THE IMPACT OF FORMATIVE ASSESSMENT FACTORS ON STUDENTS' MOTIVATION IN THE AGE OF ARTIFICIAL INTELLIGENCE: A CASE STUDY IN A VIETNAMESE HIGHER EDUCATION INSTITUTION

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Abstract: *Motivation is an influential factor in the teaching-learning situations (Filgona et al., 2020); moreover, it is a key determinant of effective learning outcomes. In learning, formative assessment provides teachers with more frequent evidence of students' mastery of standards, it helps them make useful instructional decisions. In this way, formative assessment is designed to improve students' academic progress (Stiggins, 2005). This paper aims to investigate how formative assessment influences students' motivation at a university in Vietnam amid the backdrop of artificial intelligence (AI) integration in education. A theoretical framework of formative assessment and motivation in learning was used in this descriptive study. Employing a quantitative approach, the study utilizes a questionnaire to collect data from 402 students of the Faculty of Foreign Languages at this university. The research explores students' experiences and perceptions regarding formative assessment and AI-supported feedback mechanisms. Preliminary findings indicated students' motivation were influenced by six factors relating to formative assessment, namely Feedback, Peer assessment, Classroom activities, Use of AI, Teacher's role, and Learning environment. These six factors collectively enhance students' motivation by cultivating active participation, self-directed learning, and a belief in improvement - essential elements for consistent academic progress and achievement, in which such factors as Use of AI, Teacher's role, and Classroom activities have the highest positive impacts on students' motivation. The study also offers some recommendations on formative assessment to promote motivation in learning of students of the Faculty of Foreign Languages at the university.*

Keywords: *assessment, formative assessment, learning, students' motivation*

INTRODUCTION

Education has changed a lot with the rise of artificial intelligence (AI). As more teachers use AI tools, formative assessment - a way to check student progress and give feedback during learning - has become even more important. It helps keep students motivated and engaged in their learning (Black & Wiliam, 1998). Now, with AI being used in teaching, it's worth studying how formative assessment affects students' motivation in this new learning environment.

Studies show that good formative assessment helps students take control of their learning and stay motivated (Nicol & Macfarlane-Dick, 2006). Research also suggests that quick, helpful feedback - especially when supported by AI - can keep students engaged by showing them their progress. Similarly, Hattie and Timperley (2007) find that clear feedback, along with well-defined learning goals, plays a key role in improving student performance and motivation.

In recent years, studies have increasingly focused on AI's role in personalizing feedback within formative assessments. For instance, research by Wang *et al.* (2024) indicates that AI-driven adaptive learning platforms can analyze individual student performance data to provide customized feedback, promoting higher levels of engagement and motivation. Such adaptive technologies not only appeal to diverse learning styles but also empower students by granting them autonomy over their learning paths. As we venture further into the age of AI, the imperative to integrate these tools thoughtfully into formative assessment practices becomes increasingly clear. Luckin (2018) explores how AI improves formative assessment with instant feedback and customized learning. It shows AI helps students learn independently by adjusting lessons based on their performance. However, it stresses that human supervision is crucial for ethical and practical use. Holstein *et al.* (2019) investigate how AI provides feedback in classrooms. Students like quick, tailored responses, but teachers want AI results to be clear and easy to understand. The research suggests combining AI tools with teacher input

to get the best results - using technology for speed and personalization while keeping educators in control for better judgment and support.

Motivation in learning is complex, with theories like Self-Determination Theory (Deci & Ryan, 2000) highlighting autonomy, competence, and relatedness as key drivers. AI can boost motivation by personalizing learning to match students' interests and needs. Understanding how AI-powered formative assessments support these factors is essential for creating better educational tools.

When looking at how AI can support formative assessment, it's helpful to examine different learning environments. A 2024 study by Cuevas and others in higher education found that smart tutoring systems boost motivation by giving instant feedback and interactive tasks. The research shows that when students see assessments as a way to learn rather than just a test, they engage more with the material. Furthermore, Su et al. (2022) emphasize the importance of formative assessment in fostering a growth mindset among younger learners, enabling them to view challenges as opportunities for improvement. AI technologies can facilitate this process by offering formative assessments that help students set realistic goals and track their progress, thereby reinforcing their motivation to learn. The neural networks and machine learning algorithms underlying many AI applications can significantly enhance the feedback loop in formative assessments. According to research by Heffernan and Heffernan (2014), systems that incorporate immediate feedback lead to higher student engagement and motivation. When students receive real-time, informative responses to their performance, they are more likely to understand their strengths and areas needing improvement, fostering a greater sense of competence and increased motivation to persist in their studies. Finally, it is essential to address potential challenges associated with integrating AI into formative assessments, such as digital equity and data privacy. Studies by Selwyn (2019) underscore the importance of addressing these factors as educational institutions adopt AI solutions. Ensuring equitable access to technology and maintaining the ethical use of student data are critical

for achieving the motivational benefits of formative assessment in an AI-enhanced environment.

In conclusion, the integration of AI into formative assessment represents a significant advancement in educational practices, offering unprecedented opportunities to enhance student motivation and engagement. By understanding the synergies between formative assessment, motivation, and emerging AI technologies, educators can create a more responsive and dynamic learning environment.

Although there have been many studies on AI used in assessment and brought many benefits in teaching and learning, at the university where we have been working, there has not been any scientific research on this field. For this reason, we boldly conducted the research with the title "The Impact of Formative Assessment Factors on Students' Motivation in the Age of Artificial Intelligence".

This study aims to investigate the impact of formative assessment on students' motivation in learning English in the age of AI. Specifically, the research explored the following research questions:

- What are students' perceptions of formative assessment in the age of AI?
- To what extent does formative assessment influence students' motivation in the age of AI?
- Is there a difference in learning motivation between male and female students?
- Is there a difference in learning motivation between students of different academic years?

By addressing these research questions, this study seeks to contribute to the growing body of knowledge at the intersection of AI, formative assessment, and student motivation. The findings provided valuable insights for educators, policymakers, and researchers, informing the development and implementation of effective AI-powered formative assessment strategies.

LITERATURE REVIEW

This section explores literature that outlines theories on formative assessment, learning motivation, and the factors influencing them, forming the foundation of the study's conceptual framework

Definition of Formative Assessment

In the view of Black and Wiliam (1998, p.7), formative assessment is "all those activities undertaken by teachers and/or by their students that provide information to be used as feedback to modify the teaching and learning activities in which they are engaged". According to Sadler (1989), formative assessment focuses on using feedback from student work to guide and enhance their skills. Rather than having students learn by making mistakes, it gives them focused help to improve faster. Formative assessment intends to provide information on "what, how much and how well students are learning (Angelo & Cross, 1993)".

Motivation in Learning

As highlighted by Deci and Ryan (2000), motivation in learning is considered as how much someone does something because they enjoy it, not just for external rewards. They highlight intrinsic motivation, which comes from meeting three key needs: feeling capable (competence), having control (autonomy), and feeling connected (relatedness). When these needs are met, motivation and learning improve.

Nicholls (1984) asserts that motivation is the desire to succeed in learning activities. He believes motivation depends on how much someone values success and how confident they are in their abilities. Social factors and a sense of competence also play a big role in motivation.

Based on the findings of Bandura (1997), motivation in learning is a function of self-efficacy beliefs, which reflect individuals' confidence in their ability to achieve desired outcomes. He suggests that higher levels of self-efficacy lead to greater motivation and persistence in learning tasks. According to Bandura (1997), individuals with strong

self-efficacy are more likely to set challenging goals, persevere through difficulties, and ultimately achieve better learning results.

Factors Affecting Motivation in Learning

Various research studies, both domestic and international, have explored the factors influencing students' motivation for learning through formative assessment, emphasizing the intricate relationships among these factors and their impact on students' educational journeys. This study adopts a theoretical framework of formative assessment that includes six essential components.

Feedback

As stated in Hattie and Timperley's (2007) study, feedback is very important for learning. They explain that feedback is more than just giving grades; it plays an important role in helping students understand their performance and identify areas where they can improve. They classify feedback into different types: focused on the task, the process, and self-regulation. Effective feedback boosts students' confidence and motivation. When feedback is specific and given promptly, it helps students stay engaged and enhances their understanding.

Peer assessment

Research by Topping (2009) indicates that peer assessment helps students stay engaged and motivated in their learning. When students evaluate classmates' work, they get different viewpoints, which makes them more responsible for their own learning. This process also encourages them to think about what they've learned and express their understanding, boosting their confidence and motivation in learning.

Classroom activities

In the scientific work of Garrison and Vaughan (2008), interactive classroom activities play a key role in formative assessment. They believe that working together on meaningful tasks creates a more

engaging learning atmosphere. When students actively participate and learn cooperatively, they feel more connected to both the material and their peers, which boosts their motivation to learn.

Use of AI

Based on the findings of Cuevas et al. (2024) AI can provide personalized feedback in formative assessments. They reveal that AI technologies enhance student motivation by delivering tailored feedback that addresses individual learning needs. The study emphasizes that real-time, adaptive feedback encourages active engagement and helps students feel more competent, thereby improving their overall learning outcomes.

Teacher's role

From the perspective of Wiliam (2011), he emphasizes how important teachers are in making formative assessments effective. He points out that teachers need to be good at using assessment results to guide their teaching and change their methods when necessary. When teachers build strong, supportive relationships with their students, it creates a positive classroom atmosphere. In such an environment, students feel comfortable taking risks and sharing their thoughts, which boosts their motivation and involvement in learning.

Learning environment

Students need a supportive environment to boost their motivation. According to Martens et al. (2020), they believe that student's motivation improves significantly when they experience autonomy, competence, and relatedness, which are the core components of Self-Determination Theory. The study shows that a well-structured classroom promotes effective participation of individuals and teamwork, both of which are important for formative assessment. In such an environment, students are more likely to engage in their learning, as a consequence gaining confidence and desire to make a contribution.

This study investigated six factors: feedback, peer assessment, classroom activities, use of AI, teacher's role, and the learning environment. They are interconnected and collectively influence students' motivation through formative assessment. In the scientific research of Zaky (2023), feedback plays a crucial part as a cornerstone that can offer students clarity on their progress and areas for improvement. Effective and actionable feedback uplifts intrinsic motivation and guides students toward a clearer path for success. Peer assessment, meanwhile, fosters cooperation and accountability as students evaluate their own work with their teamwork that can enhance their learning results (Bedford et al., 2007). As stated by Saban (2022), classroom activities also play a crucial role in maintaining motivation. Interactive and meaningful activities stimulate students' participation and cognitive involvement, ensuring that the learning process remains dynamic and engaging. In the view of Syifauddin and Yuliansyah (2023), the integration of AI further enhances the learning experience by offering personalized, real-time feedback tailored to individual needs and preferences. This use of adaptive technology not only increases students' sense of competence but also empowers them to take ownership of their learning. The role of teachers is equally significant in creating a motivating learning environment. Teachers who foster positive relationships, encourage open communication, and provide opportunities for constructive risk-taking create a classroom climate where students feel supported and motivated to engage (Davion, 2017). Finally, a well-designed learning environment (Kaplan & Patrick, 2016), characterized by autonomy, collaboration, and emotional support, helps students maintain their focus and commitment to learning.

Together, these six factors form a comprehensive framework for fostering student motivation. By addressing these elements effectively, formative assessment can become a powerful tool for improving educational practices and ensuring meaningful student engagement.

METHODOLOGY

Research Design

This study employed a quantitative research design to evaluate the impact of formative assessment on students' motivation to learn English. A survey-based approach was used, with a structured questionnaire (see appendix) serving as the primary data collection tool. We designed the questionnaire based on six formative assessment factors that influence student motivation to gather insights into students' experiences and perceptions of formative assessment practices and their influence on motivation. Administering the survey ensured systematic and reliable data collection across different academic years, enabling comprehensive analysis of the study's key variables.

Participants

The target population for this study consisted of undergraduate students enrolled in English courses at a Vietnamese higher education institution during the academic year 2023-2024. Of the 410 distributed questionnaires, 402 were completed and considered valid for analysis, including 124 freshmen, 139 sophomores, and 139 juniors. This sample size was chosen to ensure adequate statistical power and to provide a reliable representation of the student population.

To achieve proportional representation and reduce potential bias, a stratified random sampling method was employed. This approach ensured that students from each academic year were appropriately represented in the study. The stratified sampling method also facilitated the inclusion of diverse perspectives regarding formative assessment and its impact on student's motivation, thereby enhancing the validity and generalizability of the study's findings.

Data Collection Tool

This study employed a quantitative approach to assess students' motivation in learning English through formative assessment in the age of Artificial

Intelligence. A questionnaire was chosen as the primary data collection tool due to its efficiency in gathering large amounts of data and its ability to maintain anonymity, thereby encouraging honest responses from participants. According to Wilson and McLean (1994), questionnaires offer a cost-effective and time-efficient way to collect data from a large group of participants, while Nunan (1999) highlights their applicability in diverse educational contexts, making them ideal for this study.

The questionnaire was designed based on a review of existing literature and relevant theories to ensure it covered key aspects of the study. Items were carefully designed using simple, clear language to match the research objectives. To validate the instrument, experts reviewed it for relevance and clarity, then a pilot test refined ambiguous items. Reliability was confirmed via Cronbach's Alpha ($\alpha \geq 0.7$) to ensure internal consistency. Final adjustments improved validity before full deployment. This rigorous process ensured an accurate, reliable tool for data collection.

The questionnaire consisted of two main sections. The first section focused on formative assessment factors, designed to assess six key elements that could potentially influence students' motivation. Each of these factors was measured through specific items rated on a 5-point Likert scale, with responses ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The six factors explored in this section were:

- Factor 1: Feedback (5 observed variables)
- Factor 2: Peer Assessment (5 observed variables)
- Factor 3: Classroom Activities (5 observed variables)
- Factor 4: Use of AI (5 observed variables)
- Factor 5: Teacher's Role (5 observed variables)
- Factor 6: Learning Environment (5 observed variables)

The second section of the questionnaire assessed students' motivation, with a particular focus on their engagement with English learning. Similar to the first section, this part also utilized a 5-point Likert scale

to measure responses, allowing for a consistent approach in evaluating the dependent factor, namely students' motivation.

- Dependent factor: Students' Motivation (5 observed variables).

Data Collection Procedure

The questionnaire was distributed to 410 undergraduate students at a Vietnamese higher education institution. Before distributing the questionnaire, the researcher explained the purpose of the study to the participants and provided clear instructions on how to complete the questionnaire, with a response time of approximately 20 - 30 minutes. Data collection took place over three weeks, allowing sufficient time for participants to provide thoughtful and accurate responses. A total of 410 students completed the survey, yielding a response rate of 100%. However, 402 were successfully filled out and used for the study.

Data Analysis

The survey responses were analyzed using SPSS software to carefully and thoroughly evaluate students' answers. Descriptive statistics, such as average scores and standard deviations, were used to summarize the data. This helped show how students viewed formative assessment and how it affected their motivation.

To check if the measurement tools were reliable, we used Cronbach's Alpha for the Likert-scale questions. This helped us see how consistent the questions were within each section of the survey, making sure they accurately measured what they were supposed to.

Further analysis was conducted using Analysis of Variance (ANOVA) to compare motivation levels across different groups. The ANOVA tests allowed for a deeper exploration of how various independent factors, such as academic year and gender, influenced students' motivation. By examining significant differences between and within these groups, the study was able to draw meaningful conclusions about the role of formative assessment in motivating students across diverse contexts.

FINDINGS AND DISCUSSION

Characteristics of the Sample

The study analyzed 402 valid responses from participants. Among these, 21.6% were male, and 78.4% were female. Regarding academic years, 30.8% of the respondents were freshmen, 34.6% were sophomores and 34.6% were juniors. This distribution ensured an equitable representation of both gender and academic year, allowing the survey findings to capture a diverse range of viewpoints regarding students' motivation for learning.

Factors Affecting Students' Motivation

The analysis revealed that all six factors - Feedback, Peer Assessment, Classroom Activities, Use of AI, Teacher's Role, and Learning Environment - had Cronbach's Alpha coefficients greater than 0.7, indicating high reliability of the observed variables. These factors demonstrated significant positive impacts on students' learning motivation, as presented in Table 1.

Table 1: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-0.037	0.204		-0.181	0.856	-0.438	0.364
	FB_total	0.036	0.035	0.038	1.038	0.005	0.032	0.105
	PA_total	0.109	0.038	0.110	2.831	0.005	0.033	0.184
	CA_total	0.175	0.038	0.181	4.636	0.000	0.101	0.250
	UAI_total	0.512	0.042	0.478	12.066	0.000	0.429	0.596
	TR_total	0.180	0.035	0.198	5.138	0.000	0.111	0.248
	LE_total	0.021	0.028	0.027	755	0.005	0.025	0.033

Source: Data analysis with SPSS, September 2024

The positive coefficient suggests that feedback has a beneficial effect on motivation, with its significance level (p-value = 0.005) indicating that this effect is statistically significant. This finding raises important questions about the type and quality of feedback being provided. While constructive feedback typically enhances learning and motivation, overgeneralized or infrequent feedback - ranked 5th in influence among the six factors - may fail to effectively engage students. To maximize the impact of feedback on motivation, educators should prioritize providing frequent, personalized, and specific feedback that addresses students' individual needs and fosters their growth.

The coefficient for peer assessment reveals a significant positive impact on student motivation, with a p-value of 0.005 indicating a strong relationship. Peer assessment fosters a collaborative learning environment where students can engage in meaningful discussions about their work, enhancing both their understanding and motivation. The findings suggest that educators should develop structured peer assessment activities that promote accountability and provide opportunities for constructive peer feedback, thereby increasing student engagement and motivation.

Classroom activities demonstrate the highest positive coefficient among the factors analyzed, with a statistically significant p-value (p = 0.000). This highlights a strong correlation between engaging classroom activities and increased student motivation. Active participation in diverse and interactive settings, such as group work, hands-on activities, or problem-solving tasks, drives student interest and investment in their learning. Educators should prioritize varied instructional strategies that stimulate engagement, creativity, and collaboration to maximize the motivational impact of classroom activities.

The use of AI in education exhibits an exceptionally high positive impact on student motivation, supported by significant t-values and p-values.

This indicates that integrating AI tools can create more personalized learning experiences tailored to individual student needs and preferences. AI technologies can offer immediate feedback, adaptive learning paths, and engaging content delivery. Educators are encouraged to implement AI-based tools to provide customized educational experiences, thereby boosting motivation and enhancing learning outcomes.

The teacher's role also shows a statistically significant positive coefficient ($p = 0.000$), indicating that current teacher practices effectively motivate students. This could reflect strong alignment between teacher actions and students' needs or a positive rapport in teacher-student relationships. To further enhance motivation, professional development for teachers focusing on engagement strategies, relationship-building, and creating a supportive classroom climate could be highly beneficial.

Conversely, the coefficient for the learning environment is notably low and not statistically significant ($p = 0.005$ and $\beta = 0.027$). This suggests that the current learning environment may not adequately foster student motivation. Issues such as classroom layout, resources, and emotional support may need reassessment to create a more conducive atmosphere for learning. Educators should focus on enhancing both the physical and emotional aspects of the learning environment, ensuring it is inclusive, engaging, and supportive for all students.

In summary, the analysis indicates that the use of AI, the teacher's role, and classroom activities significantly and positively impact student motivation. Peer assessment and feedback demonstrate weaker connections to motivation, while the learning environment shows minimal influence, highlighting areas for improvement in fostering an optimal motivational framework.

The Difference in Motivation among Gender Groups

Table 2: Descriptives

M_total								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	87	3.6322	0.57859	0.06203	3.5089	3.7555	2.20	4.60
Female	315	3.6610	0.62094	0.03499	3.5921	3.7298	1.60	4.80
Total	402	3.6547	0.61144	0.03050	3.5948	3.7147	1.60	4.80

Source: Data analysis with SPSS, September 2024

Table 3: ANOVA

M_total					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.056	1	0.056	0.151	0.698
Within Groups	149.860	400	0.375		
Total	149.916	401			

Source: Data analysis with SPSS, September 2024

Table 2 presents the mean motivation scores for male and female students. The mean score for male students is 3.6322, indicating a relatively positive view of motivation, though it is slightly lower than the mean scores reported by some academic year groups. The standard deviation suggests a moderate level of variability in responses among male students. Female students report a marginally higher mean score of 3.6610, reflecting a slightly more optimistic view of motivation compared to their male counterparts. The standard deviation for female students is comparable to that of males, indicating similar levels of response variability between the two groups.

The 95% confidence intervals show that the true mean for male students' motivation lies between 3.5089 and 3.7555, while for females, it ranges from 3.5291 to 3.7289. The overlap between the confidence intervals indicates the need for statistical testing to determine whether the observed differences are significant. The p-value (Sig = 0.698) in Table 3 confirms that the differences in mean motivation scores between male and female students are not statistically significant. This suggests that gender does not have a meaningful impact on students' motivation levels based on the data.

Furthermore, the very small sum of squares between groups (0.056) compared to the sum of squares within groups (149.860) reinforces that the variability in motivation scores within each gender group is much larger than the variation between groups. This suggests a general consensus in motivational levels among males and females within their respective groups.

Although female students report a slightly higher mean motivation score, the lack of statistical significance implies that these differences are not practically meaningful. Overall, male and female students exhibit similar motivational levels, with only minor variations that are unlikely to affect the broader conclusions of the study.

The Difference in Motivation among Students of Different Academic Years

Table 4: Descriptives

M_total								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
FIRST	124	3.7274	0.55719	0.05004	3.6284	3.8265	2.20	4.60
SECOND	139	3.7554	0.56365	0.04781	3.6609	3.8499	2.40	4.80
THIRD	139	3.4892	0.67035	0.05686	3.3768	3.6016	1.60	4.60
Total	402	3.6547	0.61144	0.03050	3.5948	3.7147	1.60	4.80

Source: Data analysis with SPSS, September 2024

Table 5: ANOVA

M_total					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.872	2	2.936	8.133	0.000
Within Groups	144.044	399	0.361		
Total	149.916	401			

Source: Data analysis with SPSS, September 2024

The p-value (Sig. = 0.000) in Table 5 indicates significant differences between at least two of the groups. A p-value below 0.05 suggests that the null hypothesis can be rejected, meaning that at least one group's mean differs significantly from the others. The F-value (8.133) indicates a strong effect, as a higher F-value typically reflects larger differences among group means relative to the variability within groups. The ANOVA test evaluates whether there are statistically significant differences in mean motivation scores among the three academic years. The analysis shows that first- and second-year students have higher mean scores compared to third-year students, suggesting that students' motivation varies significantly across academic years, with first- and second-year students demonstrating higher levels of motivation.

According to Table 4, first-year students report a mean motivation score of 3.7274, reflecting a moderately positive agreement with the survey questions regarding motivation in learning. The standard deviation for this group indicates minimal variation in responses, suggesting that first-year students share similar views on motivation. Second-year students have a slightly higher mean score of 3.7545, indicating marginally stronger agreement with motivation-related factors. However, their standard deviation is higher than that of first-year students, suggesting some diversity in their responses, with certain students feeling more motivated than others. In contrast, third-year students report a lower mean score of 3.6547, indicating a decline in motivation compared to first- and second-year students. The standard deviation for third-year students is consistent with that of second-year students, reflecting similar variability in motivation perceptions within this group.

The p-value (Sig. = 0.000) in Table 5 further supports the conclusion that the differences in mean scores among the three groups are statistically significant. This confirms that the academic year plays a meaningful role in shaping students' motivation levels. The F-value of 8.133 reinforces this finding, as it indicates that the variation between group means is substantially greater than the variation within groups. These results strengthen the argument that differences in perceptions

of motivation can be attributed to the academic year, with first- and second-year students demonstrating higher motivation levels compared to their third-year counterparts.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study provides a glimpse into the interplay of formative assessment and student motivation in an era of artificial intelligence, specifically focusing on English language learners at a Vietnamese higher education institution. The findings identify six most important factors influencing students' motivation: Feedback, Peer Assessment, Classroom Activities, Use of AI, Teacher's Role, and the Learning Environment. Among these, teachers' supportive functions, application of AI tools, and interactive classroom activities emerged as the most significant motivation factors, highlighting the dynamic and evolving aspect of education in the modern era. The research demonstrates that personalized feedback by AI significantly enhances students' participation in learning by providing timely, personalized feedback that is sensitive to learners' specific needs. Furthermore, the facilitator role of the teacher centered on trust, positive feedback, and growth mindset is central to developing an inspiring learning environment. Active and interactive learning classroom pedagogies also strengthen collaboration, creativity, and learners' ownership of learning. While both Feedback and Peer Assessment are positive, their influence is relatively weaker, suggesting the need for better implementation plans to maximize their motivational potential. The Learning Environment, being positive, has the lowest influence, which suggests that it requires rethinking and strengthening physical and emotional aspects of the learning environment. Furthermore, the study uncovers significant variations in motivation levels across academic years, where first- and second-year students were more motivated compared to third-year students. Gender variation in motivation, however, was statistically insignificant. In conclusion, this research identifies the importance of integrating

AI-driven tools and enhancing enabling pedagogical practices in order to enhance formative assessment and student engagement. The study's implications provide policy-makers and teachers with hands-on recommendations to make learning responsive and engaging.

Recommendations

Based on the findings of this study, several recommendations are provided to enhance students' motivation through formative assessments and the integration of AI tools, as well as through optimizing the teacher's role and classroom activities

Increasing the use of AI tools for education

The motivational effect of AI tools is of great importance and indicates that integrating AI-based platforms can significantly change the learning experience. Teachers should utilize AI-affecting tools that provide immediate personalized feedback and adaptive learning sequences. The tools should be made personalized to solve the individualized needs of the students and provide customized content along with assessment processes that can reinforce engagement and motivation. The ability of AI to enable differentiated instruction and self-directed learning needs to be utilized to lead students along tailored learning pathways.

Improving teacher feedback practices

It was also reported that feedback was having a positive impact on motivation but not as much as with other variables. Feedback was most effective in instituting timely, regular, and differentiated feedback as an overriding priority that would address individual student needs. The feedback must be specific, concrete, and compelling so it generates a growth mindset. Ongoing feedback meetings which offer prospects for two-way communication between student and instructor could be employed in order to further enhance the effectiveness of this practice.

Facilitating peer assessment and collaborative learning

Peer assessment has a very positive effect on student motivation. Educators must introduce systematic peer assessment exercises whereby students assess each other's work and provide feedback. This enhances responsibility, cooperation, and more commitment to learning resources. Peer assessment also enhances critical thinking and self-assessment skills that drive study and personal growth. Educators must guide pupils on how to provide respectful and supportive assessments that ensure the process aims to improve study outcomes.

Adjusting classroom activities to promote engagement

Classroom activities influenced motivation the most positively. The teachers have to design and conduct several, participative, interactive, and activity-based exercises. They include problem-solving exercises, group discussions, project work, and practical work with active involvement. Teachers are able to allow the students a chance to create something and, thereby, promote ownership of learning through it. It helps the students in developing motivation levels high enough to continue working towards an extended period

Building up teacher training and support

Because of the importance of the role of the teacher in motivating students, there is a necessity to invest in the professional development of teachers. Professional development training programs should focus on teacher-student relationship-building strategies, how to create a positive classroom environment, and the utilization of active learning methods. Teachers should also be trained on how to utilize AI tools and integrate them in teaching. Continuing teacher support will enable teachers to continue being responsive to the needs of their students and enhance their overall teaching effectiveness.

Reassessing and enhance the learning environment

Despite a low correlation between learning environment and motivation, its possible influence on motivation cannot be belittled. Teachers and the school management can work together in providing the learners with the proper physical and emotional environment in terms of material availability in the well-equipped classrooms, physically friendly space, and emotionally supportive space. The learning environment must also offer opportunities for cooperation, imagination, and human interaction among learners.

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APPENDIX

QUESTIONNAIRE

Part I: Personal information

1. Which academic year are you currently in?

A. Freshman B. Sophomore C. Junior

2. What is your gender?

A. Male B. Female

Part II: Please indicate your level of agreement with the following statements by ticking on a scale from 1 to 5:

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1)	(2)	(3)	(4)	(5)

	Factors	Statement	(1)	(2)	(3)	(4)	(5)
1	Feedback	I receive timely feedback from my teacher.					
2		The feedback I get is specific to my work.					
3		I understand how to use the feedback to improve my learning.					
4		Feedback from my teacher motivates me to do better.					
5		I often reflect on the feedback I receive to guide my future efforts.					

	Factors	Statement	(1)	(2)	(3)	(4)	(5)
6	**Peer Assessment**	I receive constructive feedback from my peers.					
7		Peer assessment helps me understand different perspectives.					
8		I feel more confident in my work after peer assessment.					
9		Peer assessment activities are helpful for my learning.					
10		I value the feedback from my peers as much as from my teacher.					
11	**Classroom Activities**	Classroom activities are engaging and interactive.					
12		Activities in class help me understand the subject better.					
13		I participate actively in classroom activities.					
14		Classroom activities are well-structured to facilitate learning.					
15		The activities in class make learning enjoyable.					
16	**Use of AI**	Technology is used effectively for formative assessment in my class.					
17		I use digital tools for self-assessment.					
18		Technology enhances the feedback process.					
19		Online quizzes and tests are a regular part of my learning.					
20		I find learning more interesting with the use of technology.					

	Factors	Statement	(1)	(2)	(3)	(4)	(5)
21	Teacher's Role	My teacher supports my learning through formative assessment.					
22		My teacher encourages me to ask questions and seek clarifications.					
23		My teacher uses various methods to assess my understanding.					
24		My teacher provides opportunities for me to demonstrate my knowledge.					
25		I feel motivated by the teacher's formative assessment practices.					
26	Learning Environment	The learning environment in my class supports formative assessment.					
27		I feel comfortable sharing my thoughts and feedback in class.					
28		The classroom atmosphere encourages active participation.					
29		My classmates and I support each other's learning.					
30		The overall environment in class is conducive to learning through formative assessment.					

Part III: Please indicate your level of agreement with the following statements by ticking on a scale from 1 to 5:

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
(1)	(2)	(3)	(4)	(5)

	Statement (Dependent factor)	(1)	(2)	(3)	(4)	(5)
31	The use of AI-powered formative assessments increases my motivation to learn.					
32	Receiving immediate feedback through AI tools helps me stay motivated in my studies.					
33	AI-driven personalized learning paths keep me engaged and motivated to achieve my learning goals.					
34	Formative assessments using AI make learning more interactive and enjoyable for me.					
35	The integration of AI in formative assessments encourages me to take more responsibility for my own learning.					

Thank you for your participation.