

Original Research Article

Students' and Teachers' Perceptions of Artificial Intelligence for Assessment and Feedback in Grade 10 Mathematics Education: Evidence from Vietnamese High Schools

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Abstract: Artificial Intelligence (AI) is increasingly being adopted in education to enhance assessment and feedback processes. This study investigated the perceptions of Grade 10 students and mathematics teachers regarding the use of AI for assessment and feedback in Vietnamese high schools. A quantitative survey was conducted with students and teachers from several high schools in central Vietnam. Data were collected through structured questionnaires and analyzed using descriptive statistics. The findings indicate that students frequently use AI tools such as ChatGPT and Photomath to support mathematics learning and receive immediate feedback. Both students and teachers generally expressed positive attitudes toward AI, recognizing its potential to improve learning effectiveness, personalize feedback, and reduce teachers' workload. However, concerns were raised regarding the accuracy of AI-generated responses, overreliance on technology, academic integrity, and limitations in digital competencies. The study concludes that AI has significant potential to improve assessment and feedback in secondary mathematics education. To maximize its benefits, schools should strengthen digital infrastructure, provide training for teachers and students, and establish clear guidelines for responsible AI use.

Keywords: Artificial Intelligence, Assessment, Feedback, Mathematics Education, Secondary Education, Vietnam.

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1. INTRODUCTION

Artificial Intelligence (AI) has emerged as one of the most transformative technologies in contemporary education. Recent advances in machine learning, natural language processing, and learning analytics have enabled AI-powered systems to support teaching, learning, assessment, and educational decision-making at unprecedented levels (Ayeni *et al.*, 2024; Holmes *et al.*, 2019). Rather than serving solely as a technological innovation, AI is increasingly recognized as a catalyst for educational transformation, offering opportunities to personalize learning experiences, improve instructional effectiveness, and support data-driven educational practices (Luckin *et al.*, 2016). As educational institutions worldwide continue their digital transformation efforts, AI is becoming an integral component of modern learning environments. Among the various educational applications of AI, assessment and feedback have attracted considerable scholarly attention. Effective assessment is essential for monitoring student progress and informing instructional

decisions, while feedback plays a crucial role in guiding learning improvement and fostering self-regulated learning (Nicol & Macfarlane-Dick, 2006; Shute, 2008). Traditional assessment practices often require substantial teacher effort and may not provide timely feedback to learners. AI technologies have the potential to address these limitations by automating assessment processes, analyzing learner performance data, and generating immediate and personalized feedback (Zhai *et al.*, 2021). Recent studies suggest that AI-enhanced assessment systems can improve the efficiency, consistency, and responsiveness of educational evaluation practices (Hopfenbeck *et al.*, 2023; Nguyen *et al.*, 2023). The role of AI in feedback provision has become particularly significant in contemporary educational research. AI-supported feedback systems are capable of identifying learning difficulties, diagnosing misconceptions, and delivering individualized recommendations based on students' learning behaviors and performance patterns (Wongvorachan *et al.*, 2022; Venter *et al.*, 2025). Through the integration of learning analytics and intelligent educational technologies, feedback can be

delivered continuously and adapted to individual learning needs (Khosravi *et al.*, 2022; Ley *et al.*, 2023). Such capabilities align closely with theoretical perspectives on formative assessment and self-regulated learning, which emphasize the importance of timely, actionable, and learner-centered feedback (Nicol & Macfarlane-Dick, 2006; Panadero, 2017; Zimmerman, 2000). In mathematics education, the potential benefits of AI-assisted assessment and feedback are particularly evident. Mathematics learning requires continuous practice, immediate error correction, and systematic guidance to support conceptual understanding and problem-solving development. Intelligent tutoring systems, conversational AI tools, and adaptive learning platforms have demonstrated considerable potential for enhancing mathematics learning outcomes by providing personalized support and formative feedback (VanLehn, 2011; Heffernan, 2024; Tang, 2025). AI can help students identify errors, understand mathematical concepts, and receive individualized learning support beyond classroom instruction. At the same time, AI technologies can assist teachers in monitoring student progress and making informed instructional decisions.

Despite the growing body of research on AI in education, significant challenges remain regarding its effective implementation in school settings. Concerns related to the accuracy of AI-generated responses, excessive dependence on technology, academic integrity, ethical considerations, and digital readiness continue to be widely discussed in the literature (Holmes *et al.*, 2019; Hopfenbeck *et al.*, 2023; Venter *et al.*, 2025). Furthermore, the success of AI integration depends not only on technological capabilities but also on the perceptions, attitudes, and readiness of key educational stakeholders, particularly students and teachers. Although studies on AI-assisted assessment and feedback have expanded rapidly in recent years, empirical evidence from secondary mathematics education in developing countries remains limited. In Vietnam, research examining how teachers and students perceive the use of AI for assessment and feedback in mathematics classrooms is still scarce. Understanding these perceptions is essential for informing future implementation strategies and educational policies related to AI adoption in schools. Therefore, this study aims to investigate students' and teachers' perceptions of the use of Artificial Intelligence for assessment and feedback in Grade 10 mathematics education in Vietnamese high schools. Specifically, the study explores patterns of AI usage, perceived benefits, challenges, and readiness for AI adoption among both students and teachers. The findings are expected to contribute to the growing literature on AI-enhanced assessment and provide practical implications for educational leaders, policymakers, and practitioners seeking to integrate AI into mathematics education effectively.

2. LITERATURE REVIEW

2.1. Artificial Intelligence in Education

Artificial Intelligence (AI) has become a key driver of educational innovation, enabling more personalized, adaptive, and data-informed learning environments. AI technologies are increasingly used to support instructional delivery, assessment, feedback, learning analytics, and educational management (Ayeni *et al.*, 2024; Holmes *et al.*, 2019). According to Luckin *et al.*, (2016), AI has the potential to transform education by providing individualized learning pathways that respond to learners' needs, abilities, and progress. Rather than replacing teachers, AI serves as a supportive technology that enhances teaching effectiveness and learning outcomes. Recent studies have highlighted the growing integration of AI into educational settings worldwide. AI-powered systems can analyze large volumes of learning data, identify learning patterns, and provide recommendations that support both teachers and students (Roll & Wylie, 2016). Furthermore, smart learning environments equipped with AI technologies facilitate continuous monitoring of learner performance and enable more responsive educational interventions (Spector, 2018). These developments suggest that AI is becoming an important component of educational digital transformation. However, successful implementation of AI in education requires more than technological infrastructure. Researchers emphasize the importance of stakeholder acceptance, digital competence, ethical considerations, and institutional readiness (Holmes *et al.*, 2019). Consequently, understanding how teachers and students perceive AI applications remains a critical area of educational research.

2.2. AI-Assisted Assessment and Feedback

Assessment and feedback are among the most influential factors affecting student learning and academic achievement. Formative assessment enables teachers to gather evidence of learning progress, while effective feedback helps students identify gaps between current and desired performance (Nicol & Macfarlane-Dick, 2006; Shute, 2008). The emergence of AI has significantly expanded the possibilities for educational assessment. AI-powered systems can automatically evaluate student performance, identify misconceptions, and generate immediate feedback based on learners' responses (Zhai *et al.*, 2021). Compared with traditional assessment approaches, AI-assisted assessment offers greater efficiency, scalability, and consistency while reducing teachers' administrative workload (Nguyen *et al.*, 2023). In addition, AI technologies facilitate personalized feedback by analyzing individual learning patterns and adapting responses to students' needs. Wongvorachan *et al.*, (2022) argue that AI has the potential to transform educational feedback from a delayed and generalized process into a timely and individualized learning experience. Similarly, Venter *et al.*, (2025) found that AI-supported feedback can improve student engagement and learning effectiveness when implemented appropriately. Despite these

advantages, researchers have also identified several concerns. These include the reliability of AI-generated feedback, potential biases in algorithms, academic integrity issues, and the risk of excessive dependence on technology (Hopfenbeck *et al.*, 2023; Venter *et al.*, 2025). Therefore, AI should be viewed as a complementary tool that supports rather than replaces human judgment in assessment and feedback processes.

2.3. AI in Mathematics Education

Mathematics education represents one of the most promising areas for AI application due to its structured content, clear learning objectives, and frequent need for formative assessment. AI technologies can support mathematical learning by providing step-by-step explanations, identifying errors, and offering adaptive learning recommendations (VanLehn, 2011). Intelligent tutoring systems have demonstrated significant effectiveness in mathematics instruction. According to VanLehn (2011), well-designed intelligent tutoring systems can produce learning gains comparable to those achieved through human tutoring under certain conditions. More recently, conversational AI technologies have expanded opportunities for interactive mathematical learning by allowing students to receive immediate explanations and guidance during problem-solving activities (Heffernan, 2024). AI also supports mathematics learning through learning analytics and adaptive instructional systems. By analyzing students' learning behaviors and performance data, AI can identify strengths, weaknesses, and learning difficulties, enabling more targeted instructional support (Abu-Raya & Olsher, 2021). Tang (2025) further argues that AI can enhance mathematical understanding, student engagement, and learning personalization, although challenges related to accuracy, equity, and responsible use remain important considerations.

2.4. Theoretical Foundation: Formative Assessment and Self-Regulated Learning

The present study is grounded in theories of formative assessment and self-regulated learning. Formative assessment emphasizes the use of assessment information to support ongoing learning improvement rather than merely measuring outcomes (Shute, 2008). Effective feedback is considered a central component of formative assessment because it helps learners understand their progress and identify strategies for improvement. Nicol and Macfarlane-Dick (2006) proposed seven principles of good feedback practice, highlighting the importance of timely, constructive, and learner-centered feedback. These principles align closely with the capabilities of AI systems, which can provide immediate and personalized responses to learners. The study also draws upon self-regulated learning theory. Zimmerman (2000) defines self-regulated learners as individuals who actively monitor, evaluate, and control their learning processes. Panadero (2017) further emphasizes that effective feedback plays a crucial role in supporting self-regulation by helping learners reflect on

their performance and adjust their learning strategies. Because AI technologies can provide continuous and individualized feedback, they have considerable potential to support the development of self-regulated learning skills in mathematics education.

3. METHODOLOGY

3.1. Research Design

This study employed a quantitative descriptive survey design to investigate the perceptions of Grade 10 students and mathematics teachers regarding the use of Artificial Intelligence (AI) for assessment and feedback in mathematics education. The research focused on examining participants' levels of AI usage, perceived benefits, concerns, and readiness for AI adoption in the context of secondary mathematics education. A cross-sectional survey approach was adopted because it allows researchers to collect data from a large number of participants within a relatively short period and provides a comprehensive overview of current practices and perceptions. The study aimed to generate empirical evidence regarding the opportunities and challenges associated with AI-supported assessment and feedback in Vietnamese high schools.

3.2. Participants and Research Context

The study was conducted in several public high schools in Quang Binh Province, Vietnam. The participants consisted of Grade 10 students and mathematics teachers who were directly involved in teaching and learning activities and had experience or awareness related to the use of AI in education. A total of [N] Grade 10 students and [N] mathematics teachers participated in the study. Students were selected because they represented the primary beneficiaries of AI-supported assessment and feedback, while teachers were included due to their important role in implementing and evaluating AI applications in educational settings. The selection of both groups enabled the study to obtain a comprehensive understanding of AI adoption from both learner and instructor perspectives.

3.3. Research Instrument

Data were collected using two structured questionnaires developed specifically for this study: one for students and one for mathematics teachers.

The student questionnaire consisted of four main dimensions:

1. Frequency of AI use in mathematics learning;
2. Perceived effectiveness of AI-supported assessment and feedback;
3. Benefits of AI in mathematics learning;
4. Challenges and concerns related to AI use.

The teacher questionnaire included four dimensions:

1. Current use of AI in assessment and feedback;
2. Perceived pedagogical benefits;
3. Challenges and limitations of AI implementation;

4. Readiness for future AI adoption.

Most questionnaire items were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). In addition, several demographic and background questions were included to provide contextual information about participants.

3.4. Data Collection Procedures

Data were collected between January and April 2026. Prior to data collection, participants were informed about the purpose of the study and the voluntary nature of their participation. The questionnaires were administered through both online and paper-based formats, depending on school conditions and participant accessibility. All responses were anonymized to ensure confidentiality and encourage honest participation. Completed questionnaires were screened for completeness before being included in the final analysis.

3.5. Data Analysis

The collected data were analyzed using descriptive statistical techniques. Frequencies, percentages, means, and standard deviations were calculated to describe participants’ responses and identify major trends regarding AI usage, perceived benefits, concerns, and readiness for adoption. Mean scores were interpreted according to the following criteria:

- 1.00–1.80: Very Low
- 1.81–2.60: Low

- 2.61–3.40: Moderate
- 3.41–4.20: High
- 4.21–5.00: Very High

The results were subsequently presented through tables and interpreted in relation to existing literature on AI-assisted assessment and feedback in education.

4. RESULTS

4.1. Participant Characteristics

A total of 428 participants were involved in this study, including 404 Grade 10 students and 24 mathematics teachers from five public high schools in Quang Binh Province, Vietnam. The participating schools were Le Thuy High School, Le Truc High School, Phan Dinh Phung High School, Dong Hoi High School, and Phan Boi Chau High School. The inclusion of both students and teachers enabled the study to examine perceptions of AI-assisted assessment and feedback from both learner and instructor perspectives. Table 1 presents the demographic characteristics of the student participants. The sample was relatively balanced in terms of gender distribution, with female students slightly outnumbering male students. Students were selected from five different high schools to ensure diversity in educational contexts and learning experiences. Such a distribution enhances the representativeness of the sample and strengthens the reliability of the findings.

Table 1: Demographic Characteristics of Student Participants

Variable	Category	n	%
Gender	Male	183	45.3
	Female	206	51.0
	Prefer not to say	15	3.7
School	Le Thuy High School	87	21.5
	Le Truc High School	81	20.0
	Phan Dinh Phung High School	74	18.3
	Dong Hoi High School	79	19.6
	Phan Boi Chau High School	83	20.5
	Total	404	100.0

Table 2 summarizes the characteristics of the mathematics teachers who participated in the study. Teachers were recruited from the same schools as the student participants, ensuring consistency in the

educational context investigated. The teacher sample provided valuable insights into the practical implementation of AI-supported assessment and feedback in mathematics education.

Table 2: Characteristics of Teacher Participants

Variable	Category	n	%
School	Le Thuy High School	5	20.8
	Le Truc High School	4	16.7
	Phan Dinh Phung High School	5	20.8
	Dong Hoi High School	4	16.7
	Phan Boi Chau High School	6	25.0
	Total	24	100.0

Overall, the participant distribution indicates that the study obtained data from multiple educational settings and included both key stakeholder groups involved in mathematics assessment and feedback. This diversity provides a comprehensive basis for examining perceptions of AI adoption in secondary mathematics education.

4.2. Students' Readiness for AI Adoption in Mathematics Learning

To address RQ1, students were asked to evaluate their readiness to use Artificial Intelligence (AI) in mathematics learning. Readiness was examined through several indicators related to digital competence, technology usage, and prior experience with AI-supported learning tools. The results are presented in Table 3.

Table 3: Students' Readiness to Use AI in Mathematics Learning

Item	Mean	SD
I am comfortable using digital technology for learning.	3.82	0.81
I frequently use digital devices in my learning activities.	3.80	0.84
I have previously used AI tools for learning purposes.	3.60	0.92
Overall Mean	3.74	0.86

The results indicate that students demonstrated a relatively high level of readiness for AI adoption in mathematics learning. The overall mean score was 3.74, suggesting that most students were generally prepared to engage with AI-supported educational technologies. Among the surveyed items, the highest-rated statement was "I am comfortable using digital technology for learning" (M = 3.82). This finding suggests that students have already developed familiarity and confidence in using digital technologies, providing a favorable foundation for the implementation of AI-supported assessment and feedback systems. The second-highest mean score was observed for "I frequently use digital devices in my learning activities" (M = 3.80), indicating that technology use has become a common component of students' daily learning experiences. The lowest mean score was reported for "I have previously used AI tools for learning purposes" (M = 3.60). Although this score still falls within the moderate-to-high range, it suggests

that direct experience with AI technologies remains less widespread than general technology use. This finding implies that while students possess adequate digital readiness, opportunities for structured engagement with AI-based educational tools are still developing. Overall, the findings demonstrate that Grade 10 students exhibit positive readiness for AI integration in mathematics education. Their familiarity with digital technologies and regular use of digital learning resources provide a supportive context for the adoption of AI-assisted assessment and feedback practices in secondary schools.

4.3. Students' Needs for Assessment and Feedback

To address RQ2, students were asked to evaluate their needs for assessment and feedback in mathematics learning. The questionnaire focused on four key aspects of feedback, including immediacy, detail, error identification, and personalization. The results are presented in Table 4.

Table 4: Students' Needs for Assessment and Feedback

Item	Mean	SD
Need immediate feedback	4.07	0.82
Need detailed explanation	4.18	0.76
Need identification of errors	4.27	0.71
Need personalized feedback	4.12	0.79
Overall Mean	4.16	0.77

The results reveal a very high level of demand for assessment and feedback among Grade 10 students. The overall mean score was 4.16, indicating that students strongly value feedback as an essential component of mathematics learning.

Among the four surveyed dimensions, the highest-rated need was the identification of errors during problem-solving processes (M = 4.27). This finding suggests that students are particularly concerned with understanding where and why mistakes occur when solving mathematical problems. Rather than merely receiving final scores or correct answers, students expressed a strong desire for diagnostic feedback that

helps them recognize misconceptions and improve their problem-solving strategies.

The second-highest mean score was recorded for the need for detailed explanations (M = 4.18). Students expected feedback to go beyond simple judgments of correctness and provide step-by-step guidance that supports conceptual understanding. This result highlights the importance of explanatory feedback in mathematics education, where understanding procedures and reasoning processes is often as important as obtaining correct answers.

The need for personalized feedback also received a high rating (M = 4.12). Students indicated a

preference for feedback that addresses their individual learning difficulties, strengths, and learning pace. Such findings suggest that learners recognize the value of individualized support in improving mathematical performance and fostering independent learning.

Although it received the lowest mean score among the four dimensions, the need for immediate feedback remained notably high (M = 4.07). This result demonstrates that students appreciate timely responses that enable them to correct mistakes and adjust their learning strategies without delay.

Ranking the identified needs from highest to lowest reveals the following order: identification of errors (M = 4.27), detailed explanation (M = 4.18), personalized feedback (M = 4.12), and immediate feedback (M = 4.07). Notably, all mean scores exceeded

4.00, indicating consistently strong agreement across all feedback dimensions.

Overall, these findings demonstrate that students expect assessment and feedback practices to be detailed, personalized, diagnostic, and timely. The high demand for such forms of feedback provides a strong rationale for exploring AI-assisted assessment systems, which have the potential to deliver individualized and immediate feedback at a scale that is often difficult to achieve through traditional classroom practices alone.

4.4. Students' Perceptions of AI-Assisted Assessment and Feedback

To further address RQ2, students were asked to evaluate their perceptions of Artificial Intelligence (AI) for assessment and feedback in mathematics learning. The questionnaire examined three dimensions: perceived benefits, learning support functions, and concerns regarding AI use. The results are presented in Table 5.

Table 5: Students' Perceptions of AI for Assessment and Feedback

Dimension / Item	Mean	SD
A. Perceived Benefits		
AI can improve my learning efficiency.	4.18	0.76
AI helps me understand mathematical concepts more easily.	4.12	0.79
AI makes learning mathematics more engaging.	4.05	0.84
AI can support independent learning.	4.21	0.73
Dimension Mean	4.14	0.78
B. Learning Support Functions		
AI can provide immediate feedback on my answers.	4.25	0.71
AI can explain solutions step by step.	4.22	0.74
AI can help identify mistakes in problem solving.	4.19	0.76
AI can recommend appropriate learning materials.	4.11	0.81
Dimension Mean	4.19	0.76
C. Perceived Concerns		
AI-generated answers may not always be accurate.	3.94	0.89
Students may become overly dependent on AI.	4.08	0.85
AI may reduce students' critical thinking skills.	3.76	0.97
AI may encourage academic dishonesty.	3.89	0.92
Dimension Mean	3.92	0.91
Overall Mean	4.08	0.82

The findings indicate that students generally held positive perceptions of AI-assisted assessment and feedback in mathematics education. The overall mean score of 4.08 reflects a high level of agreement regarding the usefulness and potential value of AI technologies in supporting learning and assessment processes.

Among the three dimensions, Learning Support Functions received the highest rating (M = 4.19). In particular, students strongly agreed that AI can provide immediate feedback on their answers (M = 4.25) and explain mathematical solutions step by step (M = 4.22). These findings suggest that students highly value the capacity of AI to offer timely and detailed support during the learning process. Such capabilities directly address

the feedback needs identified in Table 4 and highlight the practical relevance of AI in mathematics education.

The second-highest dimension was Perceived Benefits (M = 4.14). Students recognized AI as a useful tool for improving learning efficiency, supporting independent learning, and facilitating conceptual understanding. The highest-rated item within this dimension was the belief that AI can support independent learning (M = 4.21), indicating that students view AI as an important resource for self-directed learning beyond the classroom.

Although students expressed generally positive attitudes, they also reported several concerns regarding AI use. The Perceived Concerns dimension obtained a

mean score of 3.92, suggesting a moderate-to-high level of concern. The most prominent concern was the possibility that students could become overly dependent on AI technologies (M = 4.08). Students also questioned the reliability of AI-generated responses (M = 3.94) and acknowledged potential risks related to academic dishonesty (M = 3.89).

Overall, the results demonstrate that students perceive AI as a valuable tool for enhancing assessment and feedback in mathematics learning while remaining aware of potential limitations and risks. The coexistence of strong perceived benefits and notable concerns suggests that successful AI implementation should

combine technological innovation with appropriate pedagogical guidance and responsible-use policies.

4.5. Teachers' Perceptions of AI-Assisted Assessment and Feedback

To address RQ3, mathematics teachers were asked to evaluate their perceptions of Artificial Intelligence (AI) in assessment and feedback practices. The questionnaire focused on the potential pedagogical benefits of AI, including assessment efficiency, workload reduction, feedback personalization, and instructional support. The results are presented in Table 6.

Table 6: Teachers' Perceptions of AI-Assisted Assessment and Feedback

Item	Mean	SD
AI can improve assessment efficiency.	4.29	0.68
AI can reduce teachers' workload.	4.17	0.77
AI can provide timely feedback to students.	4.33	0.64
AI can personalize feedback according to students' needs.	4.25	0.71
AI can support monitoring of students' learning progress.	4.21	0.74
AI can enhance the quality of formative assessment.	4.18	0.76
AI can improve students' engagement in mathematics learning.	4.05	0.83
Overall Mean	4.21	0.73

The findings indicate that teachers generally held positive perceptions toward the use of AI for assessment and feedback in mathematics education. The overall mean score of 4.21 suggests a high level of agreement regarding the educational value of AI-supported assessment practices.

Among the surveyed items, the highest-rated statement was “AI can provide timely feedback to students” (M = 4.33). This result reflects teachers’ recognition of one of the most significant advantages of AI technologies, namely their ability to deliver immediate responses that are often difficult to achieve through conventional classroom assessment. Teachers acknowledged that timely feedback can help students identify mistakes more quickly and improve learning outcomes.

The second-highest rating was recorded for “AI can improve assessment efficiency” (M = 4.29), followed by “AI can personalize feedback according to students’ needs” (M = 4.25). These findings suggest that teachers perceive AI as a practical solution for addressing challenges associated with large class sizes and increasing demands for individualized support. The ability of AI to generate personalized feedback was viewed as particularly valuable in mathematics education, where students often require different levels of guidance and explanation.

Teachers also expressed positive views regarding the role of AI in monitoring learning progress (M = 4.21) and enhancing formative assessment

practices (M = 4.18). These results indicate that AI is perceived not only as a technological tool but also as a pedagogical resource that can support evidence-based instructional decision-making.

Despite the generally favorable attitudes, teachers appeared relatively more cautious regarding the statement “AI can improve students’ engagement in mathematics learning” (M = 4.05), which received the lowest mean score among the surveyed items. Although still within the high-agreement range, this result suggests that some teachers remain uncertain about whether technological innovation alone can increase students’ motivation and engagement. This finding implies that the effectiveness of AI may depend on how it is integrated into pedagogical practices rather than on the technology itself.

Overall, the results demonstrate that mathematics teachers recognize substantial benefits of AI-assisted assessment and feedback, particularly in terms of efficiency, timeliness, and personalization. However, they also appear to maintain a balanced perspective, acknowledging that AI should complement rather than replace teachers’ professional judgment and instructional expertise.

4.6. Challenges of AI Adoption

To address RQ4, both students and teachers were asked to identify potential challenges associated with the adoption of Artificial Intelligence (AI) for assessment and feedback in mathematics education. The findings are presented in Table 7.

Table 7: Perceived Challenges of AI Adoption

Challenge	Students Mean	Teachers Mean
Accuracy of AI-generated responses	3.94	4.21
Academic integrity concerns	3.89	4.17
Overreliance on AI technologies	4.08	4.13
Lack of training and guidance	3.82	4.29
Data privacy and security concerns	3.76	4.04
Limited ability to evaluate AI outputs critically	3.85	4.08
Overall Mean	3.89	4.15

The results indicate that both students and teachers recognized several challenges associated with the implementation of AI in assessment and feedback practices. However, teachers generally reported higher levels of concern across most dimensions than students, suggesting a more cautious perspective toward AI adoption.

Among students, the highest-rated challenge was overreliance on AI technologies (M = 4.08). This finding suggests that students themselves are aware of the potential risk of becoming excessively dependent on AI tools when completing mathematical tasks. The second-highest concern was related to the accuracy of AI-generated responses (M = 3.94), indicating that students do not always fully trust the correctness of AI-provided solutions and explanations.

For teachers, the most significant challenge was the lack of training and guidance for AI integration (M = 4.29). This result highlights the need for systematic professional development programs to support teachers in effectively incorporating AI into assessment and feedback practices. Teachers also expressed substantial concern regarding the accuracy of AI-generated responses (M = 4.21) and academic integrity issues (M = 4.17), reflecting apprehension about the potential misuse of AI and its implications for fair assessment.

A comparison between the two groups reveals notable differences in perceptions. While students were primarily concerned about personal dependency on AI, teachers placed greater emphasis on implementation-

related issues, including professional preparedness, reliability of AI systems, and ethical considerations. The largest gap between the two groups was observed in the item related to training and guidance, where teachers reported considerably higher concern levels than students.

Despite these challenges, none of the identified barriers reached extremely high levels of concern. The overall mean scores of 3.89 for students and 4.15 for teachers suggest that participants generally viewed the challenges as manageable rather than prohibitive. Consequently, the findings imply that successful AI adoption in mathematics education will depend on addressing concerns related to teacher training, responsible use policies, and the development of students' critical AI literacy skills. Overall, the results demonstrate that stakeholders acknowledge both the opportunities and risks associated with AI implementation. While the perceived benefits of AI remain substantial, effective integration requires careful attention to issues of accuracy, ethics, professional capacity, and responsible educational use.

4.7. Readiness for Future AI Integration

To further address RQ4, students and teachers were asked to evaluate their readiness for future AI integration in mathematics assessment and feedback. Specifically, participants reported their willingness to use AI in the future, their support for school-wide AI adoption, and their perceived need for training and professional development. The results are presented in Table 8.

Table 8: Future Readiness for AI Integration

Item	Students Mean	Teachers Mean
Willingness to use AI in future learning and teaching activities	4.18	4.12
Support school adoption of AI for assessment and feedback	4.09	4.25
Need training programs on AI use	4.21	4.38
Confidence in benefiting from AI-assisted assessment and feedback	4.05	4.14
Overall Mean	4.13	4.22

The findings indicate a high level of readiness for future AI integration among both students and teachers. The overall mean scores were 4.13 for students and 4.22 for teachers, suggesting generally positive attitudes toward the future adoption of AI in mathematics assessment and feedback.

Among students, the highest-rated item was the need for training programs on AI use (M = 4.21), followed closely by their willingness to use AI in future learning activities (M = 4.18). These results indicate that students are interested in continuing to engage with AI technologies but also recognize the importance of developing the skills necessary to use such tools

effectively and responsibly. Support for school-wide AI adoption was also relatively strong ($M = 4.09$), reflecting students' openness to broader institutional implementation.

Teachers demonstrated an even stronger readiness for future AI integration. The highest-rated item was again the need for training programs on AI use ($M = 4.38$), representing the highest mean score reported in this section. This finding underscores teachers' recognition that successful AI implementation requires not only technological resources but also adequate professional preparation. Teachers also expressed strong support for school adoption of AI-assisted assessment and feedback systems ($M = 4.25$), suggesting that they view AI as a valuable complement to existing assessment practices. A comparison of the two groups reveals several noteworthy patterns. While students reported slightly higher willingness to use AI personally, teachers expressed stronger support for institutional adoption and professional development initiatives. Both groups consistently rated training as the most important prerequisite for successful AI implementation, indicating a shared awareness that effective AI integration depends on users' competencies and understanding. Taken together, the results from Tables 7 and 8 present an important finding. Although students and teachers acknowledged several challenges associated with AI adoption, their overall readiness for future implementation remained high. This suggests that stakeholders generally perceive the benefits of AI-assisted assessment and feedback as outweighing the potential risks, provided that appropriate support mechanisms, training opportunities, and ethical guidelines are established. Overall, the findings demonstrate a favorable environment for the future integration of AI into mathematics education. The combination of positive attitudes, institutional support, and strong demand for training provides a promising foundation for the development of AI-enhanced assessment and feedback practices in Vietnamese secondary schools.

5. DISCUSSION

5.1. High Student Readiness for AI Adoption in Mathematics Education

One of the most significant findings of this study is the relatively high level of student readiness for AI adoption in mathematics education. The results showed that Grade 10 students were generally comfortable using digital technologies, frequently employed digital devices in their learning activities, and had prior experience with AI-supported tools. These findings suggest that AI is no longer perceived as a novel or unfamiliar technology among secondary school students. Instead, AI is increasingly becoming part of students' everyday digital learning experiences. The high level of readiness identified in this study can be explained by the broader process of educational digital transformation and the growing accessibility of AI-

powered learning tools. Applications such as ChatGPT, Photomath, and other intelligent tutoring systems have become widely available, allowing students to seek explanations, verify solutions, and obtain learning support beyond the traditional classroom environment. As a result, students have developed a degree of familiarity with AI technologies before their formal integration into assessment and feedback practices. This finding is consistent with the argument of Ayeni *et al.*, (2024), who emphasize that AI has become an increasingly important component of personalized learning environments and educational technology ecosystems. The authors suggest that students' willingness to engage with AI is often influenced by their existing digital competence and previous exposure to technology-enhanced learning. Similarly, Holmes *et al.*, (2019) argue that the successful implementation of AI in education depends not only on technological infrastructure but also on learners' readiness to interact with intelligent systems. The relatively high readiness observed in the present study therefore indicates favorable conditions for future AI integration in Vietnamese secondary schools. The findings also align with the perspective of Roll and Wylie (2016), who describe the ongoing evolution of AI in education from experimental systems to practical learning tools that are increasingly embedded in everyday educational practices. The results suggest that Vietnamese students are already participating in this transition and possess the foundational digital competencies necessary for engaging with AI-assisted learning environments. Consequently, the challenge facing schools may no longer be whether students are ready for AI, but rather how educational institutions can guide students toward the effective, ethical, and responsible use of AI technologies in mathematics learning.

5.2. Strong Demand for Personalized and Immediate Feedback

A central finding of this study is the exceptionally strong demand for assessment and feedback among Grade 10 students. The overall mean score of 4.16 indicates that students place considerable value on feedback as an integral component of mathematics learning. More importantly, the highest-rated needs were related to the identification of errors during problem solving ($M = 4.27$) and the provision of detailed explanations ($M = 4.18$). These results suggest that students seek feedback not merely as a mechanism for receiving grades or evaluating performance, but as a learning resource that helps them understand mistakes, improve reasoning processes, and strengthen mathematical understanding. The prominence of error identification is particularly noteworthy in the context of mathematics education. Mathematics learning often involves multi-step procedures in which misconceptions or calculation errors occurring at an early stage can affect subsequent steps and lead to incorrect solutions. Consequently, students need feedback that goes beyond indicating whether an answer is correct or incorrect.

They require diagnostic information that identifies where errors occur and explains how they can be corrected. The high rating of detailed explanations further reinforces this interpretation, highlighting students' desire for feedback that supports conceptual understanding rather than simple performance evaluation. These findings strongly support the theoretical framework proposed by Nicol and Macfarlane-Dick (2006), who argue that effective feedback should help learners close the gap between their current performance and desired learning goals. According to their model, feedback is most valuable when it promotes self-regulation, enables learners to recognize weaknesses, and provides guidance for future improvement. The results of the present study indicate that students actively seek precisely these forms of feedback. The findings are also consistent with Shute's (2008) conception of formative feedback, which emphasizes that effective feedback should be timely, specific, and actionable. Students' strong preference for detailed explanations and error identification reflects a desire for feedback that can be immediately used to improve learning outcomes. Furthermore, the high demand for personalized feedback aligns with Panadero's (2017) review of self-regulated learning models, which highlights the importance of individualized guidance in fostering learners' ability to monitor, evaluate, and regulate their own learning processes. Taken together, these findings suggest that contemporary students expect assessment practices to serve a developmental rather than purely evaluative function. They do not simply want to know how well they performed; they want to understand why they performed in a particular way and how they can improve. This expectation creates a strong rationale for exploring AI-assisted assessment and feedback systems, which have the potential to provide individualized, detailed, and immediate feedback at a scale that is often difficult to achieve through traditional classroom practices alone.

5.3. AI as a Tool for Enhancing Assessment and Feedback

The findings of this study indicate that both students and teachers generally hold positive perceptions of AI-assisted assessment and feedback in mathematics education. Students recognized the potential of AI to provide learning support, facilitate understanding of mathematical concepts, and offer timely assistance during problem-solving activities. Similarly, teachers viewed AI as a valuable tool for improving assessment efficiency, supporting personalized feedback, and reducing the workload associated with monitoring student progress. These findings suggest that key educational stakeholders increasingly perceive AI as a practical resource for addressing some of the longstanding challenges of classroom assessment. One of the most highly valued features of AI identified by both groups is its capacity to provide immediate feedback. In traditional classroom settings, teachers often face difficulties in delivering prompt responses to every student, particularly in large classes. AI-powered

systems can overcome this limitation by generating feedback instantly, allowing learners to identify mistakes and make corrections while learning is still taking place. This finding is consistent with Wongvorachan *et al.*, (2022), who argue that AI has the potential to transform educational feedback by making it more timely, accessible, and responsive to learners' needs. Another important finding concerns the role of AI in supporting personalized feedback. Students expressed strong interest in receiving individualized guidance, while teachers acknowledged the challenges of providing such support within conventional instructional settings. The positive perceptions observed in this study therefore reinforce the argument of Nguyen *et al.*, (2023) that AI can play an important role in formative assessment by adapting feedback to individual learner characteristics and learning needs. Through data-driven analysis of student performance, AI systems can offer targeted recommendations that may be difficult to achieve consistently through manual assessment practices. Teachers also recognized the potential of AI to reduce workload and improve assessment efficiency. This finding aligns with Venter *et al.*, (2025), who reported that AI-assisted feedback systems can help educators manage increasing assessment demands while maintaining the quality and consistency of feedback. By automating routine tasks such as answer checking, error detection, and progress monitoring, AI allows teachers to devote more attention to higher-order instructional activities and pedagogical decision-making. The findings further support the conclusions of Zhai *et al.*, (2021), who identified AI as an emerging technology capable of enhancing assessment practices through automation, personalization, and continuous monitoring of learning performance. However, the results of the present study also suggest that participants view AI primarily as a complementary tool rather than a replacement for teachers. Both students and teachers appear to recognize that while AI can enhance the efficiency and scalability of assessment and feedback processes, effective learning still depends on human guidance, professional judgment, and meaningful teacher-student interaction. Overall, the positive perceptions reported by both stakeholder groups indicate that AI possesses considerable potential to enhance assessment and feedback practices in mathematics education. The findings suggest that AI can help bridge the gap between students' growing demand for individualized, detailed, and timely feedback and teachers' practical capacity to provide such support within contemporary classroom environments.

5.4. Concerns and Challenges of AI Integration

Despite the generally positive perceptions of AI-assisted assessment and feedback, the findings also reveal several concerns and challenges that must be addressed before AI can be effectively integrated into mathematics education. Both students and teachers identified issues related to the accuracy of AI-generated responses, academic integrity, overreliance on AI

technologies, and insufficient training. These findings suggest that stakeholders recognize the potential benefits of AI while remaining aware of its limitations and risks. One of the most prominent concerns involves the accuracy and reliability of AI-generated feedback. Although AI systems are increasingly capable of producing sophisticated explanations and recommendations, they may occasionally generate incomplete, misleading, or incorrect responses. In mathematics education, where conceptual accuracy and procedural correctness are essential, such errors may negatively influence learning outcomes if students accept AI-generated feedback uncritically. This concern supports the argument of Venter *et al.*, (2025), who emphasize that AI-generated feedback should be carefully monitored and complemented by human oversight to ensure educational quality. Concerns regarding academic integrity also emerged as an important challenge. Both students and teachers acknowledged that AI technologies may create opportunities for inappropriate academic practices, such as completing assignments without genuine engagement in the learning process. Similar concerns have been highlighted by Holmes *et al.*, (2019), who argue that the growing use of AI in education requires clear ethical guidelines to ensure that technological support enhances rather than undermines meaningful learning. Another notable finding relates to the risk of overreliance on AI. Students recognized the possibility of becoming dependent on AI-generated solutions, while teachers expressed concern that excessive reliance could reduce opportunities for independent reasoning and critical thinking. This challenge is particularly relevant in mathematics education, where the development of analytical and problem-solving skills remains a central objective. Importantly, the study found that teachers consistently reported higher levels of concern than students across most challenge dimensions. This difference may reflect teachers' greater awareness of pedagogical responsibilities, assessment validity, and the long-term implications of technology integration. In particular, teachers identified the lack of training and professional guidance as a major barrier to successful implementation. This finding aligns with Hopfenbeck *et al.*, (2023), who argue that the effectiveness of AI-supported assessment depends not only on technological capabilities but also on educators' ability to use these tools appropriately within pedagogical contexts. Overall, the findings suggest that the challenges associated with AI adoption are not primarily technological but educational and organizational. Addressing issues of reliability, ethics, dependency, and professional capacity will be essential for ensuring that AI contributes positively to mathematics teaching and learning.

5.5. Implications for Secondary Mathematics Education in Vietnam

The findings of this study have several important implications for the future integration of AI-assisted assessment and feedback in Vietnamese

secondary mathematics education. Given the high levels of student readiness, positive perceptions among both students and teachers, and strong support for future AI adoption, educational stakeholders should consider developing systematic strategies for the responsible implementation of AI technologies in schools. At the institutional level, schools should establish clear guidelines for the use of AI in teaching, learning, assessment, and feedback. Such guidelines should define appropriate uses of AI, address issues related to academic integrity, and clarify the complementary roles of teachers and AI systems. The development of school-based AI policies can help ensure that AI is used as a tool to enhance learning rather than simply automate educational processes. For teachers, the findings highlight the urgent need for professional development programs focused on AI literacy and pedagogical integration. Although teachers generally expressed positive attitudes toward AI, they also reported concerns regarding implementation and training. Therefore, professional learning opportunities should focus not only on the technical operation of AI tools but also on strategies for interpreting AI-generated feedback, evaluating its quality, and integrating it effectively into formative assessment practices. This implication aligns with the work of Heffernan (2024), who emphasizes the importance of preparing teachers to work alongside AI-supported educational systems. For students, the results suggest that AI literacy should become an increasingly important component of mathematics education. Beyond learning how to use AI tools, students need to develop the ability to critically evaluate AI-generated responses, recognize potential inaccuracies, and use AI responsibly to support independent learning. Such competencies are essential for preventing overreliance on technology and promoting informed engagement with AI-supported learning environments. At the policy level, the findings support the integration of AI into broader educational digital transformation initiatives. As noted by Tang (2025), AI is likely to play an increasingly significant role in the future of mathematics education. Consequently, educational authorities should develop frameworks that encourage innovation while ensuring ethical and pedagogically sound implementation. Furthermore, the findings reinforce the recommendations of Khosravi *et al.*, (2022), who argue that AI-enhanced feedback systems should be embedded within comprehensive educational strategies that combine technological innovation, teacher capacity building, and learner support. Overall, the study suggests that the successful integration of AI in Vietnamese secondary mathematics education requires coordinated efforts among schools, teachers, students, and policymakers. By addressing issues of governance, professional development, digital literacy, and policy support, AI can become a powerful tool for improving assessment and feedback practices and enhancing student learning outcomes.

6. CONCLUSION

This study investigated students' and teachers' perceptions of Artificial Intelligence (AI) for assessment and feedback in Grade 10 mathematics education in Vietnamese high schools. Drawing on survey data collected from 404 students and 24 mathematics teachers across five high schools in Quang Binh Province, the study provides empirical evidence regarding stakeholder readiness, expectations, perceptions, challenges, and future intentions related to AI-assisted assessment and feedback. The findings reveal that students demonstrate a relatively high level of readiness for AI adoption in mathematics learning. Most students are familiar with digital technologies and have prior experience with AI-supported learning tools. Furthermore, students expressed a strong demand for detailed, personalized, and immediate feedback, with error identification and explanatory feedback emerging as the most highly valued forms of support. These findings suggest that contemporary learners increasingly expect assessment practices to contribute directly to learning improvement rather than merely measuring performance. The study also found that both students and teachers generally hold positive perceptions of AI-assisted assessment and feedback. Participants recognized the potential of AI to provide timely feedback, personalize learning support, improve assessment efficiency, and facilitate formative assessment practices. At the same time, both groups acknowledged important challenges associated with AI adoption, including concerns about the accuracy of AI-generated responses, academic integrity, overreliance on technology, and insufficient training. Notably, teachers reported higher levels of concern than students, particularly regarding implementation readiness and professional capacity. The study contributes to the growing body of literature on AI in education by providing evidence from the context of secondary mathematics education in Vietnam, a setting that remains underrepresented in international research. The findings extend previous studies by demonstrating that stakeholder readiness and demand for AI-supported feedback are already evident at the high school level. The results also highlight the importance of viewing AI not as a replacement for teachers but as a complementary tool capable of enhancing assessment and feedback processes. Several limitations should be acknowledged. First, the study was conducted in a single province, which may limit the generalizability of the findings to other regions of Vietnam. Second, the research relied primarily on self-reported survey data and therefore reflects participants' perceptions rather than actual classroom practices. Future studies could employ mixed-methods approaches, incorporate classroom observations or interviews, and examine the effectiveness of specific AI-powered assessment systems in improving mathematics learning outcomes. In conclusion, the findings suggest that Vietnamese secondary schools possess favorable conditions for the integration of AI-assisted assessment and feedback. With appropriate policies, teacher training, ethical guidelines, and AI

literacy development, AI has the potential to enhance the quality of mathematics assessment, support personalized learning, and contribute to ongoing educational digital transformation efforts in Vietnam.

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