

THE IMPACT OF BLENDED LEARNING PRACTICES ON UNDERGRADUATE STUDENTS' LEARNING ENGAGEMENT IN NANTONG POLYTECHNIC

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Abstract

Enhancing students' learning engagement is crucial in higher education, particularly in the context of blended learning. This study investigates the impact of blended learning practices on undergraduate students' learning engagement at Nantong Polytechnic. Guided by constructivist learning theory, the research examines three dimensions of blended learning practices: instructional design, instructional organization, and instructional evaluation. A structured questionnaire was developed based on validated scales and distributed to a sample of 353 students from the School of Information Engineering at Nantong Polytechnic, selected using Yamane's formula. The collected data were analyzed using statistical software, employing descriptive statistics, reliability and validity tests, correlation analysis, and linear regression analysis. The findings indicate that all three dimensions of blended learning practices significantly and positively affect students' behavioral, cognitive, and emotional engagement. The study provides empirical evidence for optimizing blended learning strategies and offers recommendations for improving instructional practices to enhance student engagement in higher education.

Keywords: Blended learning, Instructional design, Learning engagement

Introduction

With the rapid advancement of educational informatization, blended learning has emerged as a transformative approach in higher education. It integrates the advantages of traditional face-to-face instruction with online learning, promoting flexibility, engagement, and deeper learning experiences. In China, the Ministry of Education has emphasized the importance of blended learning as a key component of instructional reforms, encouraging universities to implement innovative pedagogical models that combine digital resources with conventional classroom interactions. Nantong Polytechnic, as a leading institution committed to improving educational quality, has actively incorporated blended learning strategies to enhance students' academic performance and engagement.

Student engagement is a crucial determinant of learning effectiveness. Research has demonstrated that engaged students exhibit higher motivation, better knowledge retention, and improved academic outcomes. Learning engagement typically consists of three dimensions: behavioral engagement (active participation in learning activities), cognitive engagement (deep learning strategies and critical thinking), and emotional engagement (positive attitudes and interest in learning). While traditional instructional methods often struggle to maintain high levels of engagement, blended learning environments provide new opportunities to optimize

students' involvement by offering interactive content, personalized learning experiences, and diverse instructional strategies.

Despite these advantages, the successful implementation of blended learning depends significantly on instructional practices, particularly in how courses are designed, organized, and evaluated. Effective instructional design ensures that learning materials are structured in a way that supports student engagement. Instructional organization facilitates the smooth integration of online and offline components, while instructional evaluation provides feedback mechanisms that sustain motivation and improve learning outcomes. Understanding how these instructional dimensions influence student engagement is essential for refining blended learning models in higher education.

Although blended learning has gained widespread adoption, research on its effectiveness remains fragmented. Many existing studies have focused on either fully online learning environments or traditional classroom settings, with limited empirical investigations into the specific mechanisms through which blended learning practices impact student engagement. Furthermore, while studies have acknowledged the importance of teachers' instructional behaviors, there is a lack of research that systematically examines the combined influence of instructional design, instructional organization, and instructional evaluation on students' behavioral, cognitive, and emotional engagement in a blended learning context.

Moreover, most empirical studies on blended learning have been conducted in Western educational settings, where students' learning habits, technological access, and institutional support structures differ significantly from those in China. There is a pressing need to examine localized implementations of blended learning in Chinese universities and vocational institutions, particularly in applied sciences and engineering disciplines. This study seeks to address these gaps by conducting an empirical analysis of blended learning practices at Nantong Polytechnic, providing insights into their effectiveness in fostering student engagement.

Given the increasing emphasis on blended learning as a pedagogical innovation, understanding its impact on student engagement is of paramount importance. This study is motivated by several key considerations:

1. Improving Educational Effectiveness – Enhancing student engagement is a critical goal in higher education. Investigating how blended learning practices influence engagement can help educators develop more effective instructional strategies.

2. Bridging Theoretical and Practical Knowledge – While existing literature highlights the benefits of blended learning, empirical evidence regarding its impact on student engagement in Chinese higher education remains scarce. This study aims to provide data-driven insights into best practices for blended learning implementation.

3. Supporting Institutional Development – As Nantong Polytechnic continues to integrate digital technologies into its curriculum, understanding the relationship between instructional practices and student engagement will inform faculty training programs and policy decisions.

4. Enhancing Student Learning Experiences – By identifying key factors that contribute to behavioral, cognitive, and emotional engagement, this study will offer recommendations for optimizing blended learning environments to improve student motivation, participation, and academic performance.

This research aims to fill an existing gap in the literature by providing empirical evidence on the relationship between blended learning practices and student engagement in a Chinese vocational higher education context. The findings will contribute to both theoretical

advancements in blended learning research and practical improvements in instructional strategies, ultimately enhancing the quality of higher education.

Research Objectives

1. To analyze the impact of instructional design on undergraduate students' learning engagement in a blended learning environment.
2. To examine the influence of instructional organization on undergraduate students' learning engagement.
3. To evaluate the effect of instructional evaluation on undergraduate students' learning engagement.

Conceptual Framework

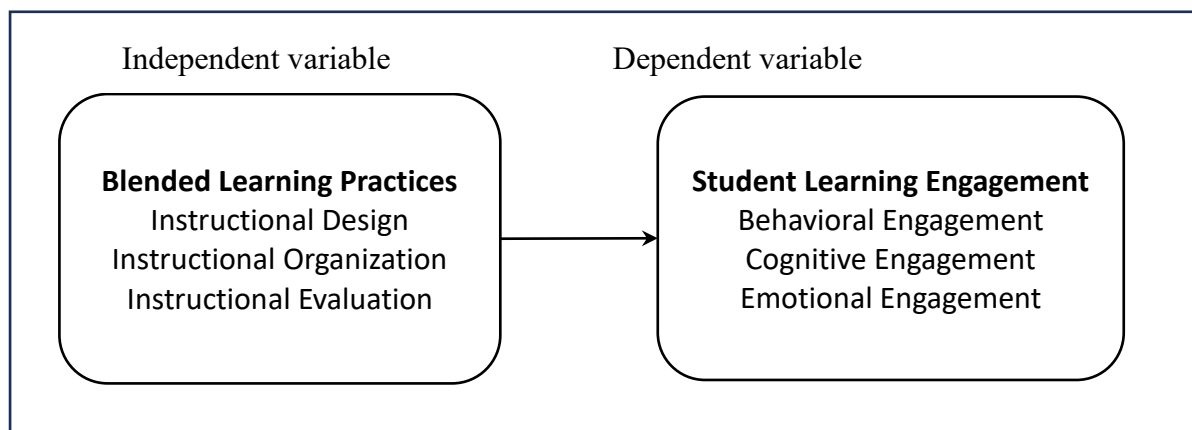


Figure 1 Conceptual Framework Diagram

Hypotheses

Based on the above research model diagram, the following hypotheses are proposed in this paper:

- Hypothesis 1: The impact of instructional design on student engagement.
- Hypothesis 2: The impact of instructional organization on student engagement.
- Hypothesis 3: The impact of instructional evaluation on student engagement.

Literature Review

Blended learning integrates traditional face-to-face instruction with online learning, aiming to leverage the strengths of both approaches. The constructivist learning theory, which emphasizes active learning and knowledge construction, provides a strong theoretical foundation for blended learning. In a blended environment, students engage in self-regulated learning online while also benefiting from teacher guidance in physical classrooms. Recent studies emphasize the role of instructional presence, cognitive presence, and social presence in shaping student engagement in blended learning settings.

1. Instructional Design in Blended Learning

Effective instructional design in blended learning ensures that online and offline components are seamlessly integrated. Research in recent years has focused on flipped classrooms, modular content organization, and adaptive learning technologies. Studies indicate

that well-structured instructional design improves student motivation and engagement. For instance, research has found that using interactive multimedia and adaptive content personalization can significantly enhance students' cognitive engagement.

2. Instructional Organization and Student Engagement

Instructional organization involves structuring course delivery, scheduling online and offline interactions, and maintaining clear communication channels. Studies suggest that synchronous and asynchronous activities should be balanced to maximize student engagement. In a blended learning study conducted in China, researchers found that organizing regular online discussions and integrating collaborative projects significantly improved student interaction and learning outcomes. Furthermore, well-structured teacher-student and peer-to-peer interactions foster a sense of learning community, which enhances behavioral and emotional engagement.

3. Instructional Evaluation and Its Influence on Engagement

Assessment plays a vital role in blended learning environments. Studies suggest that a combination of formative and summative assessments, including automated quizzes, peer assessment, and instructor feedback, leads to better learning engagement. In a study on blended learning assessment methods, researchers found that immediate feedback mechanisms in online assessments increased students' motivation and cognitive engagement. Furthermore, research has emphasized the importance of self-regulated learning strategies, indicating that students who actively reflect on their progress tend to perform better in blended courses.

Student engagement is a key factor influencing academic success and can be categorized into behavioral, cognitive, and emotional engagement. Recent studies emphasize the importance of instructional strategies in promoting these three engagement dimensions in blended learning.

1) Behavioral Engagement

Behavioral engagement refers to students' participation in learning activities, including attendance, interaction in discussions, and completion of assignments. Studies indicate that gamification, active learning strategies, and collaborative learning improve behavioral engagement in blended learning. Researchers have found that incorporating discussion forums, peer reviews, and online group projects increases students' participation rates.

2) Cognitive Engagement

Cognitive engagement involves students' deep processing of information, critical thinking, and self-regulated learning. Research highlights the effectiveness of scaffolded learning experiences, adaptive learning technologies, and inquiry-based learning in fostering cognitive engagement. A recent study found that blended learning environments that incorporate problem-solving activities and case-based discussions lead to higher-order thinking skills development.

3) Emotional Engagement

Emotional engagement reflects students' motivation, sense of belonging, and learning satisfaction. Studies suggest that supportive instructor interactions, personalized feedback, and peer collaboration positively influence students' emotional engagement. Research in Chinese higher education contexts indicates that students in well-structured blended learning environments report higher motivation and course satisfaction compared to traditional lecture-based formats.

A 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to measure responses.

As seen in Table 1, the Cronbach $\alpha = 0.816 > 0.8$ for the Blended Learning Practices, so overall the reliability of the scale used in this paper is very satisfactory. In this paper, the reliability of each variable was tested and the validation results are shown below:

Table 1: Reliability test for the Blended Learning Practices Scale

Cronbach α	item count (of a consignment etc)
0.816	9

In Table 2, the Cronbach $\alpha = 0.839 > 0.8$ for the Learning Engagement Scale, so overall the reliability of the scale used in this paper is very satisfactory. In this paper, the reliability of each variable was tested and the validation results are shown below:

Table 2: Reliability test for the Learning Engagement Scale

Cronbach α	item count
0.839	9

As can be seen in Table 3, the KMO value of the scale is $0.895 > 0.7$, which indicates that this scale is suitable for factor analysis. In addition, the approximate chi-square in Bartlett's test of sphericity = 2940.245 and the degree of freedom $df = 153$, with a significance level of less than 0.05, therefore the null hypothesis of Bartlett's test of sphericity is rejected and it is considered suitable for factor analysis.

Table 3: KMO and Bartlett's test

KMO Quantity of Sample Suitability		0.895
Bartlett's test of sphericity	approximate chi-square (math.)	2940.245
	(number of) degrees of freedom	153
	(physics)	
	significance	0.000

3. Data Collection

The questionnaires were distributed from October 25, 2024, and the distribution stopped on November 15, 2024, a total of 22 days. A total of 403 questionnaires were collected, excluding omissions, mistakes, and 16 questionnaires of non-information engineering students, obtaining 387 valid data, with an effective rate of 96.03%.

4. Data Analysis

4.1 Descriptive Statistics

The study analyzed responses from 353 undergraduate students at Nantong Polytechnic. Descriptive statistics indicated that most participants had prior experience with blended learning, with a balanced distribution of male and female students across different

academic years. The data showed that students generally responded positively to blended learning, particularly in areas of course flexibility and resource accessibility.

4.2 Correlation Analysis

Correlation analysis is the process of quantifying the correlation between variables, which quantitatively describes the strength of the two-by-two correlation between two or more variables by calculating the correlation coefficients between the variables. The result of the quantitative description is a variety of different correlation coefficients.

4.3 Regression

One-way linear regression analysis was conducted with instructional design as the independent variable and learning engagement as the dependent variable.

Research Result

Correlation analysis was used to investigate the correlations between instructional design, instructional organization, instructional evaluation, and behavioral, cognitive, and affective engagements, using Pearson's correlation coefficient to indicate the strength of the correlations. There is a positive correlation between instructional design and behavioral engagement, cognitive engagement, and affective engagement, with correlation coefficients of 0.692, 0.810, and 0.733. There is a positive correlation between instructional organization and behavioral engagements, cognitive engagements, and affective engagements, with correlation coefficients of 0.735, 0.714, and 0.803, respectively. There is a positive correlation between instructional evaluation and behavioral engagements, cognitive engagement, and affective engagement have a positive correlation between them, and their correlation coefficients are 0.712, 0.765, and 0.835.

Table 4: Correlation Analysis

variable	Instructional Design	Educational organization	Evaluation of instructional and Learning	Behavioral engagement	Cognitive investment	Emotionally invested
Instructional Design	1					
Educational organization	.640**	1				
Evaluation of instructional and Learning	.728**	.7160**	1			
Behavioral engagement	.692**	.735**	.712**	1		
Cognitive investment	.810**	.714**	.765**	.772**	1	
Emotionally invested	.733**	.803**	.835**	.855**	.687**	1

** Significant correlation at the 0.01 level (two-tailed).

In this paper, one-way linear regression analysis was conducted with instructional design as the independent variable and learning engagement as the dependent variable, as shown in Table 5, the F value of the model is 27.613 and the R² is 0.214, which indicates that

the model is relevant and able to explain 21.4% of the explanations of the independent variable, instructional design, on the dependent variable, learning engagement. Instructional design (B = 0.315, p < 0.05) has a positive influence relationship on learning engagement.

In summary, the regression equation between the independent and dependent variables is derived:

$$\text{Learning engagement} = 3.752 + 0.315 * \text{Instructional design}$$

Table 5: Regression Analysis of Instructional Design and Learning Engagement

considerations	Unstandardized coefficient		Standardized coefficient		t	P
	B	standard error	Beta			
(Constant)	3.752	0.128			29.407	0.000
Instructional Design	0.315	0.036	0.356		3.037	0.000
R ²	0.214					
F	27.613					

a Dependent variable: learning engagements

A one-way linear regression analysis was conducted with instructional organization as the independent variable and learning engagement as the dependent variable, as shown in Table 6, the F value of the model is 12.046 and the R² is 0.130, which indicates that the model is relevant and able to explain 13% of the explanations of the independent variable, instructional organization, on the dependent variable, learning engagement. instructional organization (B = 0.134, p < 0.05) has a positive influence relationship on learning engagement.

In summary, the regression equation between the independent and dependent variables is derived:

$$\text{Learning engagements} = 3.446 + 0.134 * \text{Organization of instruction}$$

Table 6: Regression Analysis of Instructional Organization and Learning Engagement

considerations	Unstandardized coefficient		Standardized coefficient		t	P
	B	standard error	Beta			
(Constant)	3.446	0.132			26.147	0.000
educational organization	0.134	0.039	0.174		3.471	0.001
R ²	0.130					
F	12.046					

a Dependent variable: learning engagements

A one-way linear regression analysis was conducted with instructional evaluation as the independent variable and learning engagement as the dependent variable, as shown in Table 7, the model has an F value of 2.344 and an R² of 0.383, which indicates that the model is correlated and explains 38.3% of the explanation of the independent variable, instructional

evaluation, on the dependent variable, learning engagement. instructional evaluation (B = 0.388, $p < 0.05$) has a positive influence relationship on learning engagement.

In summary, the regression equation between the independent and dependent variables is derived:

$$\text{Learning engagement} = 2.344 + 0.388 * \text{Instructional Evaluation}$$

Table 7: Regression Analysis of Instructional Evaluation and Learning Engagement

considerations	Unstandardized coefficient		Standardized coefficient	t	P
	B	standard error	Beta		
(Constant)	2.344	0.169		13.836	0.000
Evaluation of instructional and Learning	0.388	0.042	0.428	9.282	0.000
R ²	0.383				
F	26.160				

a Dependent variable: learning engagements

The results highlight the critical role of blended learning practices in enhancing student engagement. Instructional design was the strongest predictor of cognitive engagement, emphasizing the importance of well-structured learning materials. Instructional organization significantly influenced behavioral engagement, reinforcing the need for structured course delivery. Instructional evaluation played a key role in emotional engagement, highlighting the value of feedback mechanisms.

These findings provide empirical support for optimizing blended learning strategies to improve student learning experiences in higher education.

Discussion

These results align with existing literature, confirming that well-structured blended learning environments foster deeper student engagement. The strong influence of instructional design on cognitive engagement suggests that clear course structures, well-prepared digital materials, and interactive learning activities enhance students' ability to process and apply knowledge.

Instructional organization, which includes online-offline coordination and student-teacher interactions, plays a pivotal role in behavioral engagement. Students who actively participate in structured online discussions and collaborative projects demonstrate higher levels of commitment and class participation.

The findings also highlight the significance of instructional evaluation in maintaining emotional engagement. Regular formative assessments, timely feedback, and self-assessment opportunities contribute to students' motivation and learning satisfaction. This supports previous research, indicating that constructive feedback mechanisms enhance students' sense of achievement and engagement.

However, certain challenges remain. Some students reported difficulties in managing online learning schedules and self-discipline. These issues suggest that while blended learning provides flexibility, additional support mechanisms, such as structured study plans and learning analytics, may be needed to optimize student engagement outcomes.

Overall, the results validate the importance of a well-integrated blended learning approach in higher education. By refining instructional design, strengthening instructional organization, and enhancing instructional evaluation, educators can further maximize student engagement and learning effectiveness in blended learning environments.

Research Suggestions

Enhancing Instructional Design

To improve cognitive engagement, institutions should adopt structured and interactive content design that integrates multimedia resources, adaptive learning tools, and well-defined learning objectives. Course developers should prioritize modular course structures to enhance clarity and student comprehension. Furthermore, integrating personalized learning pathways through AI-driven learning management systems can provide students with individualized learning experiences that cater to their unique needs.

Strengthening Instructional Organization

Higher education institutions should balance synchronous and asynchronous learning components to maximize student engagement. Organizing frequent live discussions, peer collaboration activities, and structured online assignments can help reinforce student participation. Establishing a well-defined course schedule with regular feedback sessions and interactive learning checkpoints will ensure better alignment between students and instructors.

Optimizing Instructional Evaluation

Institutions should implement comprehensive assessment strategies that combine formative and summative evaluations. Providing students with real-time feedback, adaptive testing, and self-assessment opportunities can significantly enhance their engagement. Encouraging peer review mechanisms and reflective learning journals can help deepen students' understanding and promote self-regulated learning habits.

Faculty Training and Development

Universities should invest in professional development programs to train faculty members in blended learning methodologies. Educators should be equipped with pedagogical strategies for online instruction, digital literacy skills, and methods for integrating technology-enhanced learning tools into their instructional practices. Continuous professional development opportunities, such as faculty workshops, peer mentoring, and instructional design consultations, can enhance the effectiveness of blended learning delivery.

Policy Recommendations for Higher Education

Education policymakers should develop institutional frameworks that support the widespread implementation of blended learning. Policies should focus on technological infrastructure enhancement, digital equity, and faculty incentives for blended learning adoption. Additionally, establishing standardized quality assurance mechanisms can help maintain consistency and effectiveness across different blended learning courses.

Future Research

Future studies should expand the scope of blended learning research by incorporating longitudinal studies, cross-institutional comparisons, and qualitative research methodologies to gain deeper insights into student engagement dynamics. Exploring the role of emerging

technologies, such as AI-driven tutoring systems, virtual reality learning environments, and data-driven analytics, could further enhance blended learning experiences.

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