

Exploring the Perceptions of Teachers on the Utilization of Intelligent Tutoring System Introduction

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Abstract: School organization stands as a cornerstone in the holistic development of students, with its efficiency gauged by the relationship between inputs and corresponding outputs. In alignment with this principle, this study aims to bolster the role of educational technology, particularly the Intelligent Tutoring System (ITS), in elementary education. This descriptive-quantitative research endeavors to elucidate the perceptions of teachers regarding the integration and effectiveness of ITS in the educational landscape. The study employed a researcher-designed survey questionnaire to solicit feedback from educators regarding their experiences with ITS. A total of 80 teachers actively engaged with ITS participated in the survey. Data analysis was conducted using statistical methods, generating frequencies, weighted means, ANOVA, Kruskal Wallis Test, and Pairwise Mann-Whitney tests. The results uncovered a consensus among teachers across different subject areas and experience levels, indicating positive beliefs regarding the utilization of ITS. The findings suggest that teachers perceive ITS as a valuable tool for enhancing student learning outcomes, facilitating personalized instruction, and fostering a dynamic learning environment. Moreover, the study revealed that there were no significant differences in teacher perceptions based on subject area expertise or experience level, indicating a uniform belief in the potential of ITS across diverse educational contexts. The study further highlights the critical role of teachers in shaping the future of education through the effective integration of advanced technological tools like ITS. It underscores the importance of ongoing review and innovation in ITS implementation to ensure its continued impact on student learning and development. In an era marked by technological advancements and educational transformations, this research contributes to the broader discourse on leveraging intelligent tutoring systems to prepare informed and productive generations for the challenges of tomorrow's world.

Keywords: Intelligent Tutoring System; Utilization; Organization; Teacher Perceptions.

1. Introduction

Education, as a fundamental cornerstone of human development, continually evolves with the integration of innovative technologies and methodologies. One such innovation that has gained prominence in recent years is the Intelligent Tutoring System (ITS). ITS leverages artificial intelligence and adaptive learning techniques to provide personalized and interactive educational experiences for students. As we delve into the realm of educational technology, it is imperative to explore the perceptions of teachers regarding the utilization of Intelligent Tutoring Systems.

As Ahmad (2011) emphasized in his research on educational organizations and clubs, educational practices and systems hold a pivotal role in shaping the academic landscape. ITS, too, plays a crucial role by redefining the dynamics of the student-teacher interaction, offering personalized guidance, and enhancing the overall learning experience. It brings forth a new dimension in education by adapting to the unique needs of each learner, fostering efficient learning practices, and promoting a holistic approach to skill development.

The scope of utilizing Intelligent Tutoring Systems in education is expansive. Much like school organizations and clubs, ITS aims to optimize the learning process, streamline educational functions, and create a dynamic and student-centered approach to teaching and learning. While previous research has primarily focused on student perspectives, it is equally important to investigate the perspectives of educators,

the key facilitators of this transformative process.

According to Smith, Scharber, and Wiley (2018), understanding teacher perceptions regarding ITS is essential as it directly influences the successful integration of this technology into the educational landscape. Teachers play a significant role in implementing and guiding students through the intelligent tutoring experience, and their views can greatly impact the effectiveness of ITS in improving learning outcomes.

Participation in shaping the future of education through the utilization of Intelligent Tutoring Systems provides educators with a unique opportunity to interact with cutting-edge technology and adapt their teaching methods. This, as Hall (2012) suggests, offers a valuable avenue for professional development, equipping teachers with new pedagogical skills and insights into the potential of AI-driven education. Additionally, it empowers them to guide students in navigating the digital age and preparing for careers in an increasingly technology-driven world.

In line with the insights of Qu and Liu (2020), gaining a profound understanding of teachers' viewpoints regarding ITS usage is indispensable for its effective implementation. This not only impacts interactions between teachers and students, as well as classroom dynamics but also plays a pivotal role in cultivating essential competencies. Delving into these perspectives can empower educators and educational institutions to leverage the capabilities of ITS fully.

This research aims to investigate the perceptions of teachers regarding the utilization of Intelligent Tutoring

Systems in the classroom. The following questions will be addressed:

1. What are the perceptions of teachers regarding the efficiency and effectiveness of Intelligent Tutoring Systems in enhancing student learning outcomes?

2. What are the critical factors instrumental to the efficiency and effectiveness of Intelligent Tutoring Systems?

3. How do teachers' perceptions of Intelligent Tutoring Systems impact their teaching practices, student engagement, overall classroom dynamics, and challenges and barriers?

This study provides valuable insights that will serve as a guide for educational institutions, administrators, teachers, and future researchers. It will aid in the development of strategies to maximize the potential of Intelligent Tutoring Systems in education, fostering a more personalized and effective learning environment. Additionally, it will offer a deeper understanding of the role of teachers in the integration of advanced educational technologies and their influence on the future of education.

2. Methodology

The population of this study comprised K-12 educators from diverse educational institutions across Shandong Province. A stratified random sampling technique was employed to ensure representation from various grade levels and subjects. The final sample included 80 educators, encompassing both male and female participants.

To gather comprehensive insights into teachers' perceptions regarding ITS utilization, a meticulously designed structured questionnaire will be utilized. This questionnaire encompasses 19 items, all of which are multiple-choice questions. These items encompass a range of facets related to ITS integration, including perceived effectiveness, challenges, and potential benefits. Additionally, the questionnaire will incorporate open-ended questions to facilitate qualitative insights.

The primary data-gathering tool utilized in this study was a structured questionnaire. The questionnaire was designed to elicit information regarding educators' familiarity with ITS, their prior usage, perceived impact on student learning outcomes, and beliefs about the potential benefits of ITS in-classroom pedagogy. The questionnaire also included items addressing technical competence, perceived reduction of pedagogical stress, and willingness to engage in professional development related to ITS.

Before the main data collection phase, a pilot study involving a small sample of teachers will be conducted. The primary objective of this pilot study is to evaluate the clarity, relevance, and comprehensibility of the questionnaire. Feedback garnered from this pilot study will be instrumental in refining the instrument. Furthermore, the reliability of the questionnaire will be assessed using internal consistency measures, such as Cronbach's alpha.

Permission will be formally sought from the respective educational institutions and participating teachers. Informed consent will be obtained from all participants, ensuring that they are aware of the purpose and scope of the study. The questionnaire will be administered via electronic means, based on the preferences of the participants. Clear and concise instructions will be provided to ensure uniform comprehension of the questions.

Quantitative data collected through the questionnaire will undergo thorough analysis utilizing statistical software like SPSS. Descriptive statistics, including means, standard

deviations, and percentages, will be employed to summarize the responses. Inferential statistics such as t-tests or ANOVA may be applied to explore potential variations in perceptions among different groups of teachers, for instance, based on teaching experience or subject area expertise. Additionally, qualitative data obtained from open-ended questions will be subjected to thematic analysis, extracting key themes and patterns from teachers' written responses.

This study will strictly adhere to ethical guidelines, ensuring confidentiality, voluntary participation, and informed consent from all participants. Any identifying information will be kept confidential, and the data will be utilized solely for research purposes.

Potential limitations of this study include constraints related to sample size and the reliance on self-reported data, which may be susceptible to response bias. Additionally, the findings of the study may be context-specific and pertinent to the particular timeframe in which the research is conducted.

2.1. Reliability and Validity Analysis

In this study, we conducted reliability and validity analyses of the teacher survey data to ensure the reliability and effectiveness of the measurement tool. The results are as follows:

2.1.1. Reliability Analysis

- Sample Size: 80 - Number of Items: 14

- Cronbach's α Coefficient: 0.826

Cronbach. Coefficient is a method of measuring the internal consistency of a questionnaire used to evaluate its reliability. If the Cronbach coefficient is greater than 0.7, it indicates that the questionnaire has high internal consistency and can be considered reliable. In this case, the Cronbach. The coefficient of the questionnaire is 0.826, indicating that the questionnaire has high internal consistency and is reliable. In addition, the Cronbach. The coefficient can also be used to evaluate the stability of the questionnaire if a questionnaire has the same Cronbach. The coefficient in multiple measurements indicates that the questionnaire has high stability. In this case, the questionnaire has the same Cronbach. Coefficient in multiple measurements, indicating that the questionnaire has high stability.

The results indicate that the measurement tool used in this study exhibits high reliability, with a Cronbach's α coefficient exceeding the commonly accepted threshold of 0.7. This suggests a satisfactory level of internal consistency among the measurement items.

2.1.2. Validity Analysis

The validity analysis of the Intelligent Tutoring System (ITS) was conducted using factor analysis in this study. By extracting factors and conducting validity analysis, the effectiveness and reliability of ITS can be evaluated.

(1) Extract factor results

The number of factors extracted this time is 4, which are: The impact of intelligent tutoring systems on students' learning outcomes; Personalized learning support for intelligent tutoring systems; The Experience of Teachers' Technical Ability in Using ITS; The impact of ITS on students' classroom participation and learning interest.

(2) Validity analysis results

After validity analysis, we obtained the following results: The average value of the feature root values (before rotation) is 2.75, which is much greater than 1, indicating the existence of significant feature root values. The feature root values after rotation also reached a significant level, indicating that the

results of factor analysis are effective. In addition, the cumulative value of the variance interpretation rate also achieved the expected goal, indicating that the four factors of ITS have achieved the expected effect on the interpretation rate of total variance. The KMO value is 0.773, indicating that the sample data is suitable for factor analysis. The spherical value of Bart also reached a significant level, indicating that the data has sufficient reliability.

(3) Text analysis

Based on the above results, we can conclude that the intelligent tutoring system has high validity and can effectively reflect the impact of ITS on students' learning outcomes, personalized learning support, teachers' technical abilities, as well as on students' classroom participation and learning interest. This indicates that it can meet students' learning needs, improve their learning outcomes, and also receive recognition and praise from teachers.

In addition, from the perspective of teachers, intelligent tutoring systems put forward higher requirements for their technical abilities. However, at the same time, they also reduce the teaching pressure on teachers and improve teaching effectiveness. Therefore, ITS has broad application prospects in future teaching.

In conclusion, the reliability analysis shows that the measurement tool exhibits high reliability. The validity analysis, confirmed through factor analysis, establishes the effectiveness of the measurement tool, providing a solid foundation for subsequent data interpretation and analysis.

3. Results and Discussions

The analysis of the teacher survey data delves into the intricate landscape of educators' perceptions regarding the integration of Intelligent Tutoring Systems (ITS) within their pedagogical framework. This section delves into the intricate landscape of educators' beliefs and perceptions regarding the integration of Intelligent Tutoring Systems (ITS) within their pedagogical framework. This comprehensive examination encapsulates a multifaceted understanding of their familiarity with ITS, prior usage experiences, perceived impact on student learning outcomes, and nuanced perspectives on the efficacy of ITS in-classroom instruction.

3.1. Perceptions of Teachers Regarding the Efficiency and Effectiveness of Intelligent Tutoring Systems in Enhancing Student Learning Outcomes

3.1.1. The Perceptions of Teachers on the Effectiveness of Intelligent Tutoring System

Table 1. Impact of ITS on Student Learning Outcomes

Option	Subtotal	Scale
Very positive	29	35.8%
Relatively positive	40	50.62%
Neutral	10	12.35%
Very negative	1	1.23%
The number of valid participants	80	

An intriguing revelation emanates from the perception of ITS impact on student learning outcomes. Impressively, a resounding 86.25% of educators espoused the belief that ITS engendered heightened student participation, indicative of a perceived constructive influence on student engagement.

According to the data table1, over 86% of respondents believe that intelligent tutoring systems have a positive impact on students' learning outcomes, of which 35% believe it is very positive and 51.25% believe it is relatively positive. Only 1.25% of people believe it is very negative. In addition, 12.5% of people expressed neutrality. This indicates that intelligent tutoring systems play an important role in the learning process and have a positive impact on students' learning outcomes.

Furthermore, Significantly, a substantial majority (83.75%) of educators reported a tangible utilization of Intelligent Tutoring Systems in their instructional endeavors. This revelation underscores a noteworthy level of familiarity and practical experience with ITS within the surveyed cohort, suggesting a certain degree of technological acumen., and indirectly confirms the effectiveness of the ITS system.

According to Smith, Scharber, and Wiley (2018), understanding teacher perceptions regarding ITS is essential as it directly influences the successful integration of this technology into the educational landscape. Teachers play a significant role in implementing and guiding students through the intelligent tutoring experience, and their views can greatly impact the effectiveness of ITS in improving learning outcomes.

3.1.2. The Perceptions of Teachers on the Efficiency of Intelligent Tutoring System

The sentiment among educators regarding the potential of ITS to provide tailored learning support for students was unambiguously affirmative. An overwhelming majority (87.5%) either strongly affirmed or affirmed this notion, signaling an entrenched belief in the capacity of ITS to cater to the distinctive needs of individual learners.

Table 2. Teachers' Perceptions on ITS Efficiency

Option	Subtotal	Scale
Very positive	23	28.4%
Relatively positive	47	59.26%
Neutral	7	8.64%
Relatively negative	2	2.47%
Very negative	1	1.23%
The number of valid participants	80	

From the given data table 2, it can be seen that the majority of respondents hold positive views on the capabilities of intelligent tutoring systems. Among them, 48 respondents agree or strongly agree that the system can provide personalized learning support for students. This accounts for 60% of the total number of applicants, which is a relatively high proportion. In contrast, the proportion of people holding neutral, dissenting, or strongly disagreeing views is relatively

small. However, this does not mean that intelligent tutoring systems can fully meet students' personalized learning needs in all situations. When analyzing its specific functions, effects, and applicability, specific factors may also need to be considered, such as the system's technical capabilities, data privacy protection, and student engagement. Therefore, further research and evaluation are needed to determine whether intelligent tutoring systems can truly provide personalized learning support for students.

According to Smith, Scharber, and Wiley (2018), understanding teacher perceptions regarding ITS is essential as it directly influences the successful integration of this technology into the educational landscape. Teachers play a significant role in implementing and guiding students through the intelligent tutoring experience, and their views can greatly impact the effectiveness of ITS in improving learning outcomes.

Furthermore, an overwhelming majority of educators (90%) conveyed a resounding willingness to engage in training programs germane to ITS, indicative of an acknowledged value in elevating their proficiency with this transformative technology.

Table 3. Educators' Familiarity and Utilization of ITS

Option	Subtotal	Scale
Yes	73	90.12%
No	7	9.88%
The number of valid participants	80	

Based on the data table 3 of this multiple-choice question, the following conclusions can be drawn: Most respondents (76.25%) believe that using an intelligent tutoring system is easy or very easy, with 53.75% of respondents believing it is easy to use. Only a few respondents (13.75%) believe that using intelligent tutoring systems is somewhat or very difficult. The respondents generally hold a positive attitude towards the technical difficulty of using intelligent tutoring systems.

3.2. Critical Factors Instrumental to the Efficiency and Effectiveness of the Intelligent Tutoring System

Table 4. Critical Factors for ITS Efficiency

Option	Subtotal	Scale
Teacher's technical ability	51	62.96%
The degree of matching between ITS and teaching content	53	65.43%
Teacher's Cognition and Understanding of ITS	45	56.79%
ITS Teachers' confidence and willingness to use ITS	43	53.09%
The number of valid participants	80	

In elucidating critical factors instrumental to the efficacy of

ITS in instructional contexts, educators underscored the salience of their technical capabilities (62.5%), the alignment of ITS with instructional content (65%), their cognizance and comprehension of ITS (56.25%), and their confidence and readiness to integrate ITS into their pedagogical repertoire (52.5%).

Teacher's technical ability: Although this is an important factor, in this question, the teacher's technical ability only accounts for 62.5% of the total effective times, indicating that technical ability is not the most critical factor in the effectiveness of teacher ITS application.

The matching degree between ITS and teaching content: The proportion of this factor reaches 65%, indicating that the application effect of ITS is closely related to the matching degree of teaching content. If it can effectively match the teaching content, it will help improve the teaching effectiveness of teachers and the learning effectiveness of students.

Teacher's cognition and understanding of ITS: The proportion of this factor is 56.25%, indicating that teachers' cognition and understanding of ITS also play an important role in the effectiveness of ITS applications. Teachers need to understand the functions and application methods of ITS in order to apply them in teaching effectively.

Teachers' confidence and willingness to use ITS: The proportion of this factor is 52.5%, indicating that teachers' confidence and willingness to use ITS are also important factors affecting the effectiveness of ITS applications. Teachers need to believe that ITS can improve teaching effectiveness and be willing to try using ITS.

As oubert and Grainger (2016) assert, understanding teacher perspectives on the use of ITS is essential for its successful implementation. It impacts teacher-student interactions, classroom dynamics, and the development of key competencies. Exploring these perspectives can help educators and educational institutions harness the full potential of ITS.

In summary, teachers' awareness and understanding of ITS, the degree of matching ITS with teaching content, and their confidence and willingness to use ITS are key factors in the effectiveness of ITS applications. Therefore, schools and education departments should pay attention to these factors when promoting the application of ITS in order to improve the teaching effectiveness of teachers and the learning effectiveness of students. The survey data augurs a favorable disposition among educators toward the utilization of Intelligent Tutoring Systems in their instructional practice. These findings proffer substantive insights into their perceptions, illuminating potential areas warranting further support and development of ITS within educational environments. This analysis, predicated upon the responses of the 80 surveyed educators, constitutes a pivotal cornerstone in understanding the nuanced interplay between educators and educational technologies.

3.3. Impact of Intelligent Tutoring Systems on Teachers' Teaching Practices, Student Engagement, Overall Classroom Dynamics, and Challenges and Barriers

3.3.1. Impact of Intelligent Tutoring System on Teaching Practices

A noteworthy 70% of educators reported a perceptible reduction in teaching stress attributed to the integration of ITS. This signalizes that it contributes to a more streamlined and

efficient teaching experience.

Table 5. Impact of ITS on Teaching Practices

Option	Subtotal	Scale
Yes	56	69.14%
No	24	30.86%
The number of valid participants	80	

According to the above data table 570% of people feel that the teaching pressure has decreased when using intelligent tutoring systems. This means that most people believe that intelligent tutoring systems have played a positive role in reducing teaching pressure. However, 30% of people also stated that they did not feel any reduction in teaching pressure. This group of people may have a vague impression of the intelligent tutoring system, or have different opinions on the usage and effectiveness of the intelligent tutoring system.

It is worth noting that this data is based on the survey results of 80 valid participants. Overall, this result has a certain degree of representativeness and credibility. However, in order to gain a more comprehensive understanding of the feedback of different groups on intelligent tutoring systems, further research can be conducted on the differences among different age groups, educational backgrounds, subject areas, and other groups in the future.

In addition, in terms of teachers' technical abilities and ITS utilization rate, this discernment is underscored by the revelation that an imposing majority (91.25%) deemed their technical proficiency as pivotal, if not indispensable, in effectively harnessing the potential of ITS in their instructional praxis.

Table 6. Importance of Technical Ability for ITS Utilization

Option	Subtotal	Scale
very important	30	37.04%
Important	43	54.32%
Commonly	6	7.41%
Not important	1	1.23%
The number of valid participants	80	

Based on the data table, we can draw the following conclusions: Among the valid number of participants, 29 people, accounting for 36.25%, believe that technical skills are crucial for effectively utilizing ITS. The number of people who believe that technical ability is important for effectively utilizing ITS is 44, accounting for 55%. The average number of people who believe that technical ability is effective in utilizing ITS is 6, accounting for 7.5%. The number of people who believe that technical ability is not important for effectively utilizing ITS is 1, accounting for 1.25%.

In summary, the majority of people (91.25%) believe that technological capabilities are important or very important for

effectively utilizing ITS. This indicates that the importance of technical capabilities has been widely recognized in the process of utilizing ITS.

3.3.2. Impact of Intelligent Tutoring System on Student Engagement

Table 7. Impact of ITS on Student Engagement

Option	Subtotal	Scale
Yes	70	87.50%
No	10	12.50%
The number of valid participants	80	

According to the above data table 7, when using intelligent tutoring systems, the majority of students (87.50%) reported feeling more actively involved in the classroom. In comparison, a small number of students (12.50%) reported not feeling this way.

Further analysis leads us to the following conclusions:

Most students believe that the intelligent tutoring system has improved their classroom participation because it provides more interactive opportunities and personalized learning experiences. However, approximately 12.50% of students still feel less actively involved, which may be due to their habitual use of traditional teaching methods or skepticism towards new technologies. In the entire data sample, the number of valid respondents was 80, representing approximately 86% of students participating in this survey. This may indicate that most students have sufficient attention and participation in the use of intelligent tutoring systems.

In addition, educators emphasized areas where further development can help improve ITS efficiency and demonstrated unique insights into technological improvements.

Table 8. ITS Features and Enhancements

Option	Subtotal	Scale
Personalized learning path recommendation	59	72.84%
Real-time learning progress tracking	59	72.84%
Personalized homework and practice recommendations	56	69.14%
Student Learning Data Analysis	53	66.67%
Provide additional learning resources and materials	55	67.9%
The number of valid participants	80	

Personalized learning path recommendation and real-time learning progress tracking are the most commonly used functions of intelligent tutoring systems in classroom teaching, accounting for 72.5%. This indicates that intelligent tutoring systems can provide personalized learning paths, helping teachers adjust teaching strategies based on each student's learning progress and abilities.

Personalized homework and practice recommendations, as

well as student learning data analysis, are also important functions of intelligent tutoring systems, with a ratio of 68.75% for each. This indicates that intelligent tutoring systems can provide personalized assignments and exercises based on students' learning situations while also analyzing students' learning data and providing feedback to teachers.

Providing additional learning resources and materials is also an important function of intelligent tutoring systems, accounting for 67.5%. This indicates that intelligent tutoring systems can provide rich learning resources and materials, including text, images, videos, audio, and other forms, to meet the learning needs of different students.

In summary, Intelligent Tutoring Systems (ITS) offer a range of functions, including personalized learning path recommendations, real-time progress tracking, tailored homework and practice suggestions, student data analysis, and access to additional learning resources. These features collectively enhance teaching quality and efficiency, facilitating a deeper understanding and mastery of knowledge. Moreover, while ITS usage may enhance student classroom participation, it is crucial to consider feedback from a subset of students for practical application. Ongoing attention to student input, along with necessary adjustments and improvements, remains essential for educational institutions and developers.

3.3.3. Impact of Intelligent Tutoring System on Classroom Dynamics

Educators aptly discerned an array of benefits intrinsic to the integration of ITS within the classroom milieu. Paramount among these were the provision of personalized learning experiences (85%), a discernible positive impact on academic performance (46.25%), and the augmentation of students' self-directed learning proficiencies (78.75%).

Table 9. Impact of ITS on Classroom Dynamics

Option	Subtotal	Scale
Providing a personalized learning experience that helps meet the needs of different students.	69	85.19%
Has a positive impact on improving students' academic performance	37	46.91%
It has a promoting effect on students' autonomous learning ability.	64	79.01%
There is no obvious advantage in the teaching process, and traditional teaching methods are more effective.	20	24.69%
The number of valid participants	80	

The role of ITS in teaching is diverse, with positive impacts such as personalized learning experiences, improving academic performance, and promoting self-directed learning. ITS helps to meet the needs of different students, which is consistent with providing personalized learning experiences, demonstrating its flexibility and adaptability as a teaching tool. In terms of improving students' academic performance, ITS has a positive impact of 46.25%, indicating that it has a certain effect on improving students' academic performance. In terms of self-directed learning ability, ITS is considered to

have a promoting effect of 78.75%, indicating that ITS can help students improve their self-driving and self-management abilities during the learning process. At the same time, it should also be noted that traditional teaching methods are more effective, and it does not have significant advantages in the teaching process. The possible reason is that traditional teaching methods already have rich teaching experience and good teaching effects, so the role of ITS in teaching cannot be overestimated.

As Ahmad (2011) emphasized in his research on educational organizations and clubs, educational practices and systems hold a pivotal role in shaping the academic landscape. ITS, too, plays a crucial role by redefining the dynamics of the student-teacher interaction, offering personalized guidance, and enhancing the overall learning experience. It brings forth a new dimension in education by adapting to the unique needs of each learner, fostering efficient learning practices, and promoting a holistic approach to skill development.

In summary, the role of ITS in teaching is positive, but it cannot completely replace traditional teaching methods. Its effectiveness needs to be evaluated in conjunction with specific teaching content and objectives.

3.3.4. Impact of Intelligent Tutoring System on Challenges and Barriers

Educators astutely delineated several challenges and barriers likely to impede the seamless integration of ITS within the classroom domain. Foremost among these concerns were the paucity of requisite technical resources (63.75%) and the imperative need for robust training and support mechanisms (67.5%).

Need for more technical equipment: This option accounts for 63.75% of the data, indicating that some teachers may find it difficult to carry out ITS teaching due to a lack of technical equipment. Possible reasons include high equipment costs, insufficient equipment quantity, or outdated equipment. **Lack of effective training and support:** 67.5% of the data supports this viewpoint, indicating that many teachers may not have received sufficient training and support to understand and master ITS. The teaching content is incompatible with ITS: 33.75% of the data selected this option, which may mean that in some cases, the school's teaching content does not match the use of ITS, which may affect students' learning outcomes. **Low trust in ITS:** 27.5% of the data selected this option, which may indicate that some teachers and students may need clarification about the reliability, safety, or effectiveness of ITS. **Other reasons (please indicate):** An option (please indicate) has been filled in detail in this item, accounting for 1.25%. The specific content is not shown in the table and may be mentioned in the original data.

In this regard, Hall (2012) suggests offers a valuable avenue for professional development, equipping teachers with new pedagogical skills and insights into the potential of AI-driven education. Additionally, it empowers them to guide students in navigating the digital age and preparing for careers in an increasingly technology-driven world.

The above data analyzed some challenges or obstacles that it may face in teaching. These factors need to be given sufficient attention and addressed to ensure that they can be effectively applied to teaching, improving teaching quality and effectiveness.

4. Conclusion

In this study, the researchers embarked on a comprehensive exploration of the perceptions of teachers regarding the utilization of Intelligent Tutoring Systems (ITS) in educational settings. Through a mixed-methods approach combining surveys and interviews, we sought to gain a multifaceted understanding of how teachers perceive and engage with ITS.

The research provides valuable quantitative insights into the prevailing attitudes and technological self-efficacy levels among participating teachers. These findings were further enriched by the in-depth interviews, which offered nuanced qualitative perspectives on the challenges, benefits, and potential areas for improvement in ITS implementation. One notable finding was the significant impact of technological proficiency on teachers' willingness and confidence to incorporate ITS into their instructional practices. Additionally, the study highlighted the potential of ITS to cater to diverse learning needs and enhance students' autonomy in the learning process. However, it is essential to acknowledge the challenges that may arise, including concerns about technological compatibility with curriculum content and the need for adequate training and support.

This research provides valuable insights that can inform educators, policymakers, and developers in the ongoing efforts to optimize the integration of Intelligent Tutoring Systems in educational contexts. By addressing the identified challenges and capitalizing on the perceived benefits, we can pave the way for more effective and inclusive learning environments. This study also underscores the importance of ongoing professional development and support for teachers to leverage the potential of ITS fully. As technology continues to evolve, educators must be equipped with the knowledge and skills to harness these tools for the betterment of education. In light of the dynamic nature of technology and education, further research in this area is encouraged to ensure that our practices remain aligned with the evolving needs of both teachers and students.

5. Recommendation

Based on the findings from the analysis of the teacher survey data and discussions, the following recommendations are proposed to enhance the integration of Intelligent Tutoring Systems (ITS) in educational settings through the leadership of instructional leaders and collaborative efforts of teaching and non-teaching personnel:

5.1. Provide Adequate Technical Resources

Ensure that educators have access to the necessary technical resources and infrastructure required for effective utilization of ITS. This includes ensuring the availability of devices, stable internet connections, and IT support.

5.2. Offer Comprehensive Training and Support Programs

Develop and implement training programs that equip educators with the skills and knowledge needed to use ITS proficiently. Provide ongoing support and resources to address any technical challenges or concerns that may arise.

5.3. Align ITS with Instructional Content

Encourage the customization of ITS to align with specific instructional content and curriculum objectives. This will

enhance the relevance and effectiveness of ITS in supporting classroom teaching.

5.4. Emphasize Personalized Learning Experiences

Promote the use of ITS features that enable personalized learning paths, real-time progress tracking, and tailored assignments. This will cater to the diverse learning needs of students.

5.5. Address Privacy and Security Concerns

Implement robust data privacy measures to safeguard sensitive information. Provide transparent information on how student data is collected, stored, and used within the ITS platform.

5.6. Promote ITS as a Complementary Tool

Emphasize that it should complement, rather than replace, traditional teaching methods. Educators should be encouraged to integrate ITS strategically to enhance the overall learning experience.

5.7. Conduct Ongoing Assessment and Feedback

Continuously monitor the impact of ITS on student learning outcomes and gather feedback from educators and students. Use this information to make necessary adjustments and improvements.

By implementing these recommendations, educational institutions can maximize the benefits of ITS, ultimately leading to enhanced learning experiences and outcomes for students.

References

- [1] Ahmad, I. (2011). Educational organizations and clubs: Shaping the academic landscape. *Educational Research Review*, 6*(3), 192-205.
- [2] Qu, J., Liu, K., Hu, X., Yang, P., & Jiang, Z. (2020). Research Status and Trends of Dialogues Based Intelligent Learning Guidance Systems. *Open Education Research*, 04*(4), 112-120. doi: [10.13966/j.cnki.kfjyyj.2020.04.013] (<https://doi.org/10.13966/j.cnki.kfjyyj.2020.04.013>).
- [3] Hall, G. E. (2012). Integrating technology in the classroom: A professional development opportunity. *Journal of Digital Learning in Teacher Education*, 28*(4), 144-149.
- [4] Smith, S. N., Scharber, C., & Wiley, D. (2018). Teachers' use, non-use, and perceptions of an Intelligent tutoring system. *Computers & Education*, 122*, 139-151.
- [5] American Psychological Association. (2020). Ethical principles of psychologists and code of conduct. [<https://www.apa.org/ethics/code/ethics-code-2017.pdf>] (<https://www.apa.org/ethics/code/ethics-code-2017.pdf>).
- [6] Luo, F., Tian, X., Tu, Z., & Jiang, L. (2021). New Trends in Education Evaluation: A Review Of Research on Intelligent Evaluation. *Research on Modern Distance Education*, 05*, 42-52.
- [7] Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. Jossey-Bass.
- [8] Picciano, A. G. (2017). The evolution of big data and learning analytics in American higher education. *Journal of Asynchronous Learning Networks*, 21*(2), 4-13.

- [9] Smith, S. N., Scharber, C., & Wiley, D. (2018). Teachers' use, non-use, and perceptions of an Intelligent tutoring system. *Computers & Education, 122*, 139-151.
- [10] Zhu, S., Yu, L., & Shi, Y. (2017). Intelligent Guidance Systems: Application Status and Development Trends – Interviews with American Intelligent Guidance Experts Ronald Cole, Arthur Glazer, and Professor Hu Xiangen. *Open Education Research, 05*.