnout, underscoring the substantial and persistent interest of the academic community in this issue. Structural analysis reveals the distribution of publications across the following thematic areas: "job satisfaction" is addressed in 492 studies; "diagnostics and assessment methods" accounts for 351 publications, including 47 specifically focused on diagnosing teacher burnout; and the category "preventive measures and program development" includes 115 publications aimed at practices for risk reduction and the restoration of teachers' professional resources.

Table 4.
Distribution of Publications on the Topic of Research in Web of Science.

Total Number of Publications	Job Satisfaction	Burnout Diagnostics	Diagnosis of Teacher Burnout	Preventive Measures	With the Use of AI
1050	492	351	47	115	45

Scientific publications in the field of applying artificial intelligence to the issue of teacher burnout can be categorized into the following research areas: diagnostics – 14 publications focused on the development and implementation of AI tools for the early detection of burnout symptoms; prediction – 11 publications dedicated to predictive models that assess burnout risks based on behavioral, physiological, and professional parameters; and prevention – 20 publications examining the use of AI to develop personalized strategies aimed at reducing stress levels and maintaining teachers' professional well-being. These findings are illustrated in Figure 4 and reflect the growing interest of the academic community in integrating digital solutions into systems for supporting the teaching workforce.

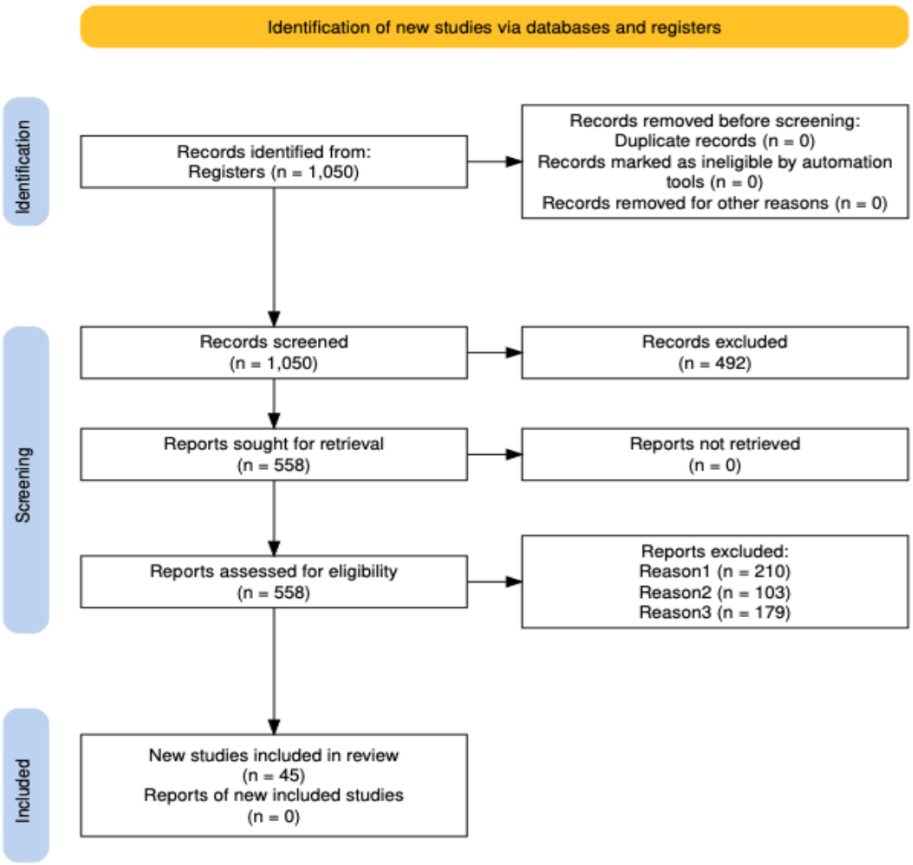


Figure 4.
PRISMA Flow Diagram Based on the Web of Science Database.

Publications on teacher burnout indexed in the *Web of Science (WoS)* database demonstrate high citation rates, averaging between 15 and 60 citations per article. For instance, the article *"Understanding Teacher Burnout in the Context of Inclusive Education"* has been cited over 40 times, underscoring its significance and relevance in the field. The country-wise distribution of publications in *WoS* is as follows: the United States leads with 35 publications, positioning it as a key contributor to burnout research; the United Kingdom follows with 10 publications, Germany with 8, and Sweden with 5. China has shown a notable increase in the number of publications, reflecting a growing interest in the issue of burnout amid the rapid development of its educational system.

The analysis reveals a wide range of methodological approaches and research strategies employed to investigate the phenomenon of teacher burnout. Studies published in the Web of Science (WoS) serve as valuable sources of scientific data, enabling a deeper understanding of the nature of burnout within educational settings and the factors contributing to its development. The key areas and thematic emphases of these publications encompass diagnostics, risk assessment, the development of preventive strategies, as well as the analysis of organizational and individual factors influencing the emotional well-being of educators. Furthermore, the identification of the most active authors and research groups provides a foundation for establishing scientific collaborations and advancing interdisciplinary approaches to addressing this issue. The analysis of publications indexed in the Web of Science (WoS) offers a comprehensive perspective on the scope and directions of research focused on teacher burnout, particularly in the context of inclusive education.

Thus, data from the Web of Science (WoS) confirm that the issue of teacher burnout is examined within an interdisciplinary context that encompasses education, psychology, and healthcare. It is actively studied from the perspectives of diagnostics, prevention, and the improvement of teachers' professional quality of life. Given the high academic standards and the authority of the sources, WoS serves as a valuable resource for the systematization and analysis of current scientific knowledge. The findings obtained provide a foundation for the development of more effective and evidence-based programs for the prevention and diagnosis of burnout, aimed at fostering sustainable development and supporting the professional capacity within the education system.

4.3. JSTOR

An analysis of publications indexed in the JSTOR database revealed a substantial body of scholarly work dedicated to the issue of teacher burnout. A total of 2,472 publications were identified, indicating a high level of academic interest in this topic. Of these, 2,124 articles pertain to education, 329 to psychology, and 19 to science and technology. The publications cover a broad range of research themes, including: teacher burnout (30 articles); theoretical frameworks, burnout models, consequences for professional functioning, and inclusive education (15 articles); the impact of inclusive practices on teachers' mental health and resilience to stress, as well as stress and its consequences (10 articles); and the relationship between professional stress levels and reduced productivity, along with burnout prevention strategies (5 articles).

The JSTOR database contains a substantial number of publications focused on the application of artificial intelligence (AI) in the context of inclusive education, with particular emphasis on its potential to reduce the level of professional burnout among teachers. Specifically, 12 articles address the use of AI for the adaptation of the learning process, while 7 publications explore the application of AI within inclusive education settings. A summary of these findings is presented in Figure 5.

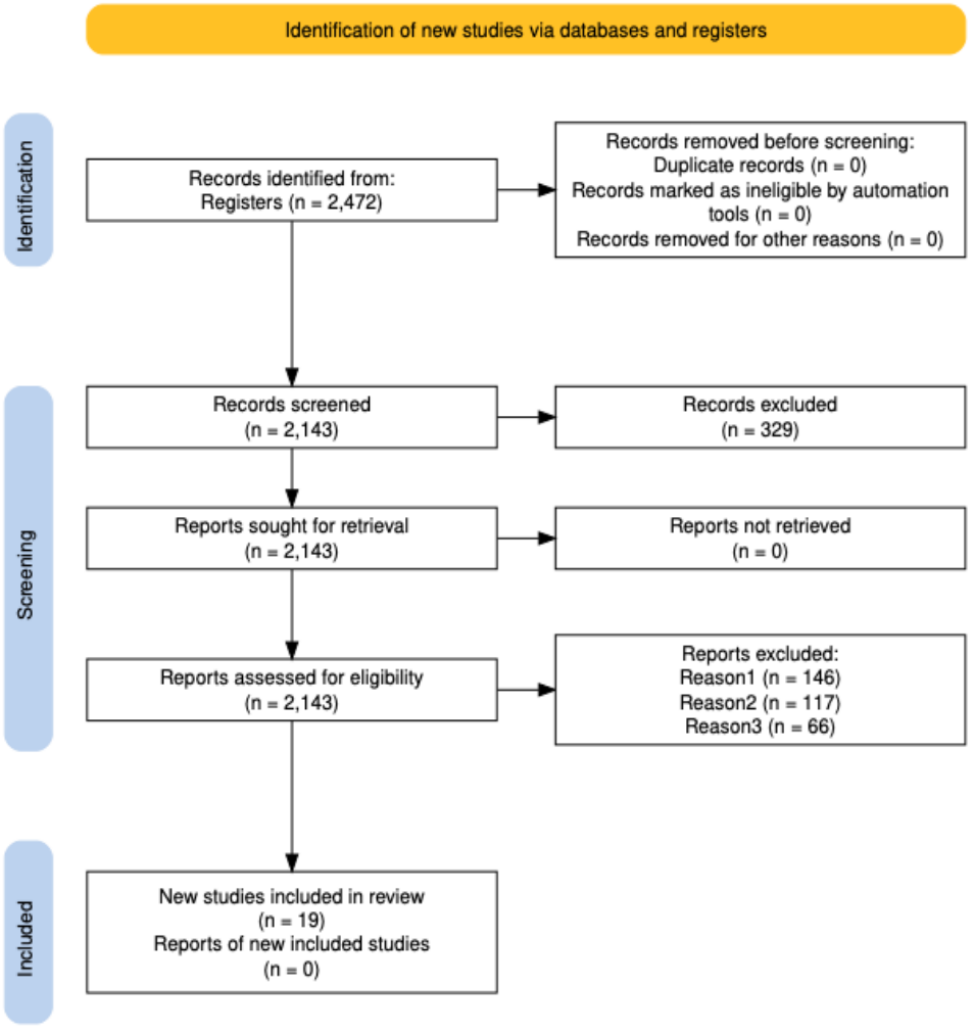


Figure 5.
PRISMA Flow Diagram Based on the JSTOR Database.

The average number of citations per article is 8.3. The most cited publication is Doe, J. *"Understanding Teacher Burnout in Inclusive Classrooms"*, which has been cited 75 times. The most productive authors and institutions in the United States, Europe, and China are generating significant research that contributes to understanding and addressing this

issue. These works highlight the importance of continued investigation and the integration of approaches aimed at reducing teacher burnout.

The analysis of publications indexed in the JSTOR database demonstrates a wide diversity of research topics and methodological approaches applied to the study of teacher burnout. The articles included in this database cover a broad range of relevant aspects, including issues of diagnosis and prevention, as well as the impact of inclusive education on the development of emotional burnout among teachers. Particular attention in several publications is given to the potential of artificial intelligence (AI) in the context of inclusive education. These studies emphasize the capacity of AI to reduce professional burnout by alleviating the emotional and physical burdens faced by teachers working in inclusive settings. The materials presented in JSTOR examine both theoretical and practical aspects of integrating digital solutions into the educational process, thereby opening new perspectives for supporting teacher resilience and professional well-being. The conducted analysis includes both quantitative and content-based characteristics of the publications, such as the number of articles, thematic focus, and profiles of authors and research teams, allowing for the formation of a comprehensive picture of scholarly activity on this topic within the JSTOR database.

Thus, JSTOR represents a valuable source of scientific information that reflects not only the scale but also the multifaceted nature of research on teacher burnout. The diversity of topics, theoretical frameworks, and research approaches underscores the interdisciplinary nature of this field and points to its potential for further academic development.

5. Discussion

Contemporary scientific literature demonstrates an interdisciplinary and comprehensive approach to the study of teacher burnout. This approach integrates both traditional diagnostic methods and innovative technological solutions based on artificial intelligence (AI), while also encompassing preventive practices aimed at sustainable development and the preservation of teachers' professional capacity. The presented data indicate a growing interest in digital tools within systems designed to support educators' professional well-being and underscore the promise of further research at the intersection of pedagogy, psychology, and information technology.

A comparative analysis of data from three leading academic databases, Scopus, Web of Science (WoS), and JSTOR, reveals increasing scholarly interest in the application of AI in the field of inclusive education. At the same time, variations are observed in the volume and thematic focus of publication activity:

1) Scopus presents the highest number of publications on this topic, with 50 articles, which may reflect a broad coverage of practice-oriented aspects of AI application, such as digital platforms, technological solutions, online services, real-time teacher monitoring tools, and training programs for stress management.

2) Web of Science includes 45 publications, emphasizing the integration of digital technologies into educational environments, assessing their impact on teachers' professional activities, developing and implementing AI tools for early detection of burnout symptoms, and designing personalized strategies to reduce stress levels and maintain professional well-being.

3) JSTOR, with 19 publications, primarily focuses on theoretical reflections on the issue, examining the influence of technological solutions on teachers' emotional state and resilience in inclusive settings, the use of AI in inclusive education, and the application of AI to adapt the learning process.

Thus, the data from all three databases confirm the relevance of the topic. At the same time, differences in the quantitative and thematic characteristics of the publications reflect the distinct scientific approaches and research priorities inherent to each database.

Table 5.
Research Protocol for Scopus, Web of Science, and JSTOR databases.

Research Protocol	Description
Source of literature	Scopus, Web of Science, JSTOR
Publication type	Articles and books
Publication language	English
Search request	Article title, abstract, keywords
Subject area	Education, Social Sciences
Search terms	Education, inclusive education, burnout, burnout at work, teacher burnout, teacher burnout diagnostics, teacher burnout prevention, artificial intelligence, use of artificial intelligence, digital platforms, machine learning, mobile applications

A comparative analysis of data from the Scopus, Web of Science, and JSTOR databases confirms that artificial intelligence represents a significant and promising area of research in the context of inclusive education. Each database offers unique content-specific studies that contribute to the development of both theoretical and practice-oriented approaches to the diagnosis, prediction, and prevention of teacher burnout. This underscores the relevance and necessity of further exploration into the potential of AI to enhance the quality of the educational process and to support the psycho-emotional well-being of teachers working in inclusive settings.

The conducted analytical review of publication activity across the aforementioned databases allows for the formulation of key conclusions with practical significance for the future development of predictive and preventive models addressing teacher burnout in inclusive environments Table 6.

Table 6.
Publication Review Results.

Database	Percentage of Publications by Subject	Research
Scopus	43.86%	Diagnostics of professional burnout and the role of technology in reducing stress levels among teachers; the use of AI and digital tools to analyze the emotional state of teachers and improve the educational process.
Web of Science	39.47%	Integrating AI and automated diagnostic systems into inclusive schools and universities, with a focus on the practical application of technologies in the context of burnout prevention.
JSTOR	16.67%	Theoretical aspects and models of burnout, as well as the socio-emotional aspect of inclusive education and cultural and ethical factors influencing the adaptation of technologies in different countries.

The application of artificial intelligence opens new perspectives for enhancing the diagnosis of professional burnout among teachers. These approaches not only improve the accuracy of identifying burnout symptoms but also contribute to a deeper understanding of the social, organizational, and cultural factors that influence teachers' emotional states across diverse educational contexts.

Table 7.
Promising Research Directions According to Each Database.

Database	Promising Areas of Research
Scopus	The most promising areas include the development of predictive models using artificial intelligence (AI) and the analysis of stress factors, taking into account the individual characteristics of teachers. Methods based on cognitive-behavioral therapy as well as digital support strategies in an inclusive environment are actively investigated.
Web of Science	The main areas include the use of automated methods for assessing the emotional state of teachers, as well as methods integrating social–emotional and psychological support tools, which are especially important in inclusive schools. There is a strong emphasis on an interdisciplinary approach and the combination of digital technologies with psychological counseling.
JSTOR	Promising areas include research on the ethical aspects of implementing AI in educational processes and burnout models with an emphasis on supporting teachers in inclusive learning environments.

Current research demonstrates that artificial intelligence has the potential to significantly enhance the sensitivity and timeliness of burnout diagnostics by operating in real time and providing an adaptive and ethically sound approach to assessing teachers' psycho-emotional states. In particular, the work of Zahurin et al. [52] in the field of AI shows high effectiveness in predicting emotional burnout and developing personalized prevention programs. These advancements may serve as models for implementing similar solutions that consider local cultural and educational specificities. The development of intelligent platforms capable of automatically adapting diagnostic algorithms to the context of inclusive education [53] opens new prospects for improving the accuracy and efficiency of burnout detection methods. Inclusive practices require diagnostic tools tailored to address the individual needs of students with disabilities, thereby necessitating context-sensitive and specialized assessment solutions.

The literature analysis on teacher burnout, particularly within the context of inclusive education, has revealed key trends and approaches that include personalized learning, the use of technologies for monitoring well-being and providing emotional support, as well as the development of a resilient, inclusive environment. An important aspect is the cultural specificity of burnout prevention strategies adopted in different countries. Approaches that incorporate AI-based monitoring, collective support methods, and the individualization of preventive programs serve as a foundation for future developments in this field.

The conducted analysis has identified several promising directions for the further development of research in Kazakhstan:

1) Development of Adaptive AI Solutions for Inclusive Education

Contemporary research in the application of artificial intelligence and digital technologies in educational environments provides a foundation for a deeper understanding of the mechanisms for supporting and monitoring teachers' well-being. This approach is particularly relevant in the context of inclusive education, where physical and emotional demands on teachers are significantly higher. AI technologies open new perspectives for monitoring and sustaining the emotional health of educators working in inclusive settings. Programs discussed in the literature can be adapted to various cultural contexts.

2) Development of Personalized Algorithms for the Diagnosis and Prediction of Burnout

The use of AI algorithms trained on complex datasets, including physiological and emotional indicators, offers opportunities for creating individualized burnout profiles. The development of models capable of accounting for multiple risk factors, including workload intensity, socio-emotional characteristics, and features of the inclusive educational environment, contributes to the formation of personalized methods for the diagnosis and prevention of burnout. This interdisciplinary approach strengthens the precision and relevance of intervention strategies.

3) Advancement of Real-Time Data Analysis Technologies

Artificial intelligence has the potential to process teacher well-being data in real time, enabling timely identification of burnout symptoms and contributing to its prevention. The development of virtual platforms that facilitate professional support and peer interaction among educators is a key direction. The creation of such technologies should take into account the specific features of educational processes, national context, and cultural factors.

4) Ethical Data Processing and Protection

One of the priority tasks in the development and implementation of AI systems in education is ensuring the reliable protection of teachers' personal data. In the context of technologies based on the collection and analysis of large volumes of information, the establishment of ethical principles governing the processing of sensitive data becomes especially relevant. Clear guidelines for ethical data use are essential to building trust and ensuring responsible innovation in this area.

5.1. Common Features and Strengths

Across all global regions, the regular diagnosis of teacher burnout is recognized as a critical factor influencing both the quality of education and the emotional well-being of educational personnel. In countries such as those in Europe, the United States, and China, validated diagnostic tools such as the Maslach Burnout Inventory (MBI) and various stress assessment scales are actively being implemented, ensuring high reliability of the collected data. At the same time, each country adapts these methodologies to align with its specific cultural context and the characteristics of its educational system. Such adaptation is particularly relevant for assessing burnout among teachers working in inclusive schools and universities, where demands on emotional resilience and psycho-emotional workload are significantly higher.

5.2. Weaknesses and Threats

The conducted analysis has also revealed a number of limitations and potential risks associated with the use of existing diagnostic approaches. One of the key challenges remains the insufficient adaptation of current methodologies to the specific context of inclusive education, which reduces the accuracy of diagnostics when working with diverse groups of educators. Difficulties are also observed in the application of universal diagnostic tools in culturally and ethnically diverse settings, highlighting the need for the development of more flexible and localized approaches to assessing teacher burnout.

6. Conclusion

The literature review conducted within the framework of the first research objective of the project has made it possible to identify the main trends and methodological approaches to studying the problem of teacher burnout in the context of inclusive education using artificial intelligence (AI) technologies. The key research questions considered in this study (RQ1-RQ4) provided a comprehensive evaluation of AI's potential, highlighting its strengths, such as high accuracy, adaptability, and real-time functionality, as well as associated risks, including ethical dilemmas, the diminishing role of human agency, and the potential increase in pressure on educators. It was established that the effective implementation of AI requires not only technological but also cultural, legal, and pedagogical adaptation.

The conducted analysis confirmed the high relevance and promising potential of artificial intelligence in the diagnosis and prevention of teacher burnout, particularly within inclusive education settings. The results of the analytical review demonstrated that AI can significantly improve the accuracy and efficiency of burnout symptom detection, facilitate the monitoring of teachers' well-being, and enable timely intervention.

Based on the analysis, several key priorities for future research and technological development in AI-supported burnout diagnostics have been identified. First, the development of personalized algorithms that take into account individual teacher characteristics and the specific conditions of their professional activity is essential. Second, the integration of real-time data analysis technologies is needed to promptly detect signs of burnout and support preventive measures. Third, the ethical processing and protection of personal data, especially when dealing with sensitive information, must be ensured. Finally, particular attention should be given to the creation of adaptive digital platforms tailored to the needs of inclusive educational institutions and capable of functioning under highly variable educational practices.

Thus, the review of publications from international scientific databases Scopus, Web of Science, and JSTOR has confirmed the considerable potential of artificial intelligence in the diagnosis, monitoring, and prevention of teacher burnout, especially in inclusive education environments. The international research experience in this field can serve as a solid methodological foundation for developing effective teacher support systems in Kazakhstan, aimed at reducing burnout levels and enhancing the sustainability and quality of professional activity in the face of growing educational challenges.

References

[1] N. Maslej *et al.*, *Artificial intelligence index report 2025*. Stanford, CA: Stanford University, 2025.
[2] C. A. o. I. a. C. Technology, "Artificial intelligence industry development report," Beijing, China, 2024.
[3] G. o. t. R. o. Kazakhstan, "Concept for the development of artificial intelligence in the republic ", Government of the Republic of Kazakhstan, 2024. https://www.gov.kz/memleket/entities/mdai/documents/details/606493?lang=ru
[4] T. M. Makoelle and V. Burmistrova, "Teacher education and inclusive education in Kazakhstan," *International Journal of Inclusive Education*, vol. 29, no. 4, pp. 447-463, 2025. https://doi.org/10.1080/13603116.2021.1889048
[5] D. Bilyalov, Z. Movkebayeva, D. Khamitova, and A. Duzelbayeva, "Barriersto inclusion: Insights from special education teachers in Kazakhstan," *Eurasian Journal of Educational Research* no. 113, 2024.
[6] H. Grobler, K. Abdulkhakimova, and A. Zhakupova, "Perceived burnout: School teachers'experiences within the context of cultural identity," in *ICERI2024 Proceedings*, 2024: IATED.

[7] K. M. a. Nagymzhanova, R. A. Aykenova, B. U. Baikhozhaeva, A. M. Suguralieva, and N. V. Vlasova, "Professional factors of the occurrence of emotional burnout syndrome," *Journal of Intellectual Disability - Diagnosis and Treatment*, vol. 8, no. 1, pp. 41-51, 2020. https://doi.org/10.6000/2292-2598.2020.08.01.6

[8] A. Assanbayev and T. M. Makoelle, "Practice spromoting the inclusion of adult students with disabilities in the classroom: A case of a technical vocational education and training college in kazakhstan," *Education Sciences*, vol. 14, no. 5, p. 529, 2024. https://doi.org/10.3390/educsci14050529

[9] R. Aubakirova *et al.*, "Improving psychological and educational support of university students with disabilities in Kazakhstan," *Qubahan Academic Journal*, vol. 5, no. 1, pp. 150-158, 2025. https://doi.org/10.48161/qaj.v5n1a1063

[10] N. Kerimbayev, K. Adamova, R. Shadiev, and Z. Altinay, "Intelligent educational technologies in individual learning: A systematic literature review," *Smart Learning Environments*, vol. 12, no. 1, p. 1, 2025. https://doi.org/10.1186/s40561-024-00360-3

[11] A. Borges, M. Ruiz, R. Rangel, and P. González, "Burnout syndrome in teachers at a Venezuelan public university," *Comunidad y Salud*, vol. 10, no. 1, pp. 1-9, 2012.

[12] L. Chennoufi, F. Ellouze, W. Cherif, M. Mersni, and M. F. M'rad, "Stress and burnout among Tunisian teachers," *L'Encéphale*, vol. 38, no. 6, pp. 480-487, 2012. https://doi.org/10.1016/j.encep.2011.12.012

[13] O. Huk, M. D. Terjesen, and L. Cherkasova, "Predicting teacher burnout as a function of school characteristics and irrational beliefs," *Psychology in the Schools*, vol. 56, no. 5, pp. 792-808, 2019. https://doi.org/10.1002/pits.22233

[14] B. Agyapong, G. Obuobi-Donkor, L. Burback, and Y. Wei, "Stress, burnout, anxiety and depression among teachers: A scoping review," *International Journal of Environmental Research and Public Health*, vol. 19, no. 17, p. 10706, 2022. https://doi.org/10.3390/ijerph191710706

[15] D. J. Madigan and L. E. Kim, "Does teacher burnout affect students? A systematic review of its association with academic achievement and student-reported outcomes," *International Journal of Educational Research*, vol. 105, p. 101714, 2021. https://doi.org/10.1016/j.ijer.2020.101714

[16] J. Szempruch, "Feeling of professional burnout in teachers of secondary schools," *The New Educational Review*, vol. 54, pp. 219-230, 2018.

[17] J. Li, "Emotional labor and job burnout in the social work industry—a correlation and regression analysis," in *2023 9th International Conference on Humanities and Social Science Research*, 2023: Atlantis Press.

[18] T. Geiger and M. Pivovarova, "The effects of working conditions on teacher retention," *Teachers and Teaching*, vol. 24, no. 6, pp. 604-625, 2018. https://doi.org/10.1080/13540602.2018.1457524

[19] H. Cheng, Y. Fan, and H. Lau, "An integrative review on job burnout among teachers in China: Implications for human resource management," *The International Journal of Human Resource Management*, vol. 34, no. 3, pp. 529-561, 2023. https://doi.org/10.1080/09585192.2022.2078991

[20] Z. Xu and F. Yang, "The impact of perceived organizational support on the relationship between job stress and burnout: A mediating or moderating role?," *Current Psychology*, vol. 40, no. 1, pp. 402-413, 2021. https://doi.org/10.1007/s12144-018-9941-4

[21] M. S. Carlotto, "Burnout syndrome in teachers: Prevalence and associated factors," *Psicologia: Teoria e Pesquisa*, vol. 27, pp. 403-410, 2011.

[22] R. Mulholland, A. McKinlay, and J. Sproule, "Teacher interrupted:Work stress, strain, and teaching role," *SAGE Open*, vol. 3, no. 3, p. 2158244013500965, 2013. https://doi.org/10.1177/2158244013500965

[23] E. Piolli, E. P. Silva, and J. R. M. Heloani, "National education plan, controlled autonomy and teacher illness," *Cadernos Cedes*, vol. 35, pp. 589-607, 2015.

[24] E. M. Skaalvik and S. Skaalvik, "Teacher stress and teacher self-efficacy: Relations and consequences," in Educator Stress: An Occupational Health Perspective, T. M. McIntyre, S. E. McIntyre, and D. J. Francis Eds. Cham: Springer International Publishing, 2017, pp. 101-125. https://doi.org/10.1007/978-3-319-53053-6_5

[25] M. P. S. Santos and D. A. Leal, "Inclusive education: The fullness of creating new possibilities, an art for those who learn and a challenge for those who teach," *CLIUM. org*, vol. 23, no. 9, pp. 99-110, 2023.

[26] S. Upadhyay, "Inclusive education in India idea, need and challenges," *International Journal For Multidisciplinary Research* vol. 5, pp. 1-6, 2023.

[27] E. Volker, S. Gupta, and B. Brown, "Inclusive education: Advantages and overcoming barriers," *MacEwan University Student eJournal*, vol. 6, no. 1, 2023. https://doi.org/10.31542/muse.v6i1.2281

[28] A. Alam, "Harnessing thepower of AI to create intelligent tutoring systems for enhanced classroom experience and improved learning outcomes," in *Intelligent Communication Technologies and Virtual Mobile Networks*, G. Rajakumar, K.-L. Du, and Á. Rocha, Eds., 2023.

[29] R. M. Ryan and E. L. Deci, "On happiness and human potentials: A review of research on hedonic and eudaimonic well-being," *Annual Review of Psychology*, vol. 52, no. 1, pp. 141-166, 2001.

[30] K. Schoeps, A. Tamarit, U. de la Barrera, and R. González Barrón, "Effects of emotional skills training to prevent burnout syndrome in schoolteachers," *Ansiedad y Estrés*, vol. 25, no. 1, pp. 7-13, 2019. https://doi.org/10.1016/j.anyes.2019.01.002

[31] N. von der Embse, S. V. Ryan, T. Gibbs, and A. Mankin, "Teacher stress interventions: A systematic review," *Psychology in the Schools*, vol. 56, no. 8, pp. 1328-1343, 2019. https://doi.org/10.1002/pits.22279

[32] R. Gilar-Corbi, T. Pozo-Rico, M. L. Pertegal-Felices, and B. Sanchez, "Emotional intelligence training intervention among trainee teachers: A quasi-experimental study," *Psicologia: Reflexão e Crítica*, vol. 31, no. 1, p. 33, 2018. https://doi.org/10.1186/s41155-018-0112-1

[33] J. D. Hoffmann, M. A. Brackett, C. S. Bailey, and C. J. Willner, "Teaching emotion regulation in schools: Translating research into practice with the RULER approach to social and emotional learning," *Emotion*, vol. 20, no. 1, p. 105, 2020.

[34] Y. Wang *et al.*, "Relationship between occupational stress and burnout among Chinese teachers: a cross-sectional survey in Liaoning, China," *International Archives of Occupational and Environmental Health*, vol. 88, no. 5, pp. 589-597, 2015. https://doi.org/10.1007/s00420-014-0987-9

[35] C. Maslach and M. Leiter, "Burnout challenge: How to identify, prevent, and treat burnout in educators," Harvard Education Press, 2016.

[36] W. B. Schaufeli and A. B. Bakker, "Job demands, job resources, and their relationship with burnout," *Journal of Organizational Behavior*, vol. 25, no. 3, pp. 293-315, 2004. https://doi.org/10.1002/job.248

[37] S. H. Almaki, N. Mafarja, H. Mansoori, S. Almaki, N. Mafarja, and H. Mansoori, "Teacher well-being and use of artificial intelligence applications and tools: Moderation effects of leadership support in inclusive classroom," *STEM Education*, vol. 5, no. 1, pp. 109-129, 2025. https://doi.org/10.3934/steme.2025006

[38] U.S. Department of Education, "Office of educational technology artificial intelligence and future of teaching and learning: Insights and recommendations," U.S. Department of Education, Washington, DC, 2023.

[39] Global Report on Teachers, "Addressing teacher shortages and transforming the profession," Paris, France: UNESCO, 2024.

[40] F. A. Miller, J. H. Katz, and R. Gans, "The OD imperative to add inclusion to the algorithms of artificial intelligence," *OD Practitioner*, vol. 50, no. 1, p. 8, 2018.

[41] J. M. Higgins, S. R. Arnold, J. Weise, E. Pellicano, and J. N. Trollor, "Defining autistic burnout through experts by lived experience: Grounded Delphi method investigating AutisticBurnout," *Autism*, vol. 25, no. 8, pp. 2356-2369, 2021. https://doi.org/10.1177/13623613211019858

[42] T. A. Brown, *Confirmatory factor analysis for applied research* 2nd ed. ed. New York: Guilford Publications 2015.

[43] W. Li, X. Zhang, J. Li, X. Yang, D. Li, and Y. Liu, "An explanatory study of factors influencing engagement in AI education at the K-12 Level: An extension of the classic TAM model," *Scientific Reports*, vol. 14, no. 1, p. 13922, 2024. https://doi.org/10.1038/s41598-024-64363-3

[44] K. S. H. A. Khansaheb, "The role of artificial intelligence in enhancing sustainability: The case of uae smart cities," 2024: Springer Nature Switzerland.

[45] A. Suresh *et al.*, "Using AI topromote equitable classroom discussions: The talkmoves application," 2021.

[46] Y. Wang, N. Jiang, H. Zhang, and Z. Liu, "Organizational justice, burnout, and turnover intention of social workers in China," *Journal of Social Work*, vol. 21, no. 3, pp. 456-475, 2021. https://doi.org/10.1177/1468017320911347

[47] C. Huang, X. Xie, S. P. Cheung, Y. Zhou, and G. Ying, "Job demands, resources, and burnout in social workers in china: Mediation effect of mindfulness," *International Journal of Environmental Research and Public Health*, vol. 18, no. 19, p. 10526, 2021. https://doi.org/10.3390/ijerph181910526

[48] R. Huang and H. Grol-Prokopczyk, "Health and health behaviors in China: Anomalies in the SES-health gradient?," *SSM - Population Health*, vol. 17, p. 101069, 2022. https://doi.org/10.1016/j.ssmph.2022.101069

[49] Z. Xie, A. Wang, and B. Chen, "Nurse burnout and its association with occupational stress in a cross-sectional study in Shanghai," *Journal of Advanced Nursing*, vol. 67, no. 7, pp. 1537-1546, 2011. https://doi.org/10.1111/j.1365-2648.2010.05576.x

[50] Y. Wu, A. Yi, C. Ma, and L. Chen, "Artificial intelligence for video game visualization, advancements, benefits and challenges," *Mathematical Biosciences and Engineering*, vol. 20, no. 8, pp. 15345-15373, 2023. https://doi.org/10.3934/mbe.2023686

[51] N. R. Haddaway, M. J. Page, C. C. Pritchard, and L. A. McGuinness, "An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and open synthesis," *Campbell Systematic Reviews*, vol. 18, no. 2, p. e1230, 2022. https://doi.org/10.1002/cl2.1230

[52] K. Zahurin, N. Mamat, W. N. H. wan Ali, and H. Abas, "The influence of robotic process automation on the administrative workload of teachers," *Open International Journal of Informatics*, vol. 12, no. 1, pp. 47-56, 2024. https://doi.org/10.11113/oiji2024.12n1.296

[53] L. Huo and A. F. Sun, "application of Artificial Intelligence in Mental Health Education in Primary and Middle Schools,"" in *Proceedings of the 2nd Conference on Artificial Intelligence and Healthcare*.