The Future of Intelligent Teaching Systems: Bridging the Gap Between Human and AI Instructions

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Abstract

Intelligent Teaching Systems (ITS) perspectives are the subject matter of this paper, specifically focusing on how these systems could be used to improve educational outcomes. The study conducted a survey using educators from different education levels, and the findings showed that it greatly benefits the students in terms of enhancing engagement and exposing learning disparities and individual differences among the learners. Nonetheless, some of the main concerns are data privacy, low usability, and inadequate technical support, which becomes a significant concern to ITS adoption. Privacy was the most bracing issue for 60% of the participants, who were anxious over data privacy and had inherent biases within the algorithms. Several concerns on usability were also raised by educators who reported inadequate training materials and difficulties in incorporating ITS with conventional teaching-learning methods. This work also emphasizes moderation, where ITS supplements human tutor guidance, enabling educators to incorporate flexible system learning while maintaining human affinity, sensitivity, and adaptability. This research provides valuable information on areas needing ITS focus in the future, such as ethical guidelines, proper training, and better access as the groundwork for proper ITS development.

Keywords: Artificial Intelligence, Teaching Patterns, AI and Human Instructions.

Introduction

Over the recent past, AI has emerged as one of the most dynamic invasions that continue to affect a myriad of industries, eventually altering futuristic expectations. More recently, the use of ITS has been identified as a relatively effective tool for application, with the main features tailoring educational processes, efficient use of resources, and enhancing instructional impact with the help of big data and learning analytics (Johnson et al., 2020; Chen et al., 2019). The use of artificial Intelligence in learning processes, including intelligent tutoring systems, automated assessments, and teaching content personalization, has shifted the conventional pedagogy from traditional ways and embodies new prospects and challenges (Luckin & Holmes, 2017). The prospect of ITS improving and supporting human instruction has continued to fuel discussion among scholars, educators, and policymakers on the presence, use, and several relevant considerations of ITS.

Traditionally, ITS could only perform simple actions due to their restricted ability in a rule-based system intended to offer students uniform courses (Anderson et al., 1995). However, with machine learning and data analysis advancements, ITS has transformed into more complex systems that can address particular student's learning requirements in real-time. For instance, these modern ITS can determine the student's existing knowledge, preferred learning mode, and learning progress, then

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adapt content and feedback in real-time (Koedinger et al., 2013). Research has shown that only this level of differentiation is enough to compound learning needs, enhance equity in learning, and ultimately reduce societal inequalities (Kulik & Fletcher, 2016). Due to increasing enrollment and call for individualization across educational institutions worldwide, ITS implementation is conceived as a possibility for better learning achievement, particularly with many diverse students (Chen et al., 2019).

However, despite the benefits that ITS shares, there are disadvantages to these technologies since we know that every advancement has its drawbacks. There is also a risk of distorting the core of teachers' and students' interaction as a significant component of the student's daily social and emotional learning (Holmes et al., 2019). At the same time, human teachers contribute feelings like understanding, flexibility, and analytical thinking abilities, which are hardly imitable by AI systems (Luckin, 2017). As stated by Dede (2020), even though it is effective in performing routine processes and delivering individualized material, they fail to carry out the flexible thinking and interaction that human teachers offer. This realization has forced researchers to consider how it can serve as an addition to conventional teaching and facilitate the integration of AI, where its strengths can be applied without eradicating the valuable human component that makes education unique (Holmes et al., 2019).

Furthermore, the deployment of ITS raises specific ethical and practical issues, namely data privacy, access, and the potential for bias in the algorithms used (Baker & Gowda, 2021). For example, the large amounts of data generated through ITS are issues of student privacy and safeguarding of information. Moreover, technological concerns, such as the disparity of access to that technology and lack of digital literacy, can amplify the existing educational inequity; it has been suggested that schools that lack enough resources may find it hard to apply ITS efficiently (Anderson & Perry, 2019). Such challenges indicate that there is a need for comprehensive rules and standards that will guide the implementation of ITS to ensure that it is implemented autonomously and responsibly to avail its benefits while avoiding vices on the side of it.

This paper aims to analyze the future development of ITS and its ability to close the instructional deficit between human and artificial Intelligence educators. In this evaluation of ITS given its strengths and weaknesses, the following research questions answer how this kind of system can foster personalized instruction, engage students, and supplement human teaching. This study also aims to establish recent ITS advancements, factors affecting ITS implementation, such as educators' attitudes, preparedness, and concerns, and the ethical implications of ITS use in education in light of current technology advances. The roles and responsibilities of human and AI instructors need to be defined to achieve better learning outcomes in the era of intelligent technology, and this study offers an understanding of the strategies with which human-AI collaboration is required in the education sector (Chen et al., 2019; Dede, 2020; Woolf, 2020).

Literature Review

Artificial Intelligence has been implemented in education, which has brought about Intelligent Teaching Systems (ITS); these are systems that help in learner-centered learning, assist the teacher, and improve learning outcomes (Chen et al., 2019). ITS is not a new concept; ITS design first appeared in the early 90s with systems designed to present mostly pre-set, rigid content (Anderson et al., 1995). However, while recent IT developments in communication technologies, machine learning, and data analysis have enhanced ITS, current ITS are complex systems that can proactively address students' needs in real time. It provides the historical development, existing

state, and concern of the ITS system with its effectiveness and ineffectiveness, as well as the ability to fill the gap between human and artificial guidance.

Evolution of Intelligent Teaching Systems

Early intelligent teaching systems relied on the rule-based tutor model, which mimics one-to-one teaching through paths and rules (Anderson et al., 1995). While not very flexible, these systems are revolutionary because they enable educators to automate some of the teaching processes. Anderson et al. (1995) endeavored to create what could be regarded as a "Cognitive Tutor" that could be among the initial ITS shaped to emulate the methodical way of the human tutor. However, these early models increased the students' attention by imposing various structures; they could not solve the learning differences problem more efficiently than the traditional face-to-face instruction method because of its rigidity (Koedinger et al., 2013).

The advanced learning technologies were deemed to be a significant shift in the development of ITS. In contrast to traditional learning, the Adaptive ITS can modify the level of difficulty and content as well as the speed of knowledge delivery depending on the individual results achieved by the student (Chen et al., 2019). Research by Kulik and Fletcher (2016) shows that adaptive ITS, because of the information it gathers, helps improve student performance by pinpointing deficiencies and delivering remedies. Also, ITS, including ALEKS (Assessment and Learning in Knowledge Spaces), works following specific algorithms to personalize the learning path; this concept is practical when it comes to learning such disciplines as math (Holmes et al., 2019). Such systems have made adaptive ITS more popular, especially in universities, due to their large intakes, thus complicating individualized instructions (Kulik & Fletcher, 2016).

ITS and Personalized Learning

Adaptive learning was identified as one of the key distinguishing features of ITS, which entails using technology to differentiate the study process according to students' needs (Luckin & Holmes, 2017). This approach is based on the constructivist learning theory, meaning learners build their knowledge actively rather than kinesthetically receiving it (Piaget, 1964). As we can see, technological tools can even analyze students' performance and recommend the content to be presented. They can also give feedback in real time, which is an aspect that supports active learning (Luckin, 2017). According to Chen et al. (2019), adaptive ITS enhances the learners' interest and willingness to learn more as they consider the material relevant to their needs. These developments argue that it can reach out to numerous learners and adapt to meet their needs at their pace, preferred method, and understanding level.

However, despite these improvements, some constraints remain on how ITSs adapt instructional material. For example, Luckin (2017) claimed that it is regularly based on such simplistic measures as quiz scores or the rates of task completion, which do not reflect the depth of a learner's understanding of the cognitive process involved. Today, it also fails to analyze open responses or create critical thinking abilities, tasks typically inherent to the human teacher (Luckin & Holmes, 2017). Therefore, the ITS paradigm can help in enhancing individualized learning to a high degree, but only if used as an extension of the human factor in education.

Human-AI Collaboration in Education

Another trend that appears to have great potential for ITS development is the focus on the interaction of human tutors and AI agents. Research shows that the best ITS interventions have AI with computing attributes integrated with instructors' emotional and Reasoning talents (Holmes et

al., 2019). For instance, it can be effectively used for administrative work so that teachers can maximize their interventions with learners (Dede, 2020). Holmes et al. (2019) mention that human teachers are relevant, especially for SEL and critical thinking, because AI, for now, remains weak in these areas.

Students' attitudes, too, prove to be more positive when AI instructions are supplementary to conventional human instructions. Kulik and Fletcher (2016) conducted a study, and when students used the AI-human model for learning, their performance and engagement improved than the AI or human-only model. This model of collaborationRegExpresents learners' ZPD according to Vygotsky's (1978) assertion that identifies learners' best learning zone when empowered by knowledgeable G-21 peers. ITS is, therefore, used in this capacity as a supportive layer that facilitates the tracking of learning activities while granting the human teacher the opportunity to take control where necessary.

Ethical and Logistical Challenges in ITS Implementation

Although the principles of ITS hold many advantages, the corresponding practices cause ethical and pragmatic issues. One primary concern is privacy, as it is predicated on gathering and analyzing data about the students in order to make recommendations to them (Baker & Gowda, 2021). This has, however, caused some concerns based on the security and privacy of students' information, particularly the young learners. Ethical considerations also include prejudices in Artificial Intelligence: Lauer (2017) mentioned that prejudices in the algorithms of AI systems mean inequalities in learning and negative consequences for learners; particular groups of students may suffer from this disadvantage (Anderson & Perry, 2019). For example, when an ITS system develops its algorithm on data that are not diverse, it can enhance prejudicial attitudes rather than eradicate them (Holmes et al., 2019).

Despite the ethical issues, practicalities also pose a significant barrier to ITS implementation, particularly in low-resource educational settings (Baker & Gowda, 2021). ITS technology may be best accessed through institutional funding and available infrastructures, leading to education inequality (Anderson & Perry, 2019). Kulik and Fletcher (2016) say that schools in lower-income areas may have a difficult time adopting ITS, resulting in a digital divide that affects their capacity to afford AI-based learning tools. In addition, integrating ITS into the classroom teaching and learning process calls for the professional development of teachers, a factor that many institutions cannot offer (Luckin, 2017).

Future Directions and Emerging Trends

Some of the new trends in ITS research work in an attempt to counter these challenges include the development of ethical AI frameworks and training programs. According to Woolf (2020), the frameworks guiding AI today lack proper student policies to enhance students' privacy in learning institutions and ensure that stakeholders know how AI applications reach their conclusions on critical matters. These policies have the dual mission of building confidence in ITS technologies while at the same time maintaining balance and fulfilling responsibility. Furthermore, professional development programs that prepare educators to employ ITS are also necessary to improve AI-human cooperation's effectiveness. According to Dede (2020), teacher training and fundamental curriculum changes will allow ITS to improve the classroom experience without devaluing direct teaching.

Recent studies also point towards the ITS capability in other education models that can go beyond traditional classroom learning. In this way, ITS can be an effective learning instrument during the

whole learning process because content can be personalized to meet specific learner requirements (Chen et al., 2019). Thus, continual, context-bound learning paradigms propose that it may have a strategic function for learners in the expanding and dynamic nature of the working world (Luckin & Holmes, 2017).

Methodology

Quantitative Survey

This research used a quantitative survey method to establish educators' stance on ITS and the factors that determine ITS implementation. The respondents were asked several questions regarding ITS, its effectiveness in enhancing class performance, and its usability level for students. Also, the survey aimed to identify possible obstacles that may hinder ITS implementation, such as privacy issues, IT constraints, and the demand for teacher education. Through quantitative data collection, this approach allows for a detailed baseline of attitudes and experiences with ITS to identify the effectiveness of ITS in closing gaps between teacher and artificial Intelligence educational delivery.

Survey Design and Structure

The survey was structured into four main sections: These include; (1) demographic details, (2) perceived efficacy of ITS, (3) enjoyment and use of ITS, and (4) apprehensions of ITS. In the demographic portion, questions about the working experience of the respondents, the grade level, specific subjects they teach, familiarity with ITS, and their prior experience using AI-assisted learning tools were asked. There were questions in the second section that asked the educators about ITS to understand how effective it is in enhancing the overall learning of students, contributing to their learning outcomes, and managing and enhancing the efficiency of the classes. The Likert scale questions were widely applied in the survey; most were answered with a scale from 1 (strongly disagree) to 5 (strongly agree). It maintained high uniformity and made the data accessible for analysis because of the systematic format.

In the third portion of the survey, questions addressed ITS accessibility, which the researcher sought to determine whether ITS could become a part of the educators' practice. This section also questioned students' experience, where the subjects probed the effects of observed ITS on student motivation, engagement, and the overall learning experience. For the fourth section, participants were to express their concerns over ITS and threats of adopting ITS, including privacy, technical support requirements to make the ITS work, and issues arising from foreign reliance on AI in the educational sector. At the end of each part of the survey, the respondents were asked additional questions to get more informative answers to the main questions and add some qualitative aspects to the received quantitative data.

Sampling and Data Collection

The target population in this survey involved teachers teaching at different levels of education, from the basic to the tertiary levels, and this was achieved through a representative sampling that considered factors such as teaching experience, educational level, and geographical region. The current study adopted a purposive sampling technique, thus targeting participants who had prior experience using AI-enabled teaching tools so that the current findings of the current study could effectively assess ITS's contribution to education. The participants were contacted and invited to

participate in the survey through educational networks, online forums, and social media channels targeting educators and teachers across all education sectors.

A total of 150 responses were obtained, which is reasonable for statistical analysis sample size for quantitative data analysis. The survey was conducted online to ensure the participants' access and maintain the respondent's anonymity. To improve response rates and data validity, the purpose of the survey was explained to the participants, who were informed that their responses would remain anonymous. The specific procedures include restarting the survey if the participant has not completed the survey within a week of receiving the invitation and sending follow-up reminders when the participant has not responded.

Data Analysis

Data collected from surveys were sorted and cleaned for analysis, and only complete responses were used in the analysis process. Collected quantitative data were analyzed using descriptive and inference statistics to establish similarities and differences between the respondents' groups, including educators from primary, secondary, and higher levels of education. Frequency analysis was used to get the general perception of ITS. In contrast, the t-test and ANOVA were used to establish if the perceptions significantly differed according to some demographic variables, which included teaching experience and familiarity with ITS.

The correlation research design was also used to compare such variables as the degree of ITS usability compared to the perceived degree of its effect on the student's engagement. Data obtained from the open-ended questions were content analyzed, and emerging themes and sub-themes were coded and categorized. This approach allowed the researchers to pinpoint qualitative trends in addition to the numerical results, giving educators a broader vision of ITS.

Limitations of the Quantitative Survey

However, several limitations would be essential to note for the quantitative survey section of this study: First, the use of survey data means that respondents have different ways of perceiving ITS effectiveness or usability due to different experiences. Further, the purposive sampling approach used to access ITS participants may demographically over-represent the targeted educator population. Finally, due to the nature of the survey being administered online, individuals who do not have easy access to the internet, such as educators, might be locked out of the system, thus increasing the prejudices of the results.

Nonetheless, the quantitative survey provides the grounding for examining the educators' views on ITS, and the results presented in this study contribute to the practical and ethical questions and answers for closing the instructional divide between human and artificial Intelligence.

Results

The quantitative survey results highlight educators' perceptions of Intelligent Teaching Systems (ITS), including their effectiveness, usability, and challenges in adoption. This section presents the results in three categories: (1) demographic overview, (2) perceptions of ITS effectiveness, and (3) usability and challenges. Statistical analysis and data visualizations help interpret the responses, offering insights into the factors influencing ITS adoption and its potential to bridge the gap between human and AI-led instruction.

Demographic Overview

Table 1: Demographic Characteristics of Respondents

Demographic Factor	Frequency (n=150)	Percentage (%)
Teaching Experience		
Less than 5 years	45	30.0%
5-10 years	50	33.3%
More than 10 years	55	36.7%
Educational Level Taught		
Primary	40	26.7%
Secondary	60	40.0%
Higher Education	50	33.3%
Familiarity with ITS		
Familiar	85	56.7%
Somewhat Familiar	50	33.3%
Not Familiar	15	10.0%

Table 1 reveals that the majority of respondents (36.7%) have over 10 years of teaching experience, with representation from educators across primary, secondary, and higher education levels. Interestingly, a majority (56.7%) reported familiarity with ITS, indicating a sample that is well-suited for discussing ITS adoption and effectiveness. This familiarity level is significant as it suggests that the participants' responses are grounded in practical experience with or awareness of AI-enhanced educational tools, making their insights relevant for this study.

Perceptions of ITS Effectiveness

Table 2: Perceived Effectiveness of ITS in Improving Personalized Learning and Student Performance

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
ITS improves personalized learning	5.0	10.0	15.0	40.0	30.0
ITS enhances student performance	8.0	12.0	20.0	38.0	22.0
ITS helps identify learning gaps	4.0	6.0	18.0	45.0	27.0
ITS provides useful feedback to students	3.0	5.0	17.0	48.0	27.0

The responses in table 2 indicate generally positive perceptions of ITS in terms of personalized learning and student performance. Notably, 70% of respondents agree or strongly agree that ITS improves personalized learning, and 67% feel that it helps identify learning gaps effectively. These findings highlight the perceived strength of ITS in offering tailored educational experiences that cater to individual needs. However, there is some ambivalence, as approximately 20% of participants responded neutrally to ITS's effectiveness in enhancing student performance, which may reflect varying degrees of ITS effectiveness in different educational contexts.

Figure 1: Perception of ITS in Improving Student Engagement

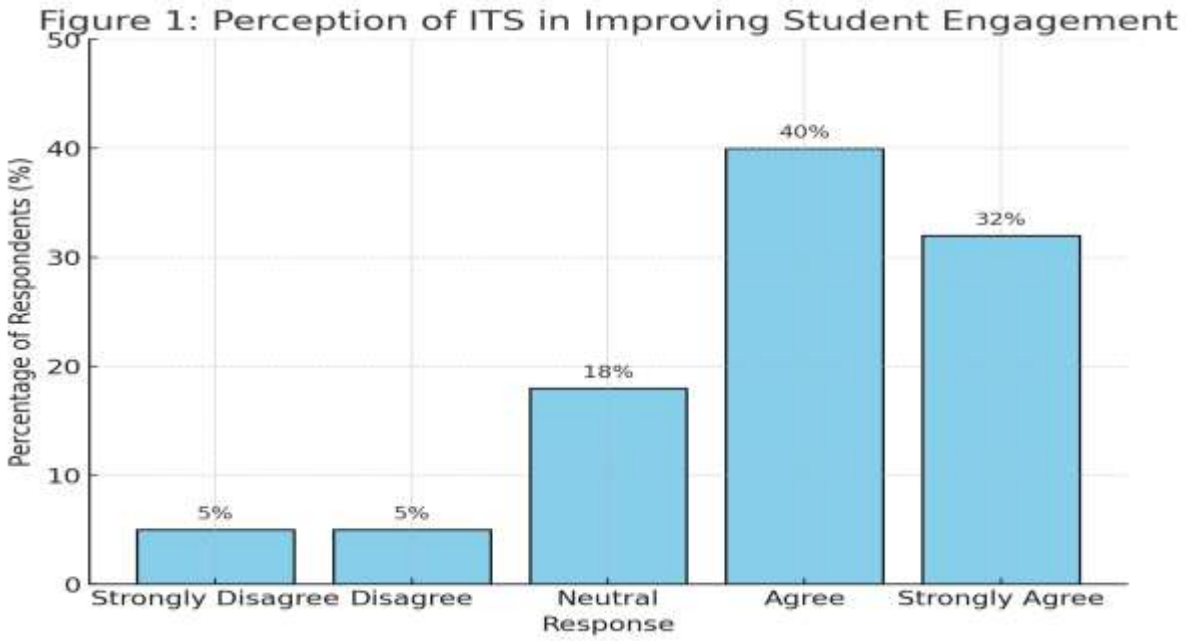

Figure 1 visualizes educators' perceptions of ITS's impact on student engagement, showing that a significant portion (72%) agreed that ITS positively affects student engagement levels. Only a small fraction (10%) disagreed, suggesting that ITS is largely viewed as a beneficial tool for engaging students in the learning process. This perception aligns with ITS's ability to provide immediate, interactive feedback, which often improves student motivation and keeps learners actively involved in their educational journey.

Usability and Challenges

Table 3: Perceived Usability of ITS

Usability Factor	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
ITS is easy to integrate into daily instruction	10.0	15.0	20.0	35.0	20.0
ITS training resources are adequate	15.0	18.0	22.0	30.0	15.0
ITS is intuitive and user-friendly	8.0	12.0	18.0	40.0	22.0

Responses in table 3 reveal mixed opinions on the usability of ITS. While 55% of respondents find ITS easy to integrate, a notable portion (25%) disagreed, suggesting that integration remains challenging for a significant subset of educators. Similarly, only 45% of respondents felt that available training resources are adequate, indicating that insufficient support may hinder ITS adoption. The data underscores a need for enhanced training and usability improvements to make ITS a more accessible tool for educators.

Table 4: Major Barriers to ITS Adoption

Barrier	Percentage of Respondents (%)
Privacy Concerns	60
Lack of Technical Support	50
Training Needs	45
High Cost of Implementation	40
Limited Access to Required Technology	35

Table 4 presents the primary barriers educators face in adopting ITS, with privacy concerns (60%) and lack of technical support (50%) ranking as the most significant issues. Privacy concerns reflect a common apprehension regarding data security, which is critical given the amount of personal and performance-related data ITS systems collect. Similarly, technical support and training needs suggest that educators require more assistance in effectively implementing ITS. These barriers highlight the importance of institutional support and the development of clear policies to facilitate ITS adoption.

Figure 2: Perception of ITS Impact on Teacher-Student Interaction

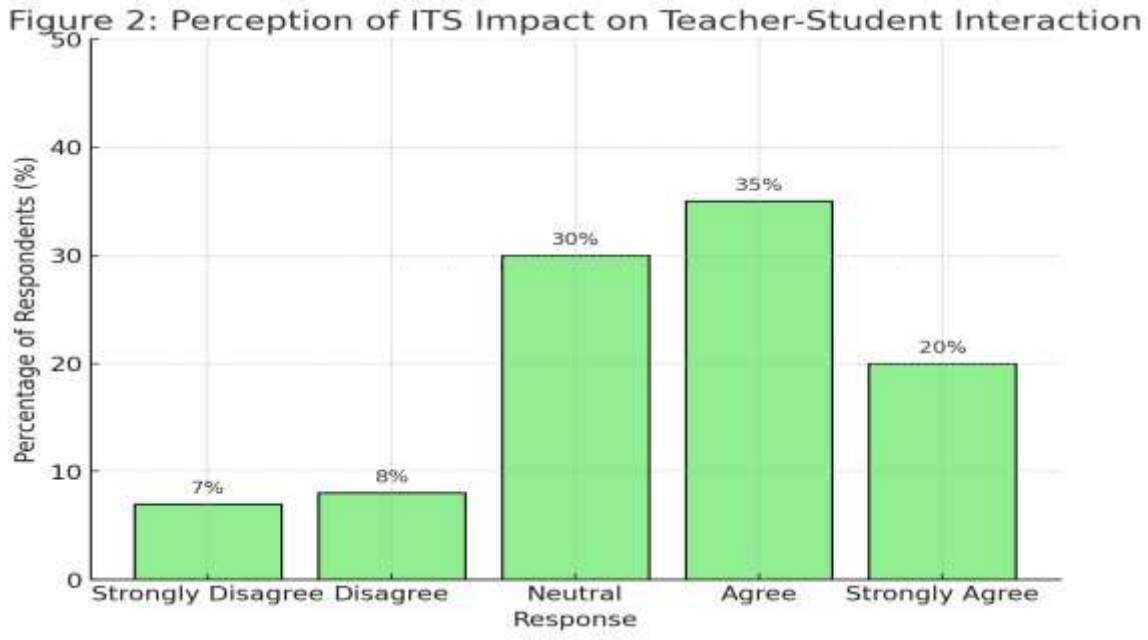

Figure 2 shows that educators hold varied opinions on how ITS affects teacher-student interaction. While 40% agreed that ITS positively influences interactions by allowing teachers to focus on more complex tasks, 30% were neutral, and 15% disagreed, possibly concerned about ITS detracting from the personal aspects of teaching. These results indicate that while ITS has the potential to support instructional goals, its impact on teacher-student dynamics requires careful consideration to ensure that ITS does not hinder meaningful interpersonal connections.

According to the quantitative survey results, educators typically have a positive attitude towards ITS as a tool that improves the efficiency of learning processes by addressing students' individual needs. Technological problems, privacy issues, and help desk support issues are other hurdles that will remain a major push back against the widespread implementation of ITS. Research-wise, the

findings imply that there is a research agenda necessary to enhance usability and privacy concerns to enable ITS to support human instructions adequately.

These findings present a broad picture of ITS based on current educational contexts to enrich future ITS design and developmental directions according to educators' experiences and perceived constructs.

Discussion

The findings of the present research echo the paradigm shift towards the usage of Intelligent Teaching Systems (ITS), specifically concerning the perceived efficiency and user-friendliness of the system as well as the issues that arose during its implementation. Specifically, the teachers and tutors in general appreciate ITS as the tool that could facilitate personalized learning, and students' interest Ins, nevertheless, there are concerns about usability, privacy issues, and technical support. These results accumulate to the previous studies and provide novel information regarding the development of ITS to better suit educators and learners.

ITS Effectiveness and Student Engagement

One of the main findings of this study is a positive attitude towards the effectiveness of ITS in improving the personalization of learning and students' participation. Personalized learning benefited from ITS as perceived by the majority of the respondents (70%) and almost three quarters (72%) of the respondents manifested that ITS enhanced student engagement. This supports previous literature, which has established that ITS may deliver instruction material in a way that accommodates the learning styles of the learner. For instance, using cases of ITS, Chen and colleagues (2019) showed that IT's adaptivity enabled learners to progress through instructional content at their own pace and in a manner that was conducive to learning and motivation. Likewise, Holmes et al. (2019) pointed that it helps ITS systems to keep learners engaged by providing the relevant feedback as they are interactive and immediate in nature.

In addition, consistent with Kulik and Fletcher's (2016) meta-analysis, our study revealed that ITS enhances learning outcomes in comparison with non-ITS instruction. Consequently, personalized learning showed up as among the biggest advantages of ITS in both of the studies, with the educators pointing to its likely effectiveness in personalizing instruction in regard to the learner/students' individual learning needs. However, what must be made clear here is that although ITS can meet personal desire, it cannot offer the complex decision making a human teacher offers as claimed by Luckin (2017). This was touched on in our survey where approximately 20% of the respondents were indifferent towards the ITS in terms of its contribution to students' performance and this could be because such respondents are yet to commit fully to the idea of AI being an opposite solution to learning.

Usability and Integration Challenges

The survey findings show that the usability of ITS is still a cause for concern as reflected by only 55% of the respondents affirming that they were easy to implement ITS into instructions while 25% of the respondents disagreed. This finding aligns with the study by Baker and Gowda (2021) which revealed usability as one of the key factors hindering ITS implementation. In that study, the educators noted challenges in customizing ITS functionalities in relation to the set instructional requirements whereby in most cases the systems were perceived as being complicated or not very responsive in flexibility. Luckin and Holmes (2017) also established that, often ITS are developed without interactive interfaces, making it hard for instructors to integrate ITS in their classrooms.

Inadequate training resources also presented itself another strongly felt barrier in which only 45% of the respondents in our study were satisfied with the ITS training support. As highlighted across the literature, several works demonstrate that PDs are required to facilitate ITS implementation (Woolf, 2020; Dede, 2020). It is not uncommon to have educators learn on the job while implementing new technologies, therefore, ITS needs training to achieve its goal. For example, Dede (2020) indicated that PD is critical in ensuring that instructors can exploit ITS fully; however, he noted that training has to be as dynamic as the ITS being trained. Under these conditions, it is noteworthy that our study reasserts the value of preparing educators to apply ITS in their practice, concluding that massively developing efficient tools for ITS training could make a vast difference to ITS application.

Privacy and Ethical Concerns

The perception by many participants regarding data security involving ITS was identified as the key concern in our survey receiving a 60% vote. This finding is in line with current debates about the impact of AI platforms in education, more specifically, ITS adapts its content and recommendations based on the large amounts of collected data from learners, raising concerns about students' data privacy and protection (Baker & Gowda, 2021). Anderson and Perry (2019) mentioned related challenges claiming that ITS systems might pose risks to students' details with poor data protection measures in place. Privacy issues are also further compounded by the fact that ITS systems are generally opaque and would thus mean that the ITS algorithms used may end up reinforcing biases and providing unfair learning models.

Some of the works mention ITS ethical problems, including those related to the algorithmic bias in decision-making (Holmes et al., 2019). For example, when they develop ITS models by a specified database, it is possible that they may find ITS resumes the bias, as diverse students may experience different learning rates (Anderson & Perry, 2019). To address these issues, Woolf (2020) has urged developers to adopt better ethical standards for ITS, including ethical protocols that respect data science, protection of privacy rights, and IT fairness. This recommendation is in tune with this study, which has highlighted that more understanding of the positive and negative application of ITS in the education sector as well as development of sound privacy policies, and ethical standards in the use of ITS are critical.

Comparisons with Other Studies and Emerging Trends

This paper presents findings that are consistent with prior research to some extent in achieving ITS integration but are also unique in some ways. For example, while Kulik and Fletcher's (2016) study and our findings both support ITS in increasing learners' engagement and personalized learning, our work gives more attention to issues related to ease of use and privacy concerns which teachers face in real-life applications of ITS. This can also mean that there is a need for future ITS design to address complexity or lack of comprehensible design and ethical apprehensions arising with increased development of ITS.

The other practice that is rapidly developing in our study is the concern with the integration of AI in class with an equal balance between human and artificial intelligence. Consequently, the analysis of the open response data revealed that most teachers believed that ITS should augment, rather than supplant, the conventional teaching approach. This opinion can also be accounted for by the fact that the models and recommendations outlined by Holmes et al. (2019) key on the centrality of artificial intelligence's computation muscle with human teacher's emotional intelligence. Dede (2020) noted that even though ITS are capable of automating certain aspects of

instruction, the human touch is still irreplaceable when it comes to nurturing critical thinking and social-emotional competencies, which are not yet in the capabilities of ITS.

Implications for Future ITS Development and Implementation

The result of this study can provide guidelines for future ITS development as follows. First, to effectively solve ITS's limitations, designers should focus on easy-and friendly interfaces, and the provision of appropriate training materials, with which educators can familiarize themselves and adjust their learning processes according to ITS facilities. Moreover, this study emphasizes the necessity of ethics and privacy-preserving mechanisms for the security challenges of ITS. These frameworks must not only protect data privacy but also bring the questions of algorithmic interpretability; which enables educators and students to know how ITS come up with personalized recommendations.

In addition, more ITS diffusion requires policy backing at the institutional and the government levels. Schools also have a significant role to fulfill by setting specific standards regarding ITS application and making sure that its application follows a general objective set for education. As for the policymakers, it was suggested to introduce guidelines for ITS data management and allocate funds for ITS training, which can contribute to reducing some of the barriers of ITS adoption highlighted in this research (Baker & Gowda, 2021).

Conclusion

In conclusion, Intelligent Teaching Systems present a highly promising approach to improve the personalization and interaction in learning contexts, because ITS are only as good as they can be integrated responsibly and within the best interests of privacy and the educators involved. As stated earlier, ITS does provide tailored and most of the organizational material, apart from this, to practice what it preaches, the medium has to be deployed as an aid to human instruction, where it is lacking in areas of care and concern or flexibility. For successful ITS implementation there must be adequate training provided, appropriate interface design work, and strict ethical protocols to protect data integrity and algorithm principles. As technologies advance, ITS has displayed its benefits, and integrating them with the auxiliary advantages of AI human educators can create a more just, efficient learning process at schools.

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