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The Influencing Factors of Blended Learning Performance Among College Students in Qingyang, Gansu Province

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Abstract

Purpose: The effects of six independent variables (Learning Motivation, Behavioral Engagement, Cognitive Engagement, Emotional Engagement, Agentic Engagement, and Feedback) on the dependent variable, Learning Performance in Blended Learning, were investigated. In addition, it aims to identify significant differences between variables**. Research Design, Data, and Methods:** The study used the KMO and Bartlett sphericity tests to evaluate the applicability of factor analysis as validity and Cronbach's alpha as reliability. Multiple linear regression analysis was conducted on 346 valid responses from Zhanjiang University of Science and Technology students to verify the significant relationship between variables. Subsequently, 60 students underwent a 14-week intervention design implementation (IDI). Then, a paired sample t-test was performed to compare the quantitative results before and after IDI. **Results :** In the multiple linear regression study, we found that learning motivation, behavioral participation, cognitive participation, emotional participation, actual participation, and feedback have a significant impact on learning performance. In addition, the result of significant value ($P<0.05$) shows that all independent variables impact student learning performance. **Conclusions:** Significant differences exist in learning motivation, behavioral engagement, cognitive engagement, emotional engagement, agent engagement, feedback, and learning performance in blended learning between the pre - and post-IDI stages.

Keywords: Student Learning Performance, Blended Learning, Senior High School Education, China

JEL Classification Code: I23, J28, L2

1. Introduction

Gansu Qingyang area is located in the northwestern part of China, which is an economically underdeveloped area, and the teaching method of college education is still based on the traditional classroom teaching mode. However, the change in the national college entrance examination policy and the new requirements for the college education model have prompted the college education model to be changed; coupled with the rapid development of China's information technology, blended teaching has become a mandatory mode for college education to cope with the new college entrance examination, and it is an inevitable choice for perfect convergence with higher education. IDI model will be used in this study to analyze the factors affecting students' learning expressiveness.

This study uses a questionnaire to focus on the college students of the College of Literature, history, and Culture in the Qingyang area of Gansu Province as the research population. Two thousand four hundred college students were selected to analyze the factors affecting students' learning expressiveness in six aspects: motivation, behavioral engagement, cognitive engagement, affective engagement, agentic engagement, and feedback. This study aims to explain the causal relationship between these factors and student learning performance to help promote educational reform and policy making, guide teaching practice and teacher development, promote student learning and development and promote educational equity and

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personalized development.

2. Literature Review

2.1 Learning Motivation

Research suggests that motivation refers to an individual's source of motivation to pursue learning goals and endeavors. It has been found that highly motivated students usually show better academic performance; they are more inclined to invest more time and effort in learning, maintain positive attitudes toward learning, and have higher learning goals and achievement expectations (Moliterni et al., 1990). Based on Eccles et al. (1998) research, they and others have distinguished between intrinsic and extrinsic motivation types. Intrinsic motivation is when students learn out of interest and personal satisfaction, while extrinsic motivation is when they learn out of external factors such as extrinsic rewards or avoidance of punishment. Eccles et al. (1998) showed that self-efficacy beliefs refer to an individual's beliefs about his or her ability to accomplish tasks in a particular task or domain. His research shows that students with high self-efficacy are more likely to face challenges and difficulties, be more motivated to engage in learning and achieve better academic performance. His research has found that students who are learning-oriented (i.e., pursuing knowledge and understanding) tend to exhibit better academic performance, whereas students who are performance-oriented (i.e., pursuing grading and ranking) may be more focused on test scores but may have relatively low academic performance (Wigfield & Eccles, 2000). Bandura's (1993) research shows that students who are learning-oriented (i.e., pursuing knowledge and understanding) tend to exhibit better academic performance, whereas students who are performance-oriented (i.e., pursuing grading and ranking) may be more focused on test scores but may have relatively low academic performance. Learning motivation includes aspects such as motivation type, self-efficacy beliefs, and learning goal orientation, and student's academic performance may be related to learning motivation; therefore, the first hypothesis is:

H1: Learning motivation has a significant impact on student learning performance.

2.2 Behavioral Engagement

Connell and Wellborn (1991) found that students actively participating in learning activities typically exhibit better academic performance. They participate in class discussions, complete homework assignments, actively participate in extracurricular activities, etc. Active participation contributes to a deeper understanding and mastery of the learning content and improves learning outcomes. Finn and Rock (1997) research show that students' behavioral engagement is closely related to their motivation to learn. Active participants usually have higher motivation to learn, and students with high motivation are more inclined to participate in learning activities actively. This interplay can create a positive cycle that further promotes academic performance. In Skinner and Belmont's (1993) studies, they concluded that actively engaged students tend to utilize more learning strategies. They can actively select and use appropriate learning strategies to improve the effectiveness and efficiency of learning. A positive correlation exists between this active learning strategy use and academic performance. In Wang et al. (2011) studies on behavioral participation and accumulation of learning experiences, they concluded that students who actively participated in learning activities were able to accumulate richer learning experiences. They broadened their learning experiences and enhanced their learning performance by participating in classroom discussions and collaborating with classmates. Behavioral engagement is more closely related to motivation, learning strategies, and learning experiences, hence the second hypothesis:

H2: Behavioral engagement has a significant impact on student learning performance.

2.3 Cognitive Engagement

Alexander and Murphy (1998) found that students who actively engaged in deep thinking typically demonstrated better learning outcomes and could think and analyze the content in-depth, building stronger understanding and knowledge structures. In Ainley's studies, they found that metacognition refers to the ability to monitor and regulate one's learning process and learning strategies and that students who are actively involved in cognitive activities usually show higher metacognitive abilities and can better manage and control their learning process (Ainley et al., 1998). Schraw (2006) mentioned in their related studies that students actively involved in cognitive activities tend to use more learning strategies. They can consciously select appropriate learning strategies to improve learning effectiveness and efficiency. Zimmerman and Schunk's (2011) studies showed that there is an interactive relationship between students' cognitive engagement and learning motivation. Cognitive engagement helps to increase learning motivation, and students with high learning motivation are more inclined to engage cognitively. There is a relationship between cognitive engagement and deep thinking, the use of learning strategies, and the interaction of learning motivation at the metacognitive level. Hence, the third hypothesis is:

H3: Cognitive engagement has a significant impact on student learning performance.

2.4 Emotional Engagement

Ma and Klinger (2000) showed a reciprocal relationship between students' affective engagement and motivation to learn, with positive affective engagement promoting increased motivation to learn and higher motivation to learn, further stimulating affective engagement. Schutz and Lanehart's (2002) study concluded that students who actively participate in learning activities can accumulate richer learning experiences. They establish a stronger emotional connection with the learning content through emotional engagement and emotional experience and improve their understanding and retention of the learning content. Based on the findings of other researchers, Frenzel et al. (2007) mentioned in their studies that students' self-regulation has a significant impact on emotional engagement and learning expressiveness and that being able to regulate and manage one's emotional experience effectively is critical to improving learning outcomes and learning expressiveness. Eccles and Wang (2012) research clearly stated that teachers' emotional involvement plays an important role in promoting students' emotional engagement and learning expressiveness and that teachers' support, encouragement, and positive emotional expression can stimulate students' positive emotional engagement and improve motivation and learning outcomes. There is a relationship between affective engagement and motivation to learn, active participation, self-regulated affective engagement, and teacher affective engagement; therefore, the fourth hypothesis is:
H4: Emotional engagement has a significant impact on student learning performance.

2.5 Agentic Engagement

Wolters et al. (1998) showed that students can actively participate in knowledge construction and information exchange by engaging in collaborative learning and group discussions, thus improving their learning performance. Collaborative learning promotes deeper thinking, shared knowledge, and understanding and improves learning outcomes. In addition, Kramarski and Michalsky's studies found that collaborative learning impacts learning expressiveness and interdependence among group members, the degree of role division and contribution, and the quality of collaborative evaluation and discussion. With the development of technology, online interaction has become a new form of student agentic engagement. Rosário et al. (2016) mentioned that through online discussions, collaborative tools, and virtual learning environments, students can demonstrate agentic engagement, actively participate in academic discussions, and share their knowledge and experiences, thus improving their learning performance. Agentic engagement is more closely related to self-regulated learning strategies, motivation, affect, and disciplinary differences. Hence, the fifth hypothesis is:
H5: Agentic engagement has a significant impact on student learning performance.

2.6 Feedback

Hattie and Timperley (2007) showed that when feedback provides specific and clear information, students are more likely to understand their mistakes and directions for improvement, leading to improved learning performance. Building on the work of other researchers, Shute (2008) found that timely feedback can motivate students to correct errors and improve learning strategies more quickly, leading to improved learning performance. Kluger and DeNisi (1996) noted that personalized feedback could provide more targeted guidance and advice based on student's individual needs and ability levels, helping them understand better, apply their knowledge, and improve their learning performance. Black and Wiliam (1998) showed that a positive feedback environment enhances students' self-confidence and motivation and promotes active participation and better academic performance. Feedback is more closely related to explicit feedback, timely feedback, and personalized feedback, so the sixth hypothesis is:
H6: Feedback has a significant impact on student learning performance.

3. Research Methods and Materials

3.1 Research Framework

The theoretical and conceptual framework describes the research pathway, creates the grounded theory, and constructs the variables. The framework describes the correlations between factors, makes it easier to understand the theoretical structure in the research area, and facilitates generalization. It can be seen as a research guide. This section expresses the theoretical framework and builds on it to improve the conceptual framework used in this paper.

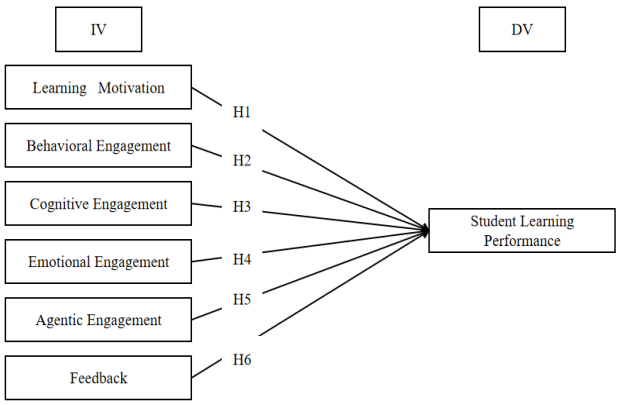

Figure 1: Conceptual Framework

H1: Learning motivation has a significant impact on student learning performance.
H2: Behavioral engagement has a significant impact on student learning performance.
H3: Cognitive engagement has a significant impact on student learning performance.
H4: Emotional engagement has a significant impact on student learning performance.
H5: Agentic engagement has a significant impact on student learning performance.
H6: Feedback has a significant impact on student learning performance.

3.2 Research Methodology

This study employed a typical empirical paradigm, using a cross-sectional design and quantitative analysis. Surveys were used as a data collection technique, using https://www.wjx.cn/.

The present research has three main phases: Pre-IDI, IDI, and Post-IDI. Pre-IDI paid more attention to diagnosing the current situation, identifying the need for changes, and planning for the next stage. The IDI stage is the implementation process of a series of interventions, and at the post-IDI stage, the expected outcomes of the interventions are assessed and discussed. During the action research process, the researcher played the role of an outsider as an ID practitioner. This way, the process and assessment can be described as uninvolved, objective, and unbiased (Mertler, 2004).

3.3 Research Population, Sample Size, and Sampling Procedures

3.3.1 Research Population

In the thesis, the study population was selected from three different majors in the College of Literature, History, and Culture at a university in the Qingyang area of Gansu Province. The researcher selected three courses from two majors that use blended learning available in the study, such as course1: Ancient Chinese Literature, Course2, Modern Chinese Literature, Course3, and General History of China. There are two classes in Ancient Chinese Literature, a total of 150 students; Modern Chinese Literature, two classes with a total of 155 students; and General Chinese History two classes with a total of 160 students. There are about 75 students in each class and about 465 students in six classes. Then, a sample population of 113 students was selected from Ancient Chinese Literature, 100 students were selected from Modern Chinese Literature, and a sample population of 133 students was selected from General History of China. A sample population of 346 college students was selected as the research population.

3.3.2 Sample size

Hair et al. (2010) suggested that a sample size between 30 to 500 is adequate for most of the research. At the preliminary diagnosis stage, the sample size for the reliability test is 15, and for multiple-liner regression testing, it is 204. At the IDI stage, 346 students are chosen as the participants for IDI implementation. At the post-IDI stage, these 346 students will be the respondents for conducting the same research methods as the pre-IDI stage.

3.3.3 Sampling Procedures

The sampling procedure of this study used purposive sampling in the form of questionnaire distribution. Starting from the specific requirements of blended learning, the researcher purposely chose students from the College of Literature, History, and Culture. The questionnaires were sent to 465 students in 6 classes through interviews. After examining their responses, 346 of these students' responses were considered eligible for further research. The questionnaire's MLR results helped establish the final action research plan. In the second phase of the IDI, purposive sampling was used to select the subjects to continue the research experiment from among the students who participated in the blended learning experiment, with 346 of them as the primary research subjects. The following are the purposes considered in this sampling procedure. These samples are active participants and practitioners of blended learning, and they are more interested in the experiment to improve their abilities in the process of blended learning very quickly. The students who participated in the questionnaire

were active and positive participants, and they came from different majors and grades, which greatly reduced the correlation of the data. In the latter stage of the IDI, the students who participated in the blended learning experiment were asked to take the questionnaire again, and five students were randomly selected from the students who participated to take part in the interviews.

3.4 Research Instruments

3.4.1 Design of Questionnaire

The design of the questionnaire means building measurements for action research, which is highly crucial in every research. The questionnaire for this action research was designed and inspired by references. According to the related research on factors affecting students' learning expressiveness in blended learning, the researcher first designed a questionnaire based on six variables: motivation, behavioral engagement, cognitive engagement, emotional engagement, agentic engagement, and feedback, and then used the index of item-objective congruence (IOC) to verify all used questions.

3.4.2 Components of Questionnaire

The questionnaire was divided into three sections. The first part includes gender-related demographic questions. The second section includes questions about the following variables: motivation to learn, behavioral engagement, cognitive engagement, emotional engagement, agentic engagement, and feedback. The third section is about learning performance.

3.4.3 IOC Results

The IOC method collects the judgment of experts to verify instruments (Rovinelli & Hambleton, 1977). A minimum of two experts is required for IOC. However, in this study, five experts were invited to pass judgment on a questionnaire developed based on previous research. Three experts were teachers from a university in the Qingyang area of Gansu Province who specialized in education. The other two experts were teachers from outside Gansu Province who had doctoral degrees in educational management, which was very helpful in developing the questionnaire from an educational management perspective. In this study, all dimension scores were higher than 0.67 in this criterion.

3.4.4 Pilot survey and Pilot test results

A questionnaire with 27 questions was delivered to 90 respondents for the reliability test; all the items were kept after the IOC process. The testing results and the degree of association are shown in the following table. All the items of this research instrument passed the reliability test with a 0.6 or above score, with 0.83 for learning motivation, 0.871 for behavioral engagement, 0.857 for cognitive engagement, 0.773 for emotional engagement, 0.849 for agentic engagement,0.82 for feedback, and 0.715 for student learning performance in blended learning.

Table 1: Pilot Test Result

Variables	No. of Items	Sources	Cron bach's Alpha	Strength of Association
Learning Motivation (LM)	4	Eccles et al. (2000)	0.830	Good
Behavioral Engagement (BE)	4	Connell and Wellborn (1991)	0.871	Good
Cognitive Engagement (CE)	3	Alexander and Murphy (1998)	0.857	Good
Emotional Engagement (EE)	3	Ma and Klinger (2000)	0.773	Acceptable
Agentic Engagement (AE)	3	Wolters et al. (1998)	0.849	Good
Feedback (F)	4	Hattie and Timperley (2007)	0.820	Good
Student Learning Performance in Blended Learning (LPBL)	6	Rosário et al. (2016)	0.715	Acceptable

4. Results and Discussion

4.1 Results

4.1.1 Demographic Profile

The researcher demonstrated the demographic profile of the entire research population (n=346), followed by selected course (n=60), who participated in IDI, as shown in Table 2.

Table 2: Demographic Profile

Entire Research Population (n=346)		Frequency	Percent
Gender	Male	175	50.58%
	Female	171	49.42%
Course	Ancient Chinese Literature	113	32.65%
	Modern Chinese Literature	100	28.91%
	General History of China	133	38.44%
Total		**346**	**100%**
IDI Participants (n=60)		**Frequency**	**Percent**
Gender	Male	33	55.00%

Entire Research Population (n=346)		Frequency	Percent
	Female	27	45.00%
Course	Ancient Chinese Literature	15	25%
	Modern Chinese Literature	25	41.67%
	General History of China	20	33.33%
Total		**60**	**100%**

4.1.2 Results of multiple linear regression

Multiple linear regression was used for the hypotheses. Since the independent variable (the six dimensions in blended learning) and the dependent variable (student learning performance) are continuous variables, the analysis can be conducted using multiple linear regression methods.

Table 3: The multiple linear regression of five independent variables on teacher's student learning performance

Variables	Standardized Coefficients Beta	t-value	p-value	R	R Square
Learning Motivation (LM)	0.1031	7.6125	< .001	0.900	0.809
Behavioral Engagement (BE)	0.2118	17.8427	< .001		
Cognitive Engagement (CE)	0.1745	14.3320	< .001		
Emotional Engagement (EE)	0.1664	9.6309	< .001		
Agentic Engagement (AE)	0.1614	12.2865	< .001		
Feedback (F)	0.1779	13.0591	< .001		
Dependent variable: Student Learning Performance					

Note: p-value <0.001**

Table 3 shows the relationship between independent variables and LPBL value at the diagnosis stages. Using SPSS to perform multiple regression analysis, the significance test showed that all the p-values were less than 0.05, indicating that all six dimensions of the independent variable had significant effects on the dependent variable. R square value is 0.809, which illustrates that the independent variables account for 80.9% of dependent variables. In addition, the significant value (P <0.05) shows that all independent variables impact students' learning performance. The normalized regression coefficients of all six variables were greater than 0, indicating that all the independent variables were positively correlated to the dependent variables. By observing the standardized regression coefficients, the feedback, behavioral engagement, cognitive engagement, emotional engagement, and agentic engagement (0.2118, 0.1779, 0.1745, 0.1664, 0.1614) were higher compared to the learning motivation (0.1013), which also reflects that the first five dimensions had a higher impact on learning performance from a statistical perspective.

H1: There is a significant mean difference in learning motivation between pre-strategic plan and post-strategic plan

H2: There is a significant mean difference in behavioral engagement between pre-strategic plan and post-strategic plan

H3: There is a significant mean difference in cognitive engagement between pre-strategic plan and post-strategic plan

H4: There is a significant mean difference in emotional engagement between pre-strategic plan and post-strategic plan

H5: There is a significant mean difference in agentic engagement between pre-strategic plan and post-strategic plan

H6: There is a significant mean difference in feedback between pre-strategic plan and post-strategic plan

4.2 IDI Intervention Stage

The detailed design of the IDI stage covers fourteen weeks. The IDI plan included the time and place, people involved, intervention purpose and tools, and the specific activities.

Table 4: Implementation Time and Activities as IDI

No.	Time and Duration	Implementation Keywords
1	Week 1	Team establishment
		Goal setting
		SWOT diagnostic analytic tool
2	Week 2-4	Group mentoring
3	Week 5-8	Practical courses
4	Week 9-12	Individual counseling
5	Week 13-14	Interview and summary

4.3 Results Comparison between Pre-IDI and Post-IDI

This section will detail each variable's paired sample t-test results before (ID) and after (IDI) intervention, aiming to explore in depth whether the intervention measures are truly effective.

Table 5: Paired-Sample T-Test Results

Variables	Mean	SD	t-value	p-value
Learning Motivation (LM)				
Pre-IDI	3.86	0.8	-3.461	0.001
Post-IDI	4.35	0.57		
Behavioral Engagement (BE)				
Pre-IDI	2.99	0.68	-3.667	< .001
Post-IDI	3.48	0.72		
Cognitive Engagement (CE)				
Pre-IDI	3.64	0.97	-3.181	0.002
Post-IDI	4.12	0.58		
Emotional Engagement (EE)				
Pre-IDI	3.51	0.63	-5.895	< .001
Post-IDI	4.13	0.43		

Variables	Mean	SD	t-value	p-value
Agentic Engagement (AE)				
Pre-IDI	3.07	0.76	-5.162	< .001
Post-IDI	3.62	0.34		
Feedback (F)				
Pre-IDI	3.22	0.87	-3.631	< .001
Post-IDI	3.73	0.65		
Learning Performance in Blended Learning (LP)				
Pre-IDI	3.24	0.38	-3.871	< .001
Post-IDI	3.57	0.58		

This section will detail each variable's paired sample t-test results before (ID) and after (IDI) intervention, aiming to explore in depth whether the intervention measures are truly effective.

There was a significant difference in Learning Motivation between pre-IDI (M=3.86, SD=0.80) and post-IDI (M=4.35, SD=0.57) condition; t (59) =-3.461, p =0.001 (<0.05) and the mean difference was -0.49.

There was a significant difference in l Behavioral Engagement between pre-IDI IDI (M=2.99, SD=0.68) and post-IDI (M=3.48, SD=0.72) condition; t (59) =-3.667, p < .001and the mean difference was -0.49.

There was a significant difference in Cognitive Engagement between pre-IDI (M=3.64, SD=0.97) and post-IDI (M=4.12, SD=0.58) condition; t (59) =-3.181, p =0.001(<0.05) and the mean difference was -0.48.

There was a significant difference in Agentic Engagement between pre-IDI (M=3.07, SD=0.76) and post-IDI (M=3.62, SD=0.34) condition; t (59) =-5.162, p< .001and the mean difference was -0.55.

there was a significant difference in Feedback between pre-IDI (M=3.22, SD=0.87) and post-IDI (M=3.73, SD=0.65) condition; t (59) =-3.631, p< .001and the mean difference was -0.51.

There was a significant difference in Learning Performance in Blended Learning between pre-IDI (M=3.24, SD=0.38) and post-IDI (M=3.57, SD=0.58) condition; t (59) =-3.871, p< .001and the mean difference was -0.34.

In summary, the above quantitative results indicate that there are significant differences in Learning Motivation, Behavioral Engagement, Cognitive Engagement, Emotional Engagement, Agent Engagement, Feedback, and Learning Performance in Blended Learning between the pre- and post-IDI stages.

5. Conclusions, Recommendations and Limitations

5.1 Conclusions & Discussions

Blended learning has significantly impacted student performance, presenting benefits and challenges based on interventions and findings. It enhances student motivation and engagement, fostering more purposeful learning. The personalized pace of learning increases flexibility and convenience, while the online component provides accessibility and promotes interaction through discussion forums and collaborative projects, enhancing understanding and motivation. The multi-sensory learning experience, facilitated by various media and instant feedback systems, contributes to tracking progress and adjusting strategies.

Active behavioral engagement in blended learning improves student participation in learning activities, promoting deep learning and critical thinking. It fosters social support and interaction, enhancing the overall learning experience. Cognitive engagement encourages active thinking and information processing, developing critical thinking skills and improving knowledge transfer. Emotional engagement stimulates interest and enthusiasm, creating a more satisfying and enjoyable learning process. Agentic engagement encourages students to take responsibility for their learning, enhancing self-directed learning abilities.

However, blended learning faces technological challenges, including reliance on stable internet connections and platforms. Effective resource allocation is crucial, with teachers needing training to master online tools and design effective blended programs. Students must develop strong independent learning and self-management skills to succeed in a blended environment. The design of engaging online modules and ensuring equity and effectiveness in assessment and feedback mechanisms are also complex challenges. Cultural and psychological adaptation is necessary for students and teachers, with attention to data privacy and security in online learning.

5.2 Recommendations

Course design should be well-structured to optimize blended learning, effectively integrating online and offline activities. Teachers require training to enhance their skills in using technological tools and designing online courses. Interaction and participation should be increased through online forums and collaborative projects. Timely assessment and feedback are crucial, and additional learning resources should be provided to support students.

Encouraging independent learning and integrating practical examples can enhance the practicality and applicability of learning. The learning environment should be optimized for stability and user experience, with continuous attention to educational technology advancements.

5.3 Limitations for Future Research

Blended learning faces limitations such as technology dependence, teacher training needs, curriculum design challenges, and the requirement for student self-management skills. Future research should focus on strengthening technological innovation, curriculum design, teacher training, student self-management, assessment mechanisms, and policy development to support the effective implementation of blended learning. Despite these challenges, blended learning is a developing direction in education, offering benefits that can improve student learning performance. Educators should continue promoting and optimizing blended learning for student growth and societal development.

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