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THE MECHANISM EXPLORATION OF HIGH-ORDER LEARNING OF COLLEGE STUDENTS IN A MOOC-BASED BLENDED LEARNING CONTEXT

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ABSTRACT – This paper is an empirical study of the theoretical exploration of mechanisms to promote students' 14 high-order learning in MOOC-based blended learning contexts. This paper identifies two core 15 components of high-order learning: reflective learning and integrative learning, explores the factors 16 influencing reflective learning and integrative learning among college students in MOOC-based 17 blended learning contexts, and conducts a social survey using a questionnaire. The main factors 18 influencing reflective and integrative learning were compiled through data analysis: self-efficacy, 19 course academic support, and faculty-student interaction support. When designing blended teaching 20 based on MOOC support, full consideration should be given to enhancing students' self-efficacy and 21 increasing the level of course academic support and faculty-student interaction support.

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INTRODUCTION

Today's world needs complex, knowledgeable, innovative, and strategic talents, and college students rely solely on memorising and reciting declarative and procedural knowledge, which is far from meeting the needs of the new development(Harris et al., 2020). Students need to have: (1) a deep understanding of complex concepts to master the ability to create new concepts, knowledge, theories, and products. (2) Critical learning of learned concepts through reflection to develop their understanding. (3) Learning integrated, transferable knowledge rather than the fragmented and contextualised facts emphasised by professionalism. (4) Awareness of lifelong learning and adaptation to the impact of new knowledge on social production(Harris, 2020).

In other words, they should master more high-order learning abilities such as comprehension, Analysis, application, and evaluation in the classroom to gain a foothold in the intelligent and innovative environment of the future(Pretorius, 2021). Developing students' high-order thinking skills is a new requirement for cultivating talents in the knowledge era. As a critical ability to adapt to the development of the knowledge era, developing students' high-order thinking skills has become a hot issue in the current education information construction goals (Becker, 2017). Developing high-order thinking skills has become an important international educational teaching reform goal. It is also an important research hotspot in education at home and abroad(Dziuban, 2018).

At present, the focus of talent training in many countries has shifted from the basic requirement of mastering professional knowledge and skills to the movement of thinking styles for handling complex tasks and information(Galikyan et al., 2021). And guiding students in higher education from the lower-order thinking of memorising and understanding knowledge to the high-order thinking of analysing, synthesising, and evaluating various types of information is an important part of innovative teaching models and improving talent quality in the new era(Rivera, 2019). To meet the new learning needs of college students, there is an urgent need to develop high-quality teaching resources, explore adapted teaching models, and play the role of universities as the main force in national teaching reform research.

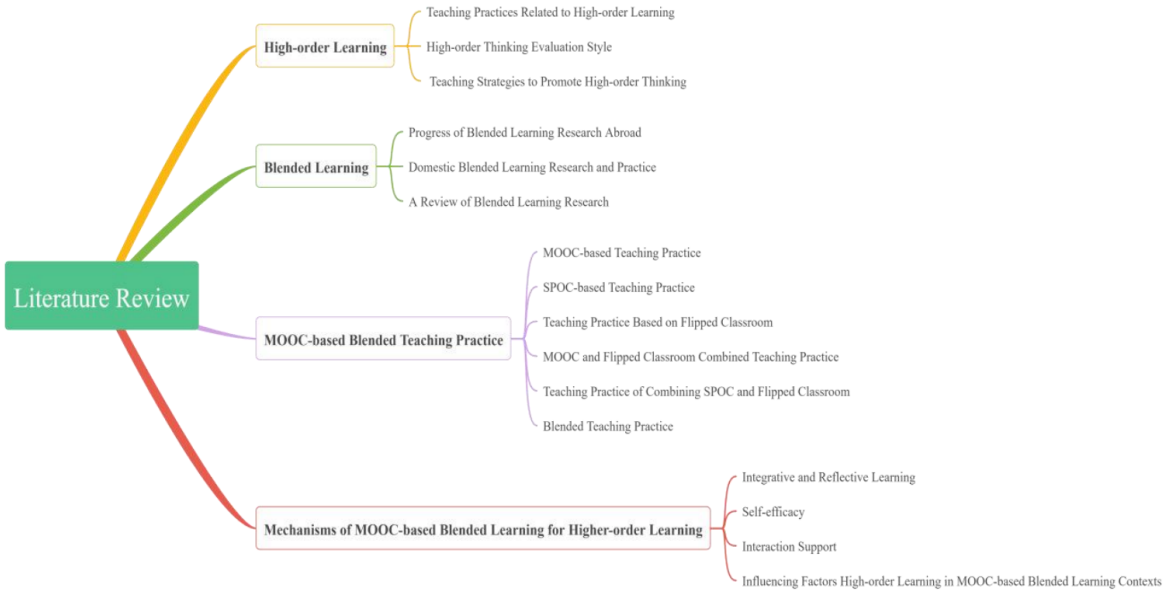
This paper constructs a model of factors influencing students' high-order learning in MOOC-based blended learning contexts by investigating and explaining the factors that influence students' high-order learning. It includes the following specific tasks: exploring the core components of high-order learning and identifying indicators that can express high-order learning and are easily observable. The second is to explore the various factors that influence the core components of high-order learning and

to formulate reasonable research hypotheses. The third is to conduct a social survey using a questionnaire to test the research hypotheses. Finally, the research findings are compiled to explain the mechanism of MOOC-based support for blended learning to promote high-order learning.

LITERATURE REVIEW

An Overview of Literature Review

In this section, we focus on the keywords "high-order learning" and "MOOC-based blended teaching" and conduct a literature review. Four aspects of research are reviewed: research on higher-order learning, research on the progress of blended learning in China and abroad, research on MOOC-based blended teaching practices, and research on the mechanism of MOOC-based blended teaching for high-order learning.



Limitations of Previous Studies

There are few studies on blended teaching to improve students' high-order thinking skills(Baturay, 2015). Most of them only analyse high-order thinking skills and cultivation strategies from the theoretical level but rarely from the empirical. However, there are relatively few studies on how to promote students' high-order thinking skills from an empirical perspective.

After systematically reviewing the research literature on "MOOC-based blended teaching for higher-order learning," we review the existing studies from four aspects(Anderson, 2003, page number).

From the perspective of research content, the research on the practical cultivation of students' higher-order thinking is scattered, not systematic, and universal, and whether the corresponding teaching methods and strategies are generalisable is to be considered(Anderson & Dron, 2020).

Regarding the research perspective, there is a lack of specific interpretation and practical guidance on teaching strategies for cultivating and developing learners' higher-order thinking. There is a lack of in-depth discussion on how teachers can effectively apply teaching strategies in the teaching process(Miller, 1994).

In terms of research findings, there have been some studies on teaching strategies for higher-order thinking development. Still, the methods or strategies provided so far have been elaborated in a general way, making it impossible to carry out specific and systematic teaching practices, promote and apply them in front-line teaching, and evaluate the effectiveness of students' higher-order thinking development(Zhao et al., 2005).

In terms of research methods, there are primarily theoretical-level discussions and a lack of empirical studies; more theoretical/model construction, fewer descriptive studies, and insufficient men tone to analysing relevant variables and their relationships that affect higher-order learning(Dynamic development of thinking, feeling, and acting. - PsycNET, 2020).

Therefore, this study integrates blended instruction with high-order learning and explores how MOOC-based blended instruction can promote high-order learning among college students through empirical research.

Theoretical Basis

Classical Education Theory

The Classical educational theories include connectionism, cognitive resource, and social cognitive theory. Part of the MOOC teaching model is derived from the theory of connectionism. This theory helps educators use MOOC resources more effectively and improves students' online learning quality. Cognitive resource theory focuses on the psychological changes of students in the learning process, which enables teachers to focus on the essential differences and design appropriate teaching strategies to facilitate the process more efficiently. The social cognitive theory explores the triadic interaction of personal, environmental, and behavioural factors in a student's learning process. This theory is the cornerstone of my research on the influencing factors of reflective and integrative learning among college students in a MOOC-based blended learning context.

Blended Learning Theory

This study redefines the essence of high-order learning based on the four aspects of the blended learning theory. With the definition, a model of high-order learning influencing factors is established in MOOC-based blended teaching contexts.

Description of relevant concepts

Integrative and Reflective Learning

High-order learning has a rich connotation, and its composition is still controversial among domestic and international scholars. This study investigates the mechanisms that influence higher-order learning among college students. Therefore, the dimensions that contain the primary connotations of higher-order learning and are easy to observe will be selected as the entry point of the study. On the one hand, the scope of higher-order learning that is the focus of this study has been defined in the literature review. Learning behaviour is an important dimension supporting the higher-order learning concept in this study(Delialioglu & Yildirim, 2008).

On the other hand, there has been sufficient evidence that integrative and reflective learning are essential manifestations of higher-order learning (Wu, Xiujuan et al., 2014), (Fang, Hualiang, 2018). Integrative and reflective learning can contribute to the Quality of learning of college students who are in the age range of 18-25 years old (Zhao et al., 2017). According to Barber, the core of integrative learning is the process by which learners connect, apply, and synthesise multiple pieces of information from various perspectives and sources and integrate this information with their own experiences (Mascolo & Fischer, 2015). The learner's integrative learning process is accompanied by higher-order learning behaviours of understanding, analysing, applying, and creating. At the heart of reflective learning is reflection, the process by which learners use metacognition to examine themselves critically. According to Dewey, reflection aims to connect old and new experiences to gain meaningful experiences (Zhang, Yun, 2007). Based on the above Analysis, this chapter and the subsequent sections will focus on integrative and reflective learning as entry points for a more in-depth study.

Self-Efficacy

Bandura combined behaviourist theory and social learning concepts to construct a social cognitive theory. This theory attempts to explain how various human behaviours occur, manifest, and regulate in

social interactions and suggests an interaction between behaviour, individual factors, and the environment. The unique social cognitive theory factors include beliefs, motivation, emotions, and cognition, mainly reflected through self-efficacy(Wu etc., 2010). Self-efficacy refers to people's subjective judgment of their ability to perform a task successfully(Zhang, etc., 2020). Bandura et al. argue that self-efficacy determines people's choice of task and beliefs about performing the task and influences the acquisition of new behaviours, the performance of learned behaviours, and emotions about performing the task(Wang & Zhu, 2019). Research has shown that self-efficacy influences learning subjects through selection, cognitive, motivational, and emotional processes (Lu et al., L., 2011).

Interaction Support

Research has shown that interaction is the key to improving the Quality of learning and making instruction productive (Zhao et al., 2005). Moore classifies interactions as student-student interactions and student-teacher interactions. And student-content interactions. In traditional face-to-face learning contexts, learners are more likely to learn meaningfully when either type of interaction is at a high level (Anderson, 2003). This study will take full advantage of this finding to propose a research hypothesis on the factors that influence higher-order learning behaviours of college students in MOOC-supported online and offline blended learning contexts.

This study defines the interactive support college students receive in MOOC-based hybrid online and offline teaching and learning contexts in three aspects: knowledge sharing, student-teacher interaction, and course learning. Knowledge sharing refers to exchanging knowledge among individuals and creating new knowledge together. Student-teacher interaction is a process in which students interact with their instructors in a variety of ways and a variety of depths. Coursework refers to students' specific problems, tasks, and assignments during their studies.

Construction of hypothetical mechanism model

Based on this study's definition of the core concepts of integrative learning, reflective learning, self-efficacy, and interactive support described above, six potential variables were identified that are the focus of this paper: integrative learning, reflective learning, self-efficacy, knowledge-sharing support, faculty-student interaction support, and course academic support. Knowledge-sharing support, faculty-student interaction support, and course academic support are considered interactive support.

Based on the above Analysis, the interrelationships among the six potential variables were compiled.

Each research hypothesis involving the six potential variables in the MOOC-based supported blended learning context was proposed. as shown in Table 1.

Table 1. Latent variable interrelationship study hypothesis

Number	Research Hypothesis
H1	Integrative learning and reflective learning correlate.
H2a	Self-efficacy has a significant positive effect on integrative learning.
H2b	Self-efficacy has a significant positive effect on reflective learning.
H3a	Knowledge sharing has a significant positive effect on integrative learning.
H3b	Knowledge sharing has a significant positive effect on reflective learning.
H4a	Coursework support had a significant positive effect on integrative learning.

H4b	Coursework support had a significant positive effect on reflective learning.
H5a	Teacher-student interaction had a significant positive effect on integrative learning.
H5b	Teacher-student interaction had a significant positive effect on reflective learning.
H6a	Self-efficacy correlates with knowledge sharing.
H6b	Self-efficacy correlates with course academic support.
H6c	Self-efficacy correlates with teacher-student interaction support.
H7a	Knowledge-sharing behaviour correlates with course academic support.
H7b	Knowledge-sharing behaviour correlates with faculty-student interaction support.
H7c	Course academic support correlates with faculty-student interaction support.

According to the social-cognitive theoretical framework, MOOC-based blended learning situations, learners, and higher-order learning (integrative and reflective learning) are causally and interactively determined by each other. On the one hand, the person as a subject strongly governs and directs their higher-order learning; the behaviour and its consequences, in turn, influence and determine the person's beliefs, motivations, emotions, cognition, etc. On the other hand, higher-order learning mediates between the learner and the online learning environment. It is how the person adapts to the online learning environment to achieve learning goals. The person and the hybrid online and offline learning environment govern higher-order learning. Self-efficacy is regarded as a personal factor; higher-order learning is viewed as a behaviour of the subject, including integrative and reflective learning; and environmental factors are mainly the interactive support provided by the teaching team to the issue, subdivided into knowledge-sharing support, faculty-student interaction support, and academic course support. Based on the research hypothesis of the relationship between potential variables, this paper constructs a model of higher-order learning influencing factors in a MOOC-supported blended learning context, as shown in Figure 1.

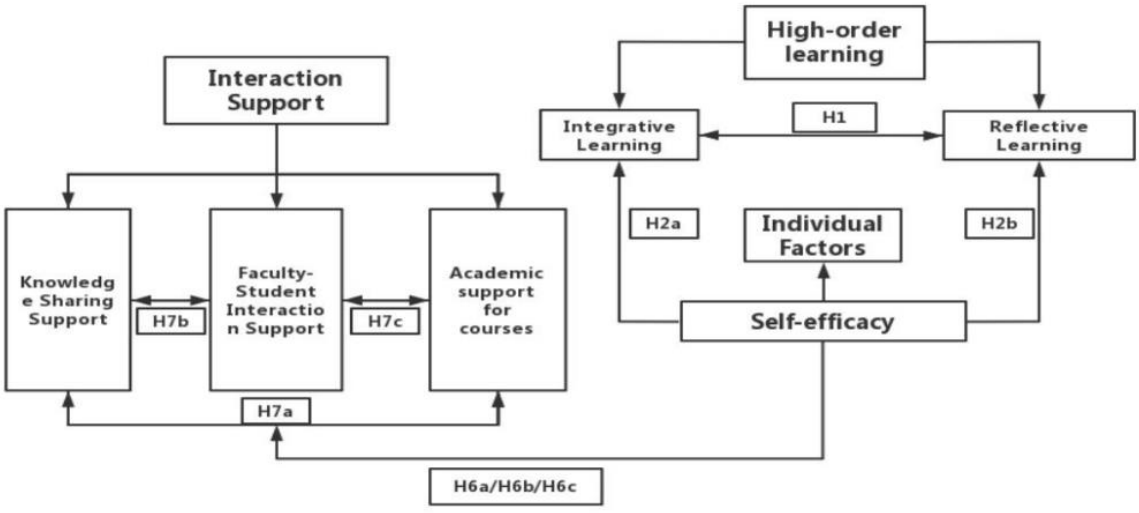


Figure 1. A hypothetical model of higher-order learning influences in blended learning contexts based on MOOC support.

METHODOLOGY

Research Design

Survey Subjects

This study focuses on the learning behaviours of college students in MOOC-based online and offline blended learning contexts. It explores the factors influencing the higher-order learning behaviours of college students to develop abstract thinking skills. Therefore, the study was conducted on college students between 18 and 25 who had participated in MOOC-based blended learning and teaching.

Sampling

The questionnaire was entered into the Questionnaire Star. The data was collected by scanning the QR code, accessing the questionnaire's web connection, and completing and submitting the questionnaire with the mobile terminal. Since there is a lack of research in China that investigates the higher-order learning of college students in MOOC-based hybrid online and offline teaching and learning contexts, it is impossible to understand the characteristics of the study population accurately. Therefore, the sampling method used in this study was the snowball sampling method.

Questionnaire

Some studies have analysed learning engagement as an essential factor influencing learners' higher-order learning in MOOC-based supported online and offline blended teaching and learning contexts (Wu, Yajie, 2017). Based on Kuhn's theory of effective educational practices, the NSSE questionnaire (Kuh, 2003) was developed at Indiana University, USA, drawing on Coates' theory on the five-dimensional student engagement framework (Coates, 2007). The questionnaire has been highly influential in evaluating the Quality of a college education. It has provided more than 1,500 colleges and universities in North America with a basis for diagnosing their educational Quality. Chinese scholars introduced the scale in 2009 and translated and improved it in terms of cultural adaptation to generate the NSSE-China. They used the instrument to conduct surveys and studies in traditional classroom contexts (He Bin & Cao Yang, 2015), (Luo Yan et al., 2009). Other measurement efforts include the Online Learning Engagement Scale developed by Dixson, which investigates information on four dimensions: skills, emotions, engagement, and performance (Dixson, 2010). In China, some scholars have combined various learning engagement scales to construct a learning engagement evaluation scale for distance students based on three dimensions: behavioural, emotional, and cognitive (Huang, 2014a). This study draws on and modifies the learning engagement evaluation scale to investigate the learning engagement of university students in MOOC-supported online and offline hybrid teaching and learning contexts to describe their integrated and reflective learning.

The first part of the questionnaire consists of two parts: the demographic characteristics of the sample, including gender, age, grade level, the discipline of study, and whether or not they have participated in MOOC-based blended learning, with five questions. The second part is the core content of the questionnaire, which consists of 25 questions. This part focuses on college students' participation in MOOC-based blended learning and investigates each dimension according to the research hypothesis. Among the 25 questions, "self-efficacy" was scored on a five-point Likert scale, including agree (5), agree (4), neutral (3), disagree (2), and counter (1). The remaining questions investigated behaviours and realities, avoiding the neutral option and using a four-point scale, including often (4 points), very often (3 points), sometimes (2 points), and never (1 point).

Table 2. Structure of the questionnaire and source of questions

Project Dimension	Secondary Dimension	Title item	Number	Question
Demographic characteristics	—	1-5	Q0(1-5)	Self-prepared

Higher-order learning behaviours	Integrative Learning	6-10	Q1(1-5)	NSSE-China2011(Dixson, 2010)
	Reflective Learning	11-14	Q2(1-4)	NSSE-China2011(Dixson, 2010)
Individual Factors	Self-efficacy	15-17	Q3(1-3)	Mei-Feng Hsu (Mei-Juan Huang, 2014a)
	Knowledge Sharing Support	18-20	Q4(1-3)	Mei-Feng Hsu (Mei-Juan Huang, 2014b)
Interaction Support	Faculty-Student Interaction Support	21-25	Q5(1-5)	NSSE-China2011(Dixson, 2010)
	Course Academic Support	26-30	Q6(1-5)	NSSE-China2011(Dixson, 2010)

Data Collection

A total of 288 questionnaires were returned for the study, of which 185 had participated in at least one MOOC-supported blended course, accounting for 63.24% of the total number of people surveyed. This percentage is higher than the percentage of students who have participated in online courses in the United States (31.6%) and close to the percentage of students who have participated in online training courses in China (66.1%), indicating the value of the survey data for Analysis and research. Among the 185 questionnaires, those with short response times (less than 100 seconds) were filtered out to ensure the data quality. Finally, 160 questionnaires were selected as the study sample, with an effective rate of 86.49%.

RESULTS

Sample Demographic Characteristics

The demographic characteristics of the final screened sample of 160 surveys are shown in Table 3. The ratio of male to female participants in this survey was 1:1.6. The survey sample was more evenly distributed across grades with a balance of 1.2:1.1:1:1.1. As the screened subjects had been responding to the study for a more extended period and had all participated in at least one course that used MOOC-based support for online and offline hybrid teaching strategies. Therefore, the screened sample data can ensure both the data quality and the scientific validity of the subsequently constructed model of higher-order learning influences in MOOC-based online and offline hybrid teaching and learning contexts for college students.

Table 3. Sample demographic characteristics

Demographic characteristics of the sample	Gender		Grade			
	Male	Female	First-year	Sophomore	Junior	Senior Year
Quantity	62	98	43	41	37	39
Proportion	38.75	61.25	27.0	25.8	22.6	24.5

Measurement Model Correction and Testing

The questionnaire items for this study were taken from a well-established questionnaire but modified appropriately. The modifications mainly converted the original survey questions from traditional learning contexts to MOOC-supported online and offline hybrid teaching contexts. To further ensure the reliability and validity of the research findings, this study conducted an exploratory factor analysis on the collected questionnaire data. Some questions were censored compared to the factors obtained from the exploratory factor analysis and the potential factors involved in the research hypothesis. The summary report of the question items, means, variance means, and reliability of each dimension of the censored questionnaire is shown in Table 4.

Table 4. Measurement Model Reliability Test

Potential Variables	Title item	Average value	Mean of variance	Cronbach's Alpha
Integrative Learning	Q1(3/4/5)	2.182	0.727	0.876
Reflective Learning	Q2(1/2/3/4)	2.412	0.869	0.895
Self-efficacy	Q3(1/2/3)	3.128	1.226	0.940
Course Academic Support	Q6(3/4/5)	2.350	0.741	0.865
Faculty-Student Interaction Support	Q5(1/2/3/4/5)	1.467	0.457	0.943
Knowledge Sharing Support	Q4(1/2/3)	2.233	0.685	0.888

As shown in Table 4, the reliability analysis of the questionnaire mainly referred to the Cronbach coefficient. It is generally accepted in academic circles that a reliability of at least 0.80 is acceptable in basic research. The reliability coefficients of all potential variables in this study were higher than this threshold, which is a high-reliability questionnaire.

Table 5. Measuring the convergent validity of the model

Observation variables	Potential Variables	Factor load	Measurement error	Composite Reliability	AVE	Observation variables	Potential Variables	Factor load	Quantity error	Composite Reliability	AVE
Q1(3)	Integrative Learning	0.86	0.19	0.875	0.701	Q4(1)	Knowledge Sharing Support	0.79	0.28	0.893	0.737
Q1(4)		0.85	0.18			Q4(2)		0.86	0.17		
Q1(5)		0.80	0.27			Q4(3)		0.92	0.11		
Q2(1)	Reflective Learning	0.79	0.30	0.894	0.677	Q5(1)	Faculty-Student Interaction Support	0.88	0.09	0.944	0.772
Q2(2)		0.80	0.30			Q5(2)		0.88	0.11		
Q2(3)		0.86	0.23			Q5(3)		0.85	0.13		
Q2(4)		0.84	0.27			Q5(4)		0.92	0.07		
						Q5(5)		0.86	0.13		
Q3(1)	Self-efficacy	0.92	0.19	0.941	0.841	Q6(3)	Course Academic Support	0.83	0.25	0.867	0.685
Q3(2)		0.89	0.26			Q6(4)		0.88	0.17		
Q3(3)		0.94	0.14			Q6(5)		0.77	0.27		

The convergent validity of the measurement model is scientific if it meets the following three conditions. (1) The factor loadings of the questionnaire questions in the measurement model are greater

than 0.7 and significant. (2) The latent variable's average variance extracted (AVE) is more significant than 0.5. (3) The composite reliability of the questionnaire questions measuring the same latent variables is more significant than 0.7. The summary of the convergent validity indicators for each dimension of the questionnaire is shown in Table 5. From Table 5, it can be seen that the questionnaire in this study has good convergent validity.

Table 6. Measuring the discriminant validity of the model

	Knowledge Sharing Support	Faculty-Student Interaction Support	Course Academic Support	Self-efficacy	Reflective Learning	Integrative Learning
Knowledge Sharing Support	0.858	—	—	—	—	—
Faculty-Student Interaction Support	0.338	0.879	—	—	—	—
Course Academic Support	0.445	0.334	0.828	—	—	—
Self-efficacy	0.586	0.339	0.521	0.917	—	—
Reflective Learning	0.295	0.275	0.432	0.357	0.823	—
Integrative Learning	0.416	0.415	0.388	0.457	0.610	0.837

The discriminant validity of the measurement model is appropriate if the square root of the mean-variance extracted value of the potential variable in the questionnaire is greater than the correlation coefficient of the variable with all other variables (Yang, Bin, 2018). In the data shown in Table 6, the data on the diagonal line is the square root of the mean-variance extracted values of the potential variables. Except on the diagonal line, the other data are the correlation coefficients of the two possible variables in the row and column where that data is located. From Table 6, it is clear that the discriminant validity of the measurement model in this study is appropriate, i.e., the value of the main diagonal of Table 6 is more significant than any other value on the row and column where it is located.

Structural Model Correction and Testing

This study's corresponding structural equation model is constructed for the measurement model based on the proposed research hypothesis. Using IBM AMOS 24.0, the paths in the structural equation model were evaluated using the maximum likelihood estimation method. For all ways with "integrative learning" and "reflective learning" as output variables, the effects of knowledge-sharing support on integrative learning (B = 0.155, p = 0.148 > 0.05) and on reflective learning (B = 0.049, p= 0.695>0.05) were not significant. Therefore, the potential variable "knowledge sharing support" was considered to be removed from the structural equation model.

After removing this latent variable, the paths in the structural equation model were again estimated using the excellent likelihood method and found that the effects of faculty-student interaction support on reflective learning (B=0.169, p=0.168>0.05), the results of course academic support on integrative learning (B=0.142, p=0.129>0.05), and the effects of self-efficacy on reflective

learning (B= 0.122, p=0.111>0.05) the three paths remained insignificant. Therefore, deleting the three paths one by one in the structural equation model was considered. The order of removing the paths was to prioritise the approaches with more significant p-values.

After the structural equation model removed the two paths of teacher-student interaction support on reflective learning and course academic support on integrative learning, the excellent likelihood method was conducted to evaluate each way. It was obtained that each path reached the significant level of 0.05. The structural equation model fitted well with the survey data. The results of testing each research hypothesis in the modified structural equation model are shown in Table 7. As seen from Table 7, all paths in the twice-modified structural equation model have reached a significant level of 0.05.

Table 7. Modified model path

Research Hypothesis	Paths	Path factor	S.E.	C.R.	P
H1	Integrative Learning ⟷ Reflective Learning	0.509	0.038	4.640	***
H2a	Self-efficacy → Integrative Learning	0,266	0.059	4.491	***
H2b	Self-efficacy → Reflective Learning	0.173	0.074	2.337	*
H4b	Course Academic Support → Reflective Learning	0.295	0.099	2.964	**
H5a	Faculty-Student Interaction Support → Integrative Learning	0.308	0.096	3.206	**
H6b	Self-efficacy ⟷ Faculty-Student Interaction Support	0.340	0.050	3.776	***
H6c	Self-efficacy ⟷ Course Academic Support	0.522	0.075	5.100	***
H7c	Course Academic Support ⟷ Faculty-Student Interaction Support	0.342	0.039	3.628	***

Note: P<0.001***; P<0.01**; P<0.05*

According to Hair (et al.), when testing the model fitness index, it is necessary first to test the model parameters for estimation violations (Alzahrani, 2020). After testing, it was found that the model constructed in this study had no negative error variance, standardised parameter coefficients were less

than 1, and no significant standard errors existed. Therefore, the overall model fitness test can be performed. Ten statistics mainly describe the fitness of the structural equations. They are divided into three categories: absolute fitness statistics (cardinality test significance probability value P, cardinality freedom ratio CMIN/DF, asymptotic residual mean square and square root RMSEA, fitness index GFI, adjusted fitness index AGFI); value-added fitness statistics (gauge fitness index NFI, relative fitness index RFI, value-added fitness index IFI, non-gauge fitness index TLI, Comparative Fit Index CFI); and parsimonious fit statistics (Parsimonious Adjusted Regular Fit Index PNFI, Parsimonious Fit Index PGFI). In this study, the recommended values of each index in the structural equation model were compiled by synthesising the research results of several scholars (Ming-Lung Wu, 2009), and the final generated structural equation model fitness indexes were collected with the recommended values of each index, as shown in Table 8.

Table 8. Fitting index of structural equation model

Fitting index	P	CMIN/DF	RMSEA	GFI	AGFI	NFI
Model Value	0.079	1.182	0.034	0.908	0.977	0.935
Recommended Value	>0.05	1.0-3.0	<0.05	>0.90	>0.90	>0.90
Fitting index	RFI	IF	TAG	CFI	PGFI	PNFI
Model Value	0.922	0.989	0.987	0.989	0.675	0.776
Recommended Value	>0.90	>0.90	>0.90	>0.90	>0.50	>0.50

The above Analysis was synthesised to construct a model of higher-order learning influences in MOOC-supported blended learning contexts. Self-efficacy has a direct positive influence on both integrative and reflective learning. Course academic support has a direct positive effect on reflective learning. Teacher-student interaction support had a direct positive effect on integrative learning. In addition, a significant positive correlation between integrative learning and reflective learning was verified in the model. There was a significant positive correlation between any two potential variables of self-efficacy, academic course support, and student-faculty interaction support.

CONCLUSION AND IMPLICATIONS

This study constructs a model of the factors influencing higher-order learning in a MOOC-supported blended learning context. It analyses the data collected through the questionnaire using structural equation modelling to enable Analysis and validation of the constructed model. The research findings obtained from this study are as follows.

Integrative learning has a significant positive correlation with reflective learning.

The survey shows that integrative learning positively correlated with reflective learning and reached a significant level of 0.001. The model's correlation coefficient for this path is 0.509, which is high. This result verifies the research hypothesis that integrative and reflective learning are interrelated (HI holds).

However, college students' higher-order learning behaviours in the hybrid online and offline teaching and learning contexts were low. The mean value of the frequency of integrated learning behaviours was 2.182, which was lower than the mean value of 2.5 on the Likert scale, while the mean value of the frequency of reflective learning behaviours was 2.412, which was slightly higher than the frequency of integrated learning behaviours, but still lower than the mean value of 2.5 on the Likert scale.

Analysis of direct positive influences on integrative and reflective learning

1. Self-efficacy has a direct positive influence on reflective learning and integrative learning in MOOC-supported blended learning contexts among college students

According to the survey, the mean value of college students' self-efficacy in MOOC-supported blended learning context is 3.128, slightly higher than that of the Likert five-band scale 3. This indicates that college students' self-efficacy in the MOOC-based blended learning context is at a medium level. Self-efficacy has a direct positive effect on both integrative and reflective learning, and the impact on integrative learning is slightly higher than on reflective learning. This indicates that college students with high self-efficacy are likelier to demonstrate integrative learning behaviours that integrate multiple materials and perspectives in MOOC-supported blended learning contexts.

2. The direct positive effect of course academic support on college students' reflective learning in MOOC-supported blended learning contexts

The study shows that the academic support provided by the current course service team positively impacts reflective learning behaviours but not integrative learning behaviours. A more reasonable explanation for this finding is that the academic support provided by the current course service teams is relatively homogeneous and does not facilitate students' integrated learning by collating different or even contradictory perspectives from multiple sources. However, students can engage in reflective thinking and inquiry-based learning based on the MOOC-based blended learning context provided by the course service team.

3. faculty-student interaction support has a direct positive effect on college students' integrative learning in MOOC-supported blended learning contexts

This study failed to verify the direct positive effect of interaction support between college students and faculty on their reflective learning. However, it may indirectly influence the reflective learning behaviours of college students in MOOC-supported blended learning contexts through interactions with course academic support or self-efficacy. The findings of this study support the idea that good faculty-student interaction support will increase the frequency of integrative learning behaviours, such as synthesising other people's perspectives or other teaching resources among college students.

The interrelationship between integrative learning and reflective learning influences

The study revealed a significant positive correlation between self-efficacy, academic support for the course, and teacher-student interaction support. The correlation coefficient between self-efficacy and educational support in the course was 0.522, which was moderate, indicating an average level of interaction between these two potential variables. The correlation coefficient between self-efficacy and student-faculty interaction support was 0.340, and the correlation coefficient between academic help and student-faculty interaction support was 0.342, indicating that the correlation between student-faculty interaction support and self-efficacy and academic support was weak.

This paper is an empirical study based on the theoretical exploration of mechanisms to promote higher-order learning among students in MOOC-supported blended learning contexts. The above social survey and data analysis findings identify two core components of the higher-order learning concept: reflective and integrative learning. The main factors influencing both types of learning were collated: self-efficacy, academic course support, and faculty-student interaction support. When designing blended learning based on MOOC support, we should consider enhancing students' self-efficacy, increasing the level of academic support for the course, and the level of support for faculty-student interaction.

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