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Implementation of Technology Enhanced Formative Assessments in 21st Century Education: A Comparative Analysis

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ABSTRACT

Teaching methods in the 21st century are more inclined to be more creative and innovative in engaging students in the digital era. Technology tools have become pivotal in 21st-century education, where students prefer flexible learning. 21st-century learning has also become more inclusive, where students become active learners. 21st-century learning has also taken a paradigm shift in analyzing student performance. Student progress is monitored by their continuous performance in the classroom in the form of feedback-based formative assessments instead of limiting them to graded summative assessments. This paper focuses on lecturers' views on 21st-century classrooms and their challenges in implementing 21st-century learning methods. The role of technology-assisted formative assessments has also been investigated through qualitative research conducted among selected lecturers from two departments in a private institution. Research findings proved that lecturers are much more inclined towards 21st-century learning as students and lecturers like more interactive and formative assessments, as they promote continuous learning. However, using technology tools has mixed among lecturers due to its constraints in certain boundaries. It is also found that implementing 21st-century learning in the classroom contributes to challenges for the lecturers regarding technology adaptation, time constraints, and student motivation.

INTRODUCTION

Today, educational systems across the globe are undergoing efforts to move beyond how they operated at the beginning of the 20th century. Traditional instructional practices are mainly exam-oriented learning, where students must solve pre-formulated problems using the knowledge they have learned throughout the academic term (Bicer et al., 2022). However, Learning practices are transforming by reframing what is taught, how it is learned, and how it is being evaluated innovatively to encourage productive learning in line with 21st-century education (Kareem et al., 2022).

21st-century learning emphasizes student-centered learning. In a student-centered classroom, the teacher encourages students to be independent learners and guides them as facilitators. A teacher in the role of facilitator still provides knowledge, but they do it in a much more interactive way. They create lesson plans and classes that require students to explore and discover the course content creatively

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(Zamora and Zamora, 2022). With independent learning, students learn from their mistakes and develop critical thinking and self-reflection skills.

Technology integration is important in 21st-century classrooms to prepare students for the digital era's modern working environment. Integrating technology tools in the classroom creates an innovative learning environment, which makes learning fun and engaging. Students become more motivated to participate in learning activities by collaborating with their peers. It also enhances creative learning, where students learn to utilize technology tools to build their knowledge and process the information more effectively and efficiently. Technology-integrated learning also promotes lifelong learning. Learning can occur anytime, anywhere, with all the information at the fingertips. It also creates flexibility in learning, Unlike traditional learning, which focuses on lecture-based learning limited to classrooms. The flexible learning method is important in 21st-century learning, where learning is not limited to classroom lectures but can occur anywhere in different forms. Learning can be conducted through student collaboration face-to-face or social media discussions. Collaborative learning activities such as debates, group projects, or peer reviews are great for developing problem-solving, creativity, and critical thinking skills (Raygan and Moradkhani, 2022).

Assessments in 21st Century Education

In 21st-century education, an innovative approach to assessment methods is important to enhance critical and creative thinking. Formative assessment has two fundamental purposes. The first is to provide the students with the current level of achievement, which is also the reflection of their current understanding of the subject. The second is to analyze their results and decide the actions to be taken by both teacher and student for further improvements to achieve the desired result. The importance of formative assessment in student learning is discussed at various levels in teaching and learning environments. Formative assessment is a form of ungraded assessment that provides ongoing feedback throughout the learning period. Formative assessment is beneficial to monitor student progress from time to time to ensure consistent learning. It helps the students to identify and self-regulate their strengths and weaknesses for consistent improvement. Narciss (2013) and Paul & Mark (2004) stated that timely feedback greatly benefits students' gradual improvement.

Formative assessments are mainly focused on feedback, not only from lecturers but also from fellow peers. The feedback from a student about their performance or feedback provided to other students about their performance is often sufficient for students to improve their work (Ecclestone, 2010; Elmahdi et al., 2018; Ross, 2006). Formative assessment enhances student skills of explaining, interpreting, and reasoning. Students can monitor the quality of their work by comparing it with their better-performing peers. These encourage students to be more adaptive toward constructive feedback, and they learn to appreciate high-quality work along with their knowledge and skills (Spector, 2016; Rusman et al., 2013; Price and Light, 2011; Jorge, 2007; Luthfiyyah and Sulistyo, 2021).

Technology Enhanced Formative Assessments

Hattie (2012) and Montrieux et al. (2014) claimed that formative assessment was rated as one of the most effective methods to encourage student achievement. Formative assessment can be implemented in different forms, such as observations, discussions, journal reflections, article reviews, projects and presentations, peer assessments or pop quizzes.

New learning technologies and tools have been increasingly beneficial to support the practice of formative assessment-based learning (Johnson et al., 2016; Woolf, 2010). The lecturers ' most common tools are online quizzes such as Kahoot, Quizizz, Quizlet, Socrative, and Padlet. Bawa (2019) and Mahbub (2020) report that online quizzes such as Kahoot, Quiziz, and Socrative facilitate learning engagement and enhance student motivation and focus. One of the advantages of using technology tools is that it provides instant feedback by responding to student's answers. It helps students to self-regulate themselves and monitor their level of understanding. Technology-assisted formative assessments encourage independent learning among students. Technology in education enables asynchronous learning, where students have the flexibility to learn according to their own pace of learning. It would benefit certain groups of students, especially slow learners.

Flipped learning is another form of formative assessment that uses technology tools. YouTube video reflections, journal reviews, or discussion-based flipped learning enhances critical thinking

among students through independent learning. Group discussions can now be conducted via Zoom, WhatsApp, and Teams. Students can still practice collaborative learning without being physically present in the class. The research has concluded that utilizing cooperative learning methods in a flipped classroom environment positively impacts students' academic success levels (Chen et al., 2015; Foldnes, 2016; Guo et al., 2018; Munir et al., 2018; Zhang, 2018).

METHODS

This paper intends to observe and do a comparative analysis regarding the progress of teaching and learning practices in higher educational institutions in line with technological advances in 21st-century education. The study aims to discover the role of formative assessments in 21st-century classroom learning and how lecturers implement formative assessments in their subject teaching in different institutions. Qualitative data collection in the form of interviews has been done to capture lecturers' opinions on 21st-century learning and the benefits and challenges faced in integrating technology tools in formative assessments.

Participants, Sampling and Data Collection

Data collection has been done in the form of interviews. One private institution from Malaysia has been chosen for the study. Two lecturers representing the Department of Transfer Program and the Faculty of Arts have been interviewed for data collection. The interview has been conducted face-to-face. The lecturers chosen are currently teaching undergraduate level Art subjects, which comprises subjects such as Communication Theory, Mass Media and Society, American Government and Politics, Principals of Advertising, and Intercultural Communication.

Participants were distinguished into two groups of lecturers. The first group (consisting of Lecturers A and B) consists of lecturers from the Centre of American Education (CAE), and the second group (consisting of Lecturers C and D) consists of lecturers from the Faculty of Arts.

Table 1. Interview Participants

Group	Participants	
Group 1 (Centre of American Education)	Lecturer A	Lecturer B
Group 2 (Faculty of Arts)	Lecturer C	Lecturer D

The interview questions provided for the lecturers are as follows:

1. How do you view the 21st-century classroom?
2. How do you view formative assessments? What classroom actions have you taken in the 21st century regarding formative assessments?
3. What technological tools do you use in formative assessments?
4. What are the advantages and challenges of integrating a 21st-century learning approach in formative assessments?
5. How do you overcome the challenges faced in 21st-century formative assessments?

RESULTS

Both groups show lots of similarities when it comes to the perception of 21st-century learning. However, there are significant differences in the learning practices and technology integration in formative assessments.

Lecturer's View on 21st Century Classroom

All four lecturers agreed that 21st-century learning is more interactive than traditional learning. The learning method in 21st-century classrooms is focused more on being collaborative and innovative by incorporating various learning methods. Lecturers feel they can experiment with various teaching methods in 21st-century classrooms to make the learning process more innovative. Lecturers are less talking, and learning becomes more student-centered with more hands-on activities. With these practices, lecturers are becoming more active learners where student voices are being heard in 21st-century classrooms. It is active learning, defined as any teaching method that engages the student in the

learning process. Active learning occurs when the teacher stops teaching a lesson, and students work on a question or task provided to them to understand a subject (Andrews et al., 2011). Active learning enhances critical and innovative thinking among students and improves problem-solving skills in getting ready for the digital working environment.

However, Lecturer A claimed that students depend on their devices in 21st-century learning. When all information is at the fingertips of technological tools, students are more prone to using shortcuts to get information through internet searches rather than self-thinking. On the other hand, Lecturer C claimed that 21st-century students expect their lecturers to be creative in classroom teaching to keep them engaged. 21st-century learning has shifted in terms of focus, where the key factor for 21st-century learning is student engagement. Students want to learn to be entertaining. Growing up with digital exposure, students are more inclined toward using technological tools in 21st-century learning.

Comparatively, both groups agreed that 21st-century learning is more interactive and collaborative, with students being active learners. However, Lecturer A from Group 1 feels that with high usage of technology tools, student addiction to mobile and digital tools seems to be unhealthy. Group 1 and Group 2 agreed that student engagement is key to providing an efficient 21st-century learning experience. Group 1 and Group 2 agreed that two-way communication between student and lecturer has significantly improved compared to traditional learning.

Table 1. Example Statements on the Perception of 21st-Century Learning

Interview Question	Example Statements	
	Group 1	**Group 2**
How do you view the 21st-century classroom?	"21st century education is flexible learning. Students can learn from anywhere and everywhere, and learning is not fixed in the classroom." "Students are fixed to the devices. They are so dependent on their devices." "We get to see the two-way communication between the teacher and learner."	"There are high expectations from students in 21st-century learning." "It was more straightforward in traditional learning. But now, they want to be entertained and are more inclined towards using technology in class." "The keyword for the 21st-century classroom is student engagement, compared to delivery of contents in traditional learning." "21st-century learning is more interactive and collaborative."

Lecturers View on Formative Assessment and Integrating 21st Century Learning Approach in Formative Assessments

Lecturer A from Group 1 feels that formative assessments guide the students not to be too engrossed in scoring for their graded assessments instead of learning qualitatively. Formative assessments make the learning process continuous and thorough rather than aiming to score the summative assessment at the end of the semester. Lecturer A gives formative assessments through discussions, forums, article reviews, and video reflections. When students share opinions with their friends through forums and group discussions, they become aware of their strengths and weaknesses regarding the subject matter. It indirectly improves their understanding of the subject content. Moreover, as a lecturer, Lecturer A feels that she can monitor students' level of understanding based on their responses. It helps the lecturer reevaluate the teaching method to understand the students better.

Lecturer B from Group 1 also agrees that formative assessments are useful to ensure students understand the content. Formative assessments are given through group projects, discussions, presentations, and blog writing. At a certain point, Lecturer B feels students take the educator role when presenting to their peers. The main purpose of introducing group projects and discussions is to encourage more communication and teamwork among the students.

Lecturer C from Group 2 feels that formative feedback is crucial for continuous learning. The more feedback given to the students, the more they will learn. Lecturer C argued that formative feedback

should also be provided in summative assessments to help students monitor their current level of understanding. It will encourage the students to learn effectively rather than being only grade-focused. Formative assessments are conducted through discussions based on an article or video posted by the lecturer. Discussions are mainly conducted through online platforms rather than face-to-face. Student comments will be monitored continuously, and feedback will be given if necessary.

Lecturer D for Group 2 is very supportive of formative assessment because it allows the lecturers to give continuous feedback to the students to support consistent learning among students. She also agreed that learning is not about grades but about gaining knowledge and understanding regarding a subject matter. With formative assessments, students experience deep learning compared to summative assessments. Formative assessments are given in the form of presentations and group research work. Student need to gather information regarding a research topic allocated to them and present their findings. During presentations, students share their knowledge with their peers, and knowledge is being learned through peer learning. However, Lecturer D has also indicated that preparation for formative assessment is time-consuming, but the outcome is worth it.

Comparing the responses from all the lecturers, both groups are very positive about implementing formative assessments in 21st-century classrooms. They strongly agree that formative assessments encourage a deeper understanding of a subject content. Formative assessment helps lecturers monitor their students' progress from time to time. However, lecturers A and C have contrasting opinions regarding classroom and online discussions. Lecturer A still believes that traditional face-to-face discussions are way more effective than online discussions, which form a bonding through live interactions. Lecturers B and D welcome the idea of students being educators and assisting in peer learning. Peer learning is very helpful in providing collaboration and teamwork in gaining knowledge. Both lecturers, A and D, also believe that formative assessments demand lots of preparation time, increasing teachers' workload.

Table 2. Lecturer's View on Formative Assessments and Methods of Implementation of Formative Assessment

Topic	Example Statements	
	Group 1	**Group 2**
How do you view formative assessments? What actions have been taken in the 21st century in the classroom regarding formative assessments?	"Formative assessment is given in forms of discussion and forum." "When they are discussing, they are understanding." "I ask students to write article reviews." "I incorporate video reflection in formative assessments." "I give several formative assessments to ensure students understand what is being taught." "Most importantly, I encourage teamwork through the activities."	"Formative feedback is very important for continuous learning." "If it is just graded, students don't know what they have learned." "I give them articles or videos to watch. I will post discussion questions based on the content uploaded. Students will participate in a discussion forum" "I will monitor their comments and provide feedback if necessary." "I am very supportive towards formative assessments." "Formative assessment is very important because it allows the educator to give good feedback to the students so that the learning is continuous throughout the semester." "I get the students to prepare a video presentation."

The Use of Technological Tools in Formative Assessments

Lecturer A from Group 1 only uses traditional Blackboard platforms and YouTube for formative assessments. As someone who disapproves of the high usage of technology tools, she prefers to implement formative assessments without being dependent on technology tools. She believes more in

learning from experiences rather than learning from tools. Lecturer B from Group 1 uses Instagram, Twitter and Tik-Tok to post student's work and discussions.

Lecturer C uses WhatsApp and Zoom as discussion platforms. She finds that leaving comments in WhatsApp groups is beneficial to monitor student participation, as the proof is evident. However, Lecturer A believes that discussions through online platforms are not "real communications" as students are still working "individually." Lecturer D uses a variety of platforms such as Socrative, Kahoot, TedEd, and Padlet. All four lecturers are similar in claiming that they don't prefer using Facebook. Lecturers A and B believe that Facebook is almost "vanishing." Lecturer C realized that most of the students were not on Facebook. Lecturer D finds that record keeping on Facebook is difficult, and she opted for the traditional Blackboard platform instead.

Table 3. The Utilization of Technology Tools in Formative Assessments

Topic	Example Statements	
	Group 1	**Group 2**
What are the technological tools you have been using for your formative assessments?	"I only use the traditional blackboard allocated for the course." "I use YouTube videos for reflection writing." "My confidence is still in traditional learning methods, rather than technology tools, where they still have to read, write and meet physically." "I don't use Facebook because Facebook is almost vanishing." "We are active more on Instagram and Twitter for our projects."	"I created a WhatsApp group for group assessments. I will not leave comments, but that proves students have participated." "I don't use Facebook." "I use Zoom discussion and Elearn." "I use Socrative, Kahoot, and Padlet for my pop quizzes."

Advantages and Challenges in Integrating 21st Century Learning Approach in Lecturing and Formative Assessments

All lecturers from both groups claimed that the challenges faced in 21st-century learning are more towards the lecturers' side, where they need to adapt to new technologies after coming from a traditional learning background themselves. Lecturers are still learning to adapt to new methods, and the time is not enough, being occupied with teaching hours and family commitments. Lecturer C believes that teaching is a continuous learning process, but whether all teachers are willing to invest their time in learning new technological innovations remains a question. Lecturer C claimed that formative feedback doesn't go well with a few students, especially Asian students who see feedback as criticism. It contrasts with Lecturers B and D, who claimed that students welcome and benefit greatly from feedback with an open mind.

Lecturer A expressed concern over the high usage of online communications that takes over the beauty of physical interactions. There is a question about the nature of online chats and whether they help improve student communication skills. It contrasts with Lecturer D, where she claims that the beauty of technological tools is that they don't have to engage in synchronous learning. It's a form of flexible learning that can occur anywhere, anytime, according to the student's preference. Flexible learning, on the other hand, according to Lecturer A, doesn't give the same amount of student engagement as a traditional face-to-face class because learning does not occur in the same time frame. All lecturers agreed on the technical and internet errors interrupting the learning process flow. The glitches and time delays in technical and connectivity issues indirectly affect student motivation and eagerness to learn to a certain extent.

Table 4. The Advantages and Challenges in Implementing Formative Assessments in 21st Century Classroom

Topic	Example Statements	
	Group 1	**Group 2**
What are the advantages and challenges of integrating a 21st-century learning approach in formative assessments?	"Lecturers are having issues to adapt. Difficulties are more on the lecturers' part because we are still learning. The problem is the time is not enough." "Nothing like face-to-face interactions." "I encourage peer review among students to provide feedback on their essay outline or presentation, but students don't respond. Mostly, they will give positive comments, but they are not open to give constructive feedback." "I think the disadvantage is, it does not give the amount of engagement as you would in a traditional face-to-face lesson." "They prefer online classroom rather than physical."	"Not all teachers are willing to learn new technology due to time constraints." "It also depends if students are willing to accept feedback, especially Asian students. They see that as a criticism." "Discussing in What's App group gives them the flexibility to comment even at 3 a.m." "Students experience technical and internet issues with technology tools." "The beauty of technological tools is that they don't have to engage in synchronous learning." "Having tutorials or posting materials online, only the dedicated students will look for it."

Action Taken to Overcome the Challenges Faced in 21st-Century Classroom

All four lecturers agreed that the main challenge in creating a collaborative classroom is to receive a hundred percent student participation. One of the significant challenges is to balance the dominant speakers and the quieter ones. Some students dominate the entire discussion, and it's challenging to bring out the quiet students to participate in these circumstances.

Lecturer A makes sure that only synchronous learning takes place throughout the semester. Live interactions were made compulsory during the classes. Rewards in extra credits or class participation marks have been given to students who actively participate during discussions 5o encourage them to give feedback. Students become more motivated to give feedback as it contributes to extra credits. Lecturers A and B both claimed that it is important that students should not be punished for giving wrong answers. Students must feel comfortable in expressing their opinions without having the fear of rejection. In this case, the lecturer must provide constructive feedback without crossing the boundaries.

Lecturers B and C share similarities in ensuring that classroom discussions are made in small groups of not more than five people. Lecturer C claimed that, in certain circumstances, some students tend to dominate the entire conversation session; hence, conducting discussions in smaller groups is important to ensure the quitter one shines. Lecturer B includes a presentation component in all her formative assessments to ensure everyone talks. Lecturer D also conducts her classroom discussion in smaller groups, similar to all three lecturers. However, she includes peer review to monitor student participation in the perception of students themselves. Each student will be reviewed by their friends, and they get to know their strengths and weaknesses. Students get the chance to improve themselves gradually, reflecting on the suggestions of their peers.

Learning has evolved. Technology adaptation is becoming a major challenge for lecturers from different learning eras. Lecturer D claimed that current lecturers are not only focused on teaching, but they have also taken up the role of someone who needs to prepare content, which is not limited to lecture content but also integrating technology-enhanced learning strategies. All lecturers in both departments had attended professional training on teaching and assessing using technology. The training has proven sufficient for the lecturers to create effective 21st-century learning practices.

However, Lecturer C made a good point, claiming that teaching through technology will be a continuous learning process for lecturers, with the advance of technology day by day. Adapting to new

technologies is time and effort-consuming, and the willingness of all lecturers to learn remains a question mark. Lecturer A is still not keen on implementing technologies besides Blackboard and YouTube in her classroom. She believes collaboration can still be made through traditional methods without depending on technology tools.

Table 5. Actions Taken to Overcome the Challenges in 21st Century Classroom Formative Assessments

Topic	Example Statements	
	Group 1	**Group 2**
How do you overcome the challenges faced in 21st-century formative assessments?	"I make sure there is live interaction. No delayed lecture." "I will make sure that they talk. I give them rewards. Like class participation marks." "Mainly, they should not be punished for wrong answers. I give them rewards for talking, not punishments for wrong answers." "Teachers from traditional learning backgrounds need to adapt to the technology." "I divide them into groups and participate in their discussions." "Because of the presentation component, all students must talk."	"Some students will dominate the entire session. The quieter ones are shy. I have smaller groups, and the quieter ones will come out and give comments. The solution is encouraging discussion in smaller groups." "Lecturers are not only focused on teaching, but they have also taken up the role of someone who needs to prepare content, which is not limited to lecture contents but also learning platforms." "I have peer review to monitor students' participation." "They must record and submit a copy of their meeting discussion."

DISCUSSION

Generally, 21st-century learning has been widely accepted by both groups of lecturers. 21st-century learning has been more inclusive, encouraging students to be active learners. The teaching methodology in 21st-century education has shifted from lecture-based passive learning to student-centered learning. The lecturer has reduced the lecture length, giving students tasks to solve through peer discussions. Cooperative, problem-based, and project-based learning have been comprehensively implemented in 21st-century classrooms. 21st-century teaching methodology has motivated lecturers and students as it experiments with various learning methods, cultivating interest and curiosity among the students and lecturers to experience different learning methods.

Formative assessments play a crucial role in assisting 21st-century learning practice. The conducting of formative assessments helps the students and lecturer monitor their progress in teaching and learning. It helps the lecturer identify the setbacks and modify their teaching approach to accommodate students needing help. On the other hand, students use formative feedback to self-regulate their strengths and weaknesses and improve themselves over time. Based on the qualitative research, lecturers practice a few approaches to implement formative assessments in the classroom. All four lecturers from both departments have used flipped learning.

All four lecturers from both departments utilize smaller groups of students for discussion proposes. Conducting discussions in smaller groups has been more effective in encouraging all students to participate in discussions. This method has been mentioned by various researchers claiming that when students work in smaller groups, their success, attitude, and motivational levels are significantly improved (Jhonson et al., 2000; Hattie, 2009; Kyndt et al., 2013; Eribil and Kocabas, 2018). Discussion (Wei et al., 2020), problem-solving (Khanova et al., 2015), and students' presentations (Wang et al., 2019) were used as in-class activities by all the lecturers. All lecturer from both departments has also incorporated flipped learning in their classroom. Flipped learning is where students learn from a pre-recorded video through discussion, reflection writing, or presentations. Flipped learning promotes collaborative learning among students.

However, using technology tools doesn't go too well with the lecturers. The main reason behind this is that as someone who grew up in traditional learning, the lecturer finds it very challenging to adapt to numerous technological inventions quickly. Due to the time constraints and lecturers' lack of motivation in learning, the evidence of using technology tools is still lacking in certain areas. Two lecturers from Group 1 and one from Group 2 only used one technology tool in their formative assessment because they did not want to indulge in many. The usage of technological tools varies from one lecturer to another depending on their willingness and interest, and this remains an issue of concern with the increasing expectations from 21st-century learners. Adopting technology in assessment is a complex process affected by individual, contextual, and technical factors (Brady, Devitt, & Kiersey, 2019; Koc, 2013; Buchholtz et al., 2018). Only one out of four lecturers use various tools in their classroom engagement. It is observed that even though the lecturers have much liked the 21st century, the usage of technology tools remains a question, whereby lecturers still opt for traditional face-to-face methods and blackboard platforms to conduct collaborative learning among students.

One of the benefits of 21st-century learning is that it allows asynchronous learning, where students have the flexibility to learn anytime outside the classroom. Group 1 Lecturers don't approve of asynchronous learning because online discussions or chat don't look like "real" communication. It contrasts with lecturers from Group 2, who give flexibility to their students to "discuss" among their peers anytime and anywhere through online platforms. Discussions are even conducted in WhatsApp groups in the form of group chats and also in discussion forums. Lecturers from Group 1sunway only conduct face-to-face or live online discussions, and they insist that students meet physically simultaneously.

CONCLUSION

It is observed that lecturers from both departments support 21st-century learning. However, the teaching implementations regarding various teaching methodologies are more evident in Group 2. Collaborative learning in Group 1 is limited to classroom hours using traditional methods, but collaborative learning in Group 2 is conducted synchronously and asynchronously through various online platforms. The variety of online platforms implemented in learning is more evident in Group 2, as well as teaching methods. Lecturers in Group 2 implemented peer review, WhatsApp discussions, weekly reviews, pop quizzes through Kahoot and Socrative, and Zoom discussions, which is less evident in Group 1, whereby they only focus on classroom collaborations and video reflections. However, due to the limited number of participants in this study, it is suggested that future research conduct the study on a larger scale. Lecturers' and students' technology literacy and the socio-cultural and policy factors are worthwhile to be examined extensively. Besides, technology-enhanced formative assessment from students' point of view is also compelling to be investigated.

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