Original Article
IRSTI 14.25.07 10.51889/2960-1649.2025.63.2.012

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Formation of Future Primary School Teachers' Readiness for Conducting Pedagogical Diagnostics Based on ICT

Abstract

Introduction. The study addresses the issue of preparing future primary education teachers for conducting pedagogical diagnostics based on information and communication technologies, identifying the main possibilities of ICT-based preparation in universities for effective diagnostic practices in primary education settings. *Methodology and Methods.* The research employed analysis of scientific literature to examine the current state of preparing future primary education teachers for conducting pedagogical diagnostics using information and communication technologies. A survey was conducted among teachers working in primary grades at secondary school № 185 in Almaty to determine their opinions and views on the possibilities of using information technologies for conducting pedagogical diagnostics. *Results.* Based on the literature study, the current state analysis revealed the relevance of ICT-based pedagogical diagnostics preparation for future primary education teachers. The survey results demonstrated specific opportunities that need to be provided when preparing future primary school teachers for pedagogical diagnostics based on information and communication technologies. Teachers' opinions and views provided insights into practical requirements and possibilities for implementing ICT-based diagnostic approaches in primary education. *Scientific novelty.* The research contributes to understanding the specific requirements and possibilities for preparing future primary education teachers in ICT-based pedagogical diagnostics, establishing the theoretical foundation for integrating information technologies into diagnostic preparation programs and identifying key areas for improvement in teacher education. *Practical significance.* The findings provide evidence-based recommendations for universities preparing future primary education teachers, offering insights into necessary opportunities and approaches for effective ICT-based pedagogical diagnostics training that can enhance the quality of diagnostic practices in primary education settings.

Keywords: future primary school teacher, primary education, information and communication technology, pedagogical diagnostics, training.

Introduction. The modernization of general education, which is currently being carried out in Kazakhstan, puts at the forefront the tasks of developing the individuality of the child, his abilities and inclinations, revealing the creative potential of the individual from the moment he enters the 1st grade of a comprehensive school. Therefore, a modern teacher of primary education should carry out training, development and education based on the individual characteristics of the student. It is necessary to be able to control the process of constant change of the student and ensure his rise to a high level of development, conduct research pedagogical searches, solving the problems of the formation of the child's personality on a scientific basis (State program, 2021).

A modern teacher of primary education in the scientific and methodological region should organize scientific and methodological work, self-analysis, self-assessment in order to improve his pedagogical skills. And pedagogical diagnostics allows you to successfully solve these problems in practical professional and pedagogical activities. With the help of pedagogical diagnostics, it determines the causes of possible failures of students in the process of obtaining knowledge from the subject, evaluates the student not only according to the achieved results, but also according to the cognitive

approaches used in obtaining a specific result, determines the pace of the student's progress in the learning process, personal orientation in its development, etc (Vilenskaya, 2020). And this increases the need for the formation of the subject of the learning process, the skills of organizing and conducting pedagogical diagnostics are formed (Ivanova, 2020). In this regard, the relevance of the formation of diagnostic training of future primary education teachers working in primary school increases. Because a teacher armed with knowledge and skills in the field of pedagogical diagnostics has access to detailed information based on criteria for the student's full mastery of the educational material. Provides access to information about the state of the pedagogical process, the quality of education and upbringing, processes, analyzes, evaluates these data, predicts the development of the pedagogical process and makes adjustments possible (Sweller, 2016). A thorough study of the individual characteristics, interests and needs of each child, communication skills, professional identification of successful mastery of the studied discipline, optimal ways, methods of education and development, formation of their own development trajectory, competent work (Reis et al., 2021).

However, at present, it has been shown that the problem under consideration, that is, teachers of primary education, in fact, do not have the knowledge, skills and abilities to conduct pedagogical diagnostics on the basis of information and technology, they do not see the need for pedagogical diagnostics. After all, there is an opinion that pedagogical Diagnostics is not a mandatory function of teachers of primary education. Despite the fact that, according to research, some professional difficulties of a teacher are explained by their inability to carry out pedagogical diagnostics, draw conclusions from its results, master the methods, the university does not require special training. This problem was not first developed methodological and organizational foundations for the formation of diagnostic readiness of future teachers of primary education. Secondly, the lack of identification of the reasons for the difficulties in forming the readiness of future primary education teachers to conduct diagnostics makes it necessary to study this issue from a theoretical and practical point of view. Therefore, finding theoretical and practical solutions for the formation of diagnostic readiness of future teachers of primary education on the basis of information and Communication Technologies is becoming an urgent problem.

Materials and Methods. In general, information and communication technology is a popular concept in pedagogical science. Information and communication technologies are aimed at ensuring information processes. Usually, the means of information and communication technologies include software and hardware tools and techniques operating on the basis of microprocessor technology, modern means and systems of the telecommunications industry, information exchange, audio and video technology, providing operations for collecting, extracting, collecting, storing, processing and transmitting information. In the traditional understanding of didactics, information and communication technologies are an analogue of technical means of education. Pedagogical technologies are created on the basis of these tools with the active participation of the teacher. There are a lot of information technology tools, which include computers of all groups, their complementary apparatus, software, virtual reality systems, and information systems (Komar, 2020).

The above-mentioned information and communication technologies contribute to the solution of the tasks of strengthening all levels of educational processes, multilateral development of students, preparing graduates of higher educational institutions for life in the conditions of the information society in the future, the implementation of social orders arising in accordance with the informatization processes of modern society. It is clear that the use of information and communication technologies is one of the main conditions for informatization of education. Today, many scientists who are studying the issue of introducing these technologies into education believe that their use will change the entire educational process. (Afroz et al., 2016).

The study highlights the transformative potential of ICT in the field of pedagogical diagnostics. With the advent of sophisticated assessment tools and digital platforms, teachers now have unprecedented opportunities to adapt diagnostic assessments to the diverse needs of elementary school students. The literature says that the effective use of ICT in diagnostics not only simplifies the assessment process, but also increases the accuracy and detail of understanding the learning process of students. (Hoth, 2016). Scientists advocate the integration of knowledge about technological pedagogical content (TPACK) into teacher training programs, emphasizing the need for teachers to have a fine understanding of both content and pedagogy enhanced by technology (Neethiperumal, 2022).

According to Kiselev, a significant number of teachers feel unprepared for the effective integration of technology into their teaching practice, especially in the context of diagnostic assessment. The literature highlights the urgency of bridging this gap to provide future teachers with the skills they need in the digital age (Kiselev, 2023). Several studies have identified common problems and barriers to integrating ICT into teacher training. Significant obstacles are created by factors such as lack of institutional support, limited access to technology and resistance to change among teachers. Understanding and addressing these issues is crucial to developing effective strategies in teacher training programs (Wiyono et al., 2021). Based on successful case studies, the literature highlights the best practices of integrating ICT into pedagogical diagnostics. The work demonstrates examples where teacher training programs have successfully incorporated ICT tools for diagnostic purposes, leading to improved student learning outcomes. These success stories provide valuable insights into the potential impact of well-designed teacher training initiatives (Wiyono et al., 2022).

Some literature emphasizes the need to change the paradigm of pedagogical approaches, the transition from traditional methods to more dynamic, technologically advanced strategies. Teshaboev and others argue that the training of future teachers involves the formation of a mindset that considers technology not as an addition, but as an integral component of effective teaching and diagnostic assessment (Teshaboev et al., 2023). The work of Altynnikova et al. highlights the importance of supportive policies and collaborative efforts between educational institutions and policy makers to create an environment conducive to the effective training of future teachers (Altynnikova et al., 2022).

The central place in the discussion is occupied by the impact of pedagogical diagnostics using ICT on student learning outcomes. Yarullin's research shows that smart technology integration not only improves diagnostic accuracy, but also promotes more engaging and personalized learning for elementary school students. Understanding the nuances of this impact is crucial for the formation of effective teacher training programs (Yarullin, 2016). The study of best practices and exemplary models for integrating ICT into pedagogical diagnostics is crucial to inform teacher training programs. Chirva's work demonstrates how innovative approaches, including the use of digital portfolios and interactive assessment tools, can improve diagnostic practice in primary education. These models provide valuable information about the practical implementation of ICT in the classroom (Chirva, 2018).

While the benefits of integrating ICT into pedagogical diagnostics are obvious, scholars such as Makarenko have highlighted the challenges teachers face in this process. Problems such as limited access to technology, resistance to change and the need for continuous professional development are becoming crucial factors influencing the successful implementation of ICT in primary education. Understanding and solving these problems are important components of preparing future teachers to navigate the digital landscape of pedagogical diagnostics (Makarenko, 2020). Recognition of the cultural context in which pedagogical diagnosis takes place is of paramount importance for effective teacher training. Vaganova emphasizes the importance of taking cultural nuances into account when implementing ICT, ensuring that diagnostic

assessments are culturally sensitive and inclusive. Future teachers need to develop cultural competence in integrating technology, creating a fair and enriching learning environment for different groups of students (Vaganova, 2019).

In addition to technical competencies, the literature highlights the importance of addressing ethical issues and promoting digital literacy among future teachers (Bolick et al., 2019). Understanding issues related to data privacy, responsible use of technology, and the development of digital citizenship is becoming a crucial factor in preparing teachers to address the ethical challenges inherent in the technological educational landscape. Although the existing literature provides a substantial basis, gaps remain, especially in understanding the nuances of how ICT integration affects pedagogical diagnostics specific to primary education. Future research should explore context-specific issues, diverse implementation models, and the long-term impact on student learning outcomes.

The literature review highlights the urgent need to review teacher training programs, putting ICT at the forefront of pedagogical diagnostics. Understanding the current situation, challenges and best practices, this article aims to contribute to an ongoing dialogue on equipping future teachers with the skills necessary for effective pedagogical diagnostics based on ICT in primary education. In accordance with the requirements of the document "Typical qualification characteristics of teacher positions", it is noted that "primary school teacher – determines and contributes to the development of the individual abilities of the student, applies new approaches, effective types, methods and means of teaching, develops tasks for the summative assessment of sections and quarters, studies the individual abilities, interests and inclinations of students, pupils".

The main idea of the study is to identify the possibilities of preparing future teachers of primary education on the basis of information technologies in universities for conducting pedagogical diagnostics. In the implementation of the idea, the following basic provisions were guided:

- scientific and theoretical research on the problem of preparing future teachers of primary education for conducting pedagogical diagnostics on the basis of information technologies;

- information received from students as a result of a survey to determine their opinions and views on the possibilities of using information technologies for conducting pedagogical diagnostics.

Based on the above works, a brief survey of students was conducted in order to determine their opinions and views on the possibilities of using information technologies for conducting pedagogical diagnostics.

In the study, data collection was analyzed using SPSS software. As a research methodology, we used quantitative and qualitative methods. In the quantitative part, the research survey approach was used, and in the qualitative part, the phenomenological approach was used. The survey was conducted by primary school teachers of secondary school №185 in Almaty. 20 teachers took part in the survey.

The content of the questionnaire consisted of the following questions:

1. How do you assess the importance of pedagogical diagnostics on a scale from 1 to 10 in improving the quality of Education?

2. To what extent, in your opinion, ICT can contribute to the effectiveness of pedagogical diagnostics?

3. Do you currently use any ICT in your teaching or learning environment to conduct pedagogical diagnostics?

4. If yes, specify the types of acts you use.

5. What problems did you face when integrating ICT into pedagogical diagnostics?

6. What is your level of knowledge in using ICT for pedagogical diagnosis?

7. What do you think are the potential advantages of using ICT in conducting pedagogical diagnostics?

Results. *"How do you assess the importance of pedagogical diagnostics on a scale from 1 to 10 in improving the quality of Education?"* to question 1, the respondents rated "3" - 45%, "4" - 5%, "5" - 30%, "8" - 20%.

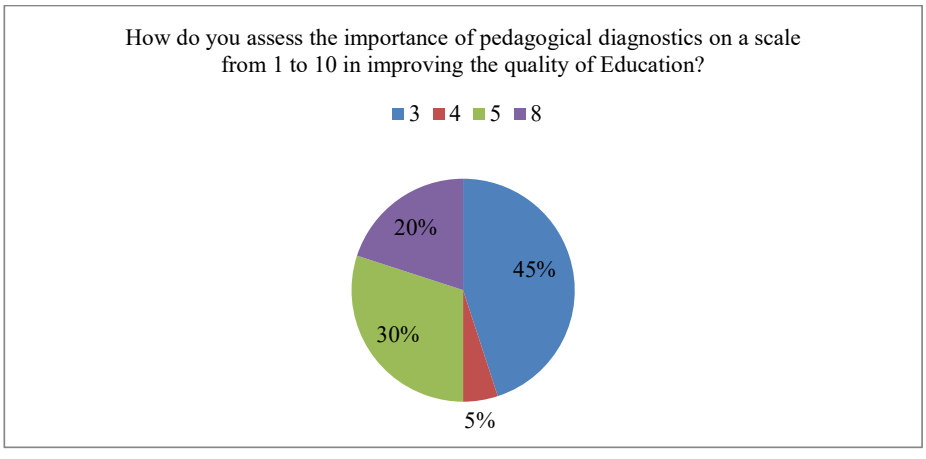

Figure 1: Result on the question 1 of the questionnaire

The majority of respondents (45%) rated the importance of pedagogical diagnostics relatively low, suggesting that they perceive it as having a minimal impact on improving the quality of education. This could indicate a segment of respondents who may not fully recognize the value of pedagogical diagnostics in enhancing educational outcomes.

A small percentage (5%) assigned a score of 4, indicating a somewhat higher but still limited belief in the importance of pedagogical diagnostics. These respondents may see some significance but may not fully appreciate its potential impact. A significant portion (30%) rated the importance of pedagogical diagnostics right in the middle of the scale. This suggests a group of respondents who acknowledge its relevance to a moderate extent but may not consider it a highly influential factor in improving education quality. A notable 20% of respondents assigned a score of 8, indicating a high level of importance attributed to pedagogical diagnostics. These individuals view it as a critical factor in enhancing the quality of education and recognize its potential to significantly impact teaching and learning outcomes.

"To what extent, in your opinion, ICT can contribute to the effectiveness of pedagogical diagnostics?" Question 2 was answered by "none" - 5%, "very little" - 30%, "average" - 25%, "important" - 25%, "I am not sure" - 15%.

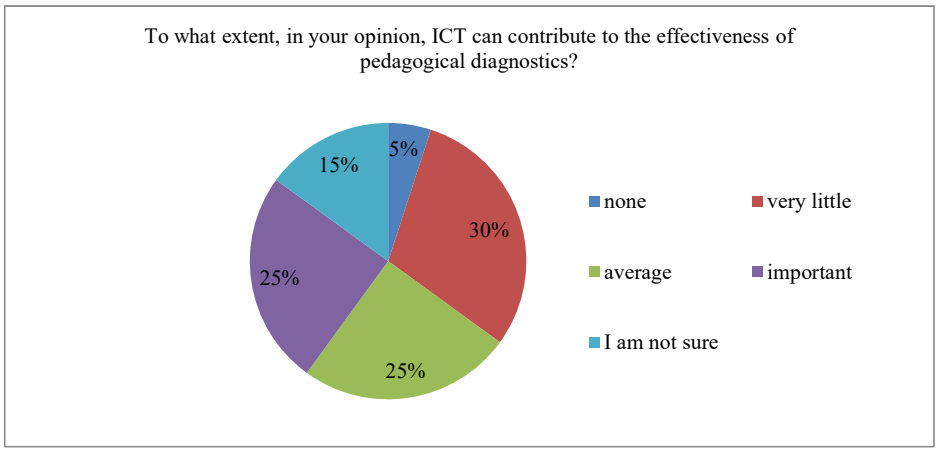

Figure 2: Result on the question 2 of the questionnaire

Let's analyze the responses to the question about the extent to which ICT can contribute to the effectiveness of pedagogical diagnostics, based on the provided percentages. A small percentage of respondents (5%) firmly believe that ICT does not contribute to the

effectiveness of pedagogical diagnostics. This could suggest a segment of individuals who might be skeptical or unaware of the potential benefits of integrating technology into educational assessment practices. The largest portion of respondents (30%) expressed the opinion that ICT has a minimal impact on the effectiveness of pedagogical diagnostics. This group acknowledges some contribution but perceives it to be relatively insignificant in comparison to other factors. A quarter of respondents (25%) believes that ICT has an average level of contribution to the effectiveness of pedagogical diagnostics. This group recognizes a moderate impact but may not view technology as a transformative element in this context. Another 25% of respondents consider ICT to be important in contributing to the effectiveness of pedagogical diagnostics. This indicates a substantial portion of individuals who recognize the significance of technology in enhancing the diagnostic processes in education. A minority of respondents (15%) indicated uncertainty regarding the contribution of ICT to the effectiveness of pedagogical diagnostics. This group may require more information or education about the potential benefits and applications of technology in this context.

"Do you currently use any ICT in your teaching or learning environment to conduct pedagogical diagnostics?" 25% answered yes to question 3, 75% answered no.

A quarter of respondents (25%) indicated that they currently use ICT in conducting pedagogical diagnostics. This suggests that there is a segment of educators who actively incorporate technology into their diagnostic practices, potentially leveraging digital tools for assessment and analysis. The majority of respondents (75%) stated that they do not currently use ICT in conducting pedagogical diagnostics. This indicates a significant portion of individuals who may not have integrated technology into their diagnostic processes or are not utilizing it to its full potential in this context.

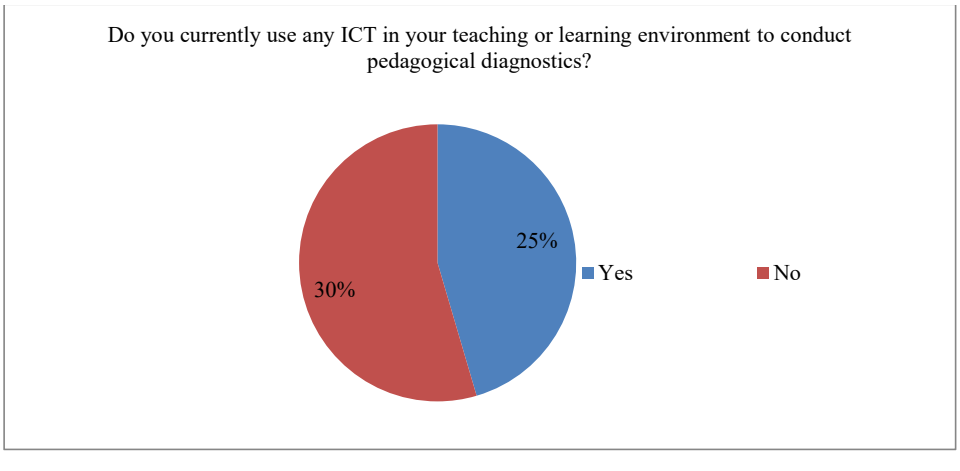

Figure 3: Result on the question 3 of the questionnaire

In Question 4, *"If yes, specify the types of acts you use"*, Excel, Google tables, and platforms are displayed. Edpuzzle, Kahoot. Tools that collect real-time data on student understanding during lessons through quizzes or polls. Excel, Google Sheets. While general-purpose, spreadsheet software is often used for basic data analysis in education settings. By actively using ICT in pedagogical diagnostics, teachers can streamline assessment processes, gain deeper insights into student learning, and provide more personalized and effective support. The specific tools and technologies chosen will depend on the preferences of individual educators, the resources available, and the unique needs of their students.

"What problems did you face when integrating ICT into pedagogical diagnostics?" we received answers to 5 questions: lack of access to technologies, lack of knowledge and

professional development on the use of ICT, lack of readiness for change, confidentiality and security issues, diversity of technological skills.

" What is your level of knowledge in using ICT for pedagogical diagnosis?" for 6 questions "low " – 20%," medium " – 60%," high " – 20%.

A minority of respondents (20%) indicated that they have a low level of knowledge in using ICT for pedagogical diagnostics. This suggests that there is a segment of individuals who may feel less confident or experienced in leveraging technology for diagnostic purposes. The majority of respondents (60%) reported having a medium level of knowledge in using ICT for pedagogical diagnostics. This indicates a substantial portion of individuals who feel reasonably confident and proficient in integrating technology into their diagnostic practices. Another minority of respondents (20%) expressed having a high level of knowledge in using ICT for pedagogical diagnostics. This suggests that there is a smaller but still significant group of individuals who feel very confident and well-versed in leveraging advanced technology for diagnostic assessments.

"What do you think are the potential advantages of using ICT in conducting pedagogical diagnostics?" to 7 questions respondents will give the following answers:

- ICT allows for the automation of assessment processes, reducing manual grading time and providing instant feedback. This efficiency enables teachers to focus more on personalized instruction;

-by leveraging ICT tools, educators can tailor diagnostic assessments to individual student needs. This personalization fosters a more adaptive and engaging learning experience for each student;

-ICT facilitates the collection and analysis of data related to student performance. This data-driven approach enables teachers to make informed decisions about instructional strategies, interventions, and curriculum design;

-using ICT in diagnostics allows for real-time monitoring of student progress. Teachers can identify learning gaps early, enabling timely intervention and providing targeted support to students who need it;

-ICT provides access to a wealth of multimedia resources, such as videos, simulations, and interactive content. Integrating these resources into diagnostics enhances the variety of assessment methods and caters to diverse learning styles.

Discussion. The findings of this study highlight a significant gap between the theoretical recognition of ICT's role in pedagogical diagnostics and its actual implementation by future primary school teachers. This is consistent with the results of Wiyono et al. (2022), who also identified a low frequency of ICT usage among teachers for instructional supervision and diagnostic purposes, despite the availability of technological resources. One of the most striking results from our survey is that only 25% of respondents currently use ICT in pedagogical diagnostics, and 75% do not integrate digital tools at all. This aligns with the international findings of Demirtaş and Aksoy (2023), who noted that a large proportion of pre-service teachers lack practical experience and confidence in applying ICT for assessment, even though they support its potential in theory.

Additionally, the low perception of the importance of pedagogical diagnostics (with 45% rating it as "3" out of 10) parallels the results of the study by Teshaboev et al. (2023), which found that many primary teachers undervalue diagnostic tasks due to insufficient training and a lack of institutional emphasis on formative assessment. These findings underscore the need for rethinking university programs to better emphasize the scientific and practical value of pedagogical diagnostics. In contrast, some respondents in our study (20%) did recognize the high importance of diagnostics and ICT integration. This group's understanding and attitude are in line with the findings of Neethiperumal (2022), who demonstrated that integrating TPACK (Technological Pedagogical Content Knowledge) frameworks into teacher education significantly improves pre-service teachers' ability to apply ICT in diagnostic and instructional tasks. Despite moderate self-reported ICT competence (60% claimed "medium" knowledge), actual usage remains limited, reinforcing the discrepancy

identified by Kiselev (2023), who emphasized that declarative knowledge about ICT does not always translate into applied competence. The need for context-based, hands-on training with real diagnostic scenarios is apparent.

Furthermore, our study confirmed key advantages of ICT-supported diagnostics, such as data automation, personalization, and real-time feedback - findings echoed in the work of Yarullin et al. (2016), who argued that smart diagnostic technologies increase learning accuracy and engagement. However, our respondents also faced barriers like lack of access to technology, limited training, and resistance to change, as also noted in Makarenko et al. (2020). Thus, the scientific value of our study lies in uncovering the current mismatch between teacher perceptions, competencies, and actual practices regarding ICT in pedagogical diagnostics. These results support the argument that teacher education programs must incorporate systematic, practical training in ICT tools, as also recommended by Wiyono et al. (2021) and Altynnikova et al. (2022). To sum up, the integration of ICT into pedagogical diagnostics remains underdeveloped among future teachers despite its recognized benefits. By comparing our findings with recent international studies, we emphasize the urgent need for systemic educational reforms that address both technological infrastructure and pedagogical culture in teacher training.

Conclusion. In conclusion, the responses to the questionnaire on the integration of ICT into pedagogical diagnostics reveal a nuanced landscape. While a significant proportion of educators acknowledge a medium level of knowledge in utilizing ICT for diagnostic purposes, there exists a diverse range of opinions regarding the importance and effectiveness of such integration. Challenges, including limited access to technology and resistance to change, underscore the need for targeted professional development and collaborative efforts to bridge knowledge gaps. Notably, the majority of respondents currently do not employ ICT in pedagogical diagnostics, signaling a potential opportunity for comprehensive training initiatives. The potential advantages of ICT, such as enhanced efficiency and personalized learning experiences, underscore the importance of strategically navigating these challenges to unlock the full benefits of technology in optimizing educational practices and improving student outcomes.

The results of the survey show that in preparing future teachers of primary education for pedagogical diagnostics based on information and communication technologies, it is necessary to provide the following opportunities.

- conduct workshops, training sessions, or awareness campaigns to highlight the benefits of pedagogical diagnostics;
- encourage dialogue among educators to share success stories and best practices related to the implementation of effective pedagogical diagnostics;
- incorporate information on the importance of pedagogical diagnostics in teacher training programs and professional development initiatives.

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