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Enhancing Student Engagement: An Empirical Study of Impacting Factors and TARGET-Based Intervention Among Electronic Commerce Students in China

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Abstract

Background and Aim: Student engagement is essential for academic success in higher education. In Chinese universities, however, traditional teaching methods, large class sizes, and digital distractions often hinder engagement. This study explores the key factors impacting student engagement and examines how structured instructional intervention can enhance engagement among university students.

Materials and Methods: A mixed-methods design was adopted to examine student engagement among e-commerce undergraduates at a university in Yunnan. Quantitative data were collected through structured questionnaires and analyzed using multiple linear regression. A structured instructional intervention was then implemented, with pre- and post-intervention interviews conducted to evaluate its effectiveness.

Results: Initial findings indicated that motivation to learn, self-efficacy, and instructor interactivity had significant positive impacts on student engagement, while active collaborative learning and student-student interactions showed limited impacts. Following the implementation of structured interventions, all student engagement factors—both significant and previously insignificant—demonstrated notable improvement.

Conclusion: The findings underscore the critical role of targeted pedagogical strategies in fostering student engagement. While certain elements may appear ineffective in conventional settings, their impact can be substantially enhanced through deliberate instructional design. This study provides empirical support for engagement-focused teaching practices and offers valuable implications for future intervention research in higher education contexts.

Keywords: Student Engagement; Active Collaborative Learning; Instructional Intervention; Higher Education

Introduction

Student engagement is widely considered to be one of the important indicators of educational quality, and has a positive impact on academic achievement, knowledge retention, and the development of critical thinking and problem-solving skills (Fredricks et al., 2004). As the teaching paradigm shifts from teacher-centered to student-centered, how to effectively improve student engagement has become a core issue in educational research and practice.

In Chinese higher education, the problem of insufficient student engagement is particularly prominent. Traditional teaching methods, large classes, and digital interference often hinder student engagement. Specific manifestations include frequent use of mobile phones during class, unwillingness to sit in the front row, and silence in class discussions. These behaviors not only affect students' learning outcomes but also pose challenges to the improvement of teaching quality and educational standards (Trowler, 2010).

Despite this, Chinese universities have made some progress in promoting student-centered teaching reforms in recent years. Studies have shown that the use of active learning strategies such as collaborative learning and project-based learning can help improve students' learning motivation and engagement. However, the effectiveness of these methods is often affected by factors such as classroom dynamics, teaching quality, and institutional support. Therefore, it is urgent to develop structured intervention strategies suitable for the context of Chinese higher education based on empirical research to effectively improve student engagement.

This study aims to explore the key factors impacting Chinese university student engagement and to design and implement structured instructional intervention strategies to improve student engagement. Through empirical investigation and intervention practice of students majoring in e-commerce in a

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university in Yunnan Province, this study hopes to provide feasible solutions and theoretical support for improving student engagement in higher education.

Objectives

This study aims to explore the mechanisms underlying student engagement in higher education by examining its relationships with five key predictors: active collaborative learning, motivation to learn, self-efficacy, student-student interactions, and instructor interactivity. Grounded in multiple theoretical frameworks and informed by prior empirical studies, the research adopts a mixed-methods approach to not only identify significant influencing factors but also to design and evaluate targeted instructional interventions. The goal is to develop evidence-based strategies that effectively enhance student engagement in the university classroom context.

1) To investigate the significant impact of active collaborative learning on student engagement.
2) To investigate the significant impact of motivation to learn on student engagement.
3) To investigate the significant impact of self-efficacy on student engagement.
4) To investigate the significant impact of student-student interactions on student engagement.
5) To investigate the significant impact of instructor interactivity on student engagement.
6) To assess and analyze the current level of active collaborative learning, motivation to learn, self-efficacy, student-student interactions, instructor interactivity, and student engagement.
7) To design and implement Intervention Design and Implementation (IDI) on active collaborative learning, motivation to learn, self-efficacy, student-student interactions, instructor interactivity, and student engagement.
8) To determine the significant differences between active collaborative learning, motivation to learn, self-efficacy, student-student interactions, instructor interactivity, and student engagement between the pre-IDI and post-IDI phases.

Literature review

Active Collaborative Learning（ACL）

Active collaborative learning refers to a student-centered instructional approach where learners work in groups to exchange knowledge, solve problems, and achieve shared academic goals. It emphasizes peer interaction, mutual support, and co-construction of understanding. According to So and Brush (2008), it involves small groups working cooperatively to achieve shared academic goals through the exchange of skills and perspectives. This aligns with Laal and Laal's (2012) conceptualization of students engaging in collective tasks or problem-solving activities that encourage cooperation and mutual support. Similarly, Okolie et al. (2022) describe collaborative learning as a process in which learners work interdependently to complete tasks, deepen understanding, and promote shared success. These definitions converge on the premise that interaction and peer learning play a pivotal role in educational effectiveness. The "active" dimension of collaborative learning underscores student agency and sustained participation. McDonough and Foote (2015) define active collaborative learning as an instructional practice that cultivates learners' engagement in the construction of knowledge, enabling them to take ownership of their learning experience. This approach stands in contrast to traditional lecture-based methods, which Harasim (1990) critiques for treating students as passive recipients of information in a unidirectional flow from teacher to learner. Research consistently shows that collaborative learning enhances student engagement by encouraging communication, promoting responsibility, and increasing satisfaction with the learning experience (Blasco-Arcas et al., 2013; Finn & Zimmer, 2012). It has been linked to improved cognitive performance, deeper learning, and greater classroom involvement (Ma et al., 2020; Chan et al., 2019).

H1: Active collaborative learning has a significant impact on student engagement.

Motivation to Learn （MTL）

Motivation to learn refers to the internal drive that prompts learners to engage with academic tasks and pursue knowledge acquisition. Rooted in Self-Determination Theory (SDT), motivation is considered

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a self-regulated force shaped by perceived value and personal relevance of learning activities (Ryan & Deci, 2000). It plays a central role in determining whether students approach learning actively or passively (Cook & Artino Jr, 2016; Ferrer et al., 2022). From a cognitive perspective, motivation impacts goal setting, persistence, and the willingness to overcome challenges during the learning process (Brophy, 1987; Frith, 1997). Research suggests that students with higher motivation levels are more likely to participate in academic discussions, seek feedback, collaborate with peers, and invest cognitive effort in mastering content (Pajares & Schunk, 2001; Simmering et al., 2009). Both intrinsic and extrinsic motivational factors—such as autonomy, competence, and environmental influences—affect learners' behavioral and emotional engagement (Schunk & Miller, 2002; Ojo et al., 2024). Recent studies further indicate a positive correlation between motivation and student engagement, including greater persistence, enjoyment, and social interaction in both traditional and online learning contexts (Chung et al., 2020; Bedi, 2023).

H2: Motivation to learn has a significant impact on student engagement.

Self-efficacy (SFE)

Self-efficacy, a central construct in Bandura's Social Cognitive Theory (1977, 1986), refers to an individual's belief in their capacity to perform specific tasks successfully. It functions as a motivational mechanism influencing how people think, feel, and act. In academic contexts, self-efficacy affects goal setting, persistence, and the ability to overcome challenges (Pintrich, 1991; Schunk, 1984). Learners with high self-efficacy are more likely to engage in learning activities, regulate their behavior effectively, and demonstrate resilience under pressure (Sutcliffe et al., 2016). The construct is developed through personal mastery experiences, social modeling, verbal encouragement, and emotional feedback (Bandura & Wessels, 1997). Numerous studies have confirmed the positive association between self-efficacy and student engagement. Bandura (2001) emphasized that self-efficacy enhances motivation and persistence, both of which are essential to sustained engagement. Linnenbrink and Pintrich (2003) found that self-efficacy predicts behavioral, emotional, and cognitive involvement in academic settings. Lam et al. (2012) and Ferrell (2012) also identified a strong correlation between learners' belief in their capabilities and their active participation. More recent findings (Liu & Guo, 2021; Buil et al., 2020) suggest that students with greater self-efficacy show increased confidence, better task management, and stronger commitment to academic goals. This relationship holds across learning formats, including online education (Chen et al., 2024) and simulated learning environments. In essence, self-efficacy consistently emerges as a key determinant of student engagement in diverse educational settings.

H3: Self-efficacy has a significant impact on student engagement.

Student-student interactions (SSI)

Student-student interaction, also known as learner-learner interaction, refers to the mutual exchange of knowledge, ideas, and perspectives among students, either with or without the presence of an instructor (Moore, 1989). As one of the three key types of interaction in distance and traditional education, alongside learner-instructor and learner-content, this form of engagement plays a vital role in the learning process. It fosters a collaborative atmosphere where students can deepen understanding, enhance critical thinking, and co-construct knowledge (Kuo et al., 2014). Anderson's (2003) Interaction Equivalence Theory argues that when peer-to-peer interaction is strong and meaningful, it can compensate for lower levels of instructor involvement without negatively affecting learning outcomes. Given the common challenges of limited instructor access in large or online classes, student-student interaction has become increasingly important for maintaining learner engagement and improving academic performance (Sher, 2009). Research has consistently confirmed the educational benefits of student-student interactions. Kurucay and Inan (2017) showed that students engaged in peer collaboration perform better academically than those studying alone. Gunawardena et al. (2010) and Lai et al. (2019) highlighted the role of peer interaction in promoting engagement in online learning, where it supports social connection and sustained participation. Costley et al. (2022) found that structured peer exchanges, such as group activities and collaborative tasks, foster both knowledge sharing and emotional engagement. Abed et al. (2024) further suggested that these interactions

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stimulate higher-order thinking by encouraging students to analyze, evaluate, and integrate diverse concepts.

H4: Student-student interactions have a significant impact on student engagement.

Instructor interactivity (II)

Instructor interactivity refers to the dynamic, reciprocal communication between instructors and students that underpins effective teaching and learning (Moore & Kearsley, 2012). This multidimensional concept encompasses both structured instructional activities, such as feedback, assessment, and mentoring, and informal exchanges that sustain student motivation and engagement (Moore, 1989; Sher, 2009). Effective instructor-student interaction often integrates strategies like Socratic questioning, real-time feedback, and project-based learning to foster deeper cognitive engagement and knowledge construction (Zhong, 2024). Empirical studies consistently affirm the positive association between instructor interactivity and student engagement. Chickering and Gamson (1987) emphasized that frequent and meaningful instructor-student communication enhances motivation and learning outcomes. Anderson (2003) found that learners often perceive instructor interaction as the most valuable component of their educational experience. High levels of interactivity have been linked to increased engagement and learning satisfaction (Siau et al., 2006). In traditional classrooms, interactions often take the form of real-time dialogue, such as question-and-answer sessions, which not only assess understanding but also encourage active participation (Liu et al., 2003; Chou, 2003). Beyond content delivery, such interactions are key in creating supportive, learner-centered environments (Pianta et al., 2012; Keiler, 2018). Studies have shown that instructor responsiveness and emotional support significantly predict student satisfaction and academic engagement (Kuo et al., 2014; Blasco-Arcas et al., 2013). More recently, Qureshi et al. (2023) highlight that interactive teaching methods foster collaborative learning, thereby strengthening students' involvement and sustained engagement.

H5: Instructor interactivity has a significant impact on student engagement.

Student Engagement (SE)

Student engagement broadly refers to students' active and sustained involvement in learning processes. It is widely recognized as a multidimensional construct involving behavioral, emotional, and cognitive components (Fredricks et al., 2004). Behavioral engagement reflects participation and effort in academic tasks; emotional engagement includes interest, enjoyment, or a sense of belonging; cognitive engagement refers to the use of deep learning strategies and self-regulation (Ferrell, 2012). Scholars such as Hu and Kuh (2002) and Krause and Coates (2008) emphasize that engagement entails the time and energy students invest in meaningful educational activities, while Reeve (2013) highlights its motivational underpinnings. Recent studies also frame engagement as both observable behavior and internal commitment toward learning goals (Gan et al., 2024; Guerra et al., 2024). A strong body of research links student engagement to academic achievement, retention, and overall learning satisfaction (Leach, 2016; Maxwell-Stuart & Huisman, 2018). Student engagement is influenced by diverse factors, including self-efficacy (Heo et al., 2021), motivation (Bedi, 2023), workload, and peer or instructor interactions (Tani et al., 2021). Collaborative learning environments have been shown to enhance student engagement and performance (Qureshi et al., 2023). Additionally, technologies such as clickers and online tools that promote interactivity can foster emotional and cognitive engagement (Blasco-Arcas et al., 2013). As Martin and Bolliger (2018) note, student engagement acts as a critical link between learners, content, peers, and instructors and is a reliable predictor of academic success.

Conceptual Framework

Theoretical and conceptual frameworks provide the foundational basis for shaping research direction by grounding the study in established theories and clarifying the core variables involved (Adom et al., 2018). These frameworks help illustrate how different factors are interconnected, offering a structured lens through which the research domain can be understood and broader insights can be drawn. The conceptual framework of this study draws on three representative models that emphasize the multifaceted determinants

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of student engagement. First, Qureshi et al. (2023) proposed a model highlighting the role of interactivity facilitated by classroom technologies such as clickers. Their study demonstrated that increased interactivity promotes active collaborative learning and student engagement, which in turn mediates improvements in academic performance. Second, Bedi (2023) explored the interplay between motivation to learn, self-efficacy, and student engagement in online contexts. The findings showed that motivation significantly enhances engagement, with self-efficacy partially mediating this relationship. The study also identified instructional strategies such as timely feedback, structured course design, and inclusive teaching as critical to sustaining engagement in virtual environments. Third, the framework by Abubakarı et al. (2022) examined predictors of online engagement among international students. While factors such as institutional support, motivation, and personal innovativeness were found to be significant, the expected impacts of instructor and peer interaction were statistically non-significant in this context. Nevertheless, previous literature consistently affirms the value of instructional presence and learner interaction as key elements in fostering cognitive and emotional engagement (Anderson, 2003; Moore, 1989). Building upon these models, this study constructs a conceptual framework that integrates five core predictors—active collaborative learning, motivation to learn, self-efficacy, student-student interactions, and instructor interactivity—to examine their collective influence on student engagement. This framework not only synthesizes insights from prior empirical research but also addresses gaps regarding the interactive dimensions of engagement, offering a comprehensive lens for understanding student engagement in higher education.

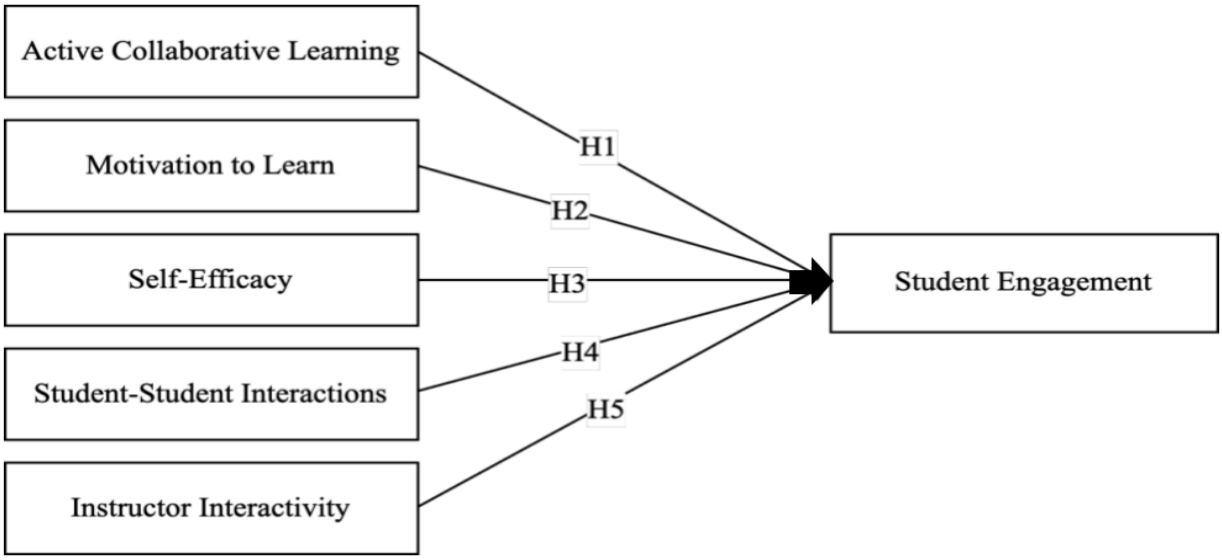

Figure 1 Conceptual Framework

The conceptual framework is used to propose five hypotheses for validation:
H1: Active collaborative learning has a significant impact on student engagement.
H2: Motivation to learn has a significant impact on student engagement.
H3: Self-efficacy has a significant impact on student engagement.
H4: Student-student interactions have a significant impact on student engagement.
H5: Instructor Interactivity has a significant impact on student engagement.

Methodology

Research Design

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This research employed a sequential mixed-methods design comprising a quantitative diagnostic phase followed by a qualitative-informed intervention. In Phase 1, a structured questionnaire was used to assess the influence of the five predictors on student engagement. In Phase 2, a pedagogical intervention based on the TARGET framework was implemented to improve engagement through structured classroom strategies. The intervention lasted eight weeks and incorporated learner-centered approaches such as Project-Based Learning, Think-Pair-Share, and Jigsaw.

Participants

The study involved undergraduate e-commerce majors at a public university in Yunnan, China. Freshman and sophomore students (n = 408) were targeted, with a final sample of 200 students selected via stratified sampling for the survey. An additional 30 participated in pilot testing, and 38 students joined the intervention phase. The sample size met statistical recommendations for regression (Hair et al., 2014).

Research Instruments

A structured questionnaire was developed to collect data, comprising two main sections. The first section recorded demographic information, including gender and academic year. The second section assessed six core constructs related to student engagement, with all items adapted from previously validated instruments to ensure content validity and measurement reliability.

Active Collaborative Learning was measured using four items adapted from So and Brush (2008) and Qureshi et al. (2023). Motivation to Learn was assessed with four items based on the scale developed by Afsar and Umrani (2020). Self-efficacy was measured using four items from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich (1991). Student–Student Interactions and Instructor Interactivity were each measured with five items, adapted from Sher (2009). Student Engagement was measured using sixteen items adapted from Reeve and Tseng (2011), capturing behavioral, emotional, and cognitive dimensions as conceptualized by Fredricks et al. (2004).

All items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Content validity was evaluated by three experts in educational research using the Item-Objective Congruence (IOC) index. Based on expert feedback, one student engagement item was removed due to insufficient alignment with the theoretical construct. Internal consistency for each construct was confirmed through Cronbach's alpha, with all coefficients exceeding the acceptable threshold of 0.70.

Table 1 Design of Questionnaire

Variable	Number of items	Items	Reference
Active Collaborative Learning (ACL)	4	ACL1. I feel that collaborative learning in my group is effective. ACL 2. I can develop knowledge and skills through peer collaboration. ACL 3. I feel part of a learning community in my group. ACL 4. I actively participate in collaborative learning.	Adapted from So and Brush (2008) and Qureshi et al. (2023)
Motivation to Learn (MTL)	4	MTL1. I am motivated to learn the knowledge and skills emphasized in classes. MTL 2. I will try to learn as much as I can from my classes. MTL 3. I am willing to exert considerable effort in my classes in order to improve my knowledge and skills. MTL 4. I often look for opportunities to develop new knowledge and skills.	Adapted from Afsar and Umrani (2020)

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Variable	Number of items	Items	Reference
Self-Efficacy (SFE)	4	SFE1. I believe I will receive an excellent grade in my classes. SFE 2. I am confident I can understand the most complex material in my courses. SFE 3. I am confident I can do an excellent job on the assignments and tests in my courses. SFE 4. Considering the difficulty of my courses, the instructor, and my skills, I think I can do well in my classes.	Adapted from Pintrich (1991)(MSLQ)
Student-Student Interactions (SSI)	5	SSI1. I was able to share learning experiences with other students. SSI 2. I was able to communicate with other students in this course. SSI 3. Increased contact with fellow students helped me more in this course. SSI 4. A sense of community existed with fellow students taking this course. SSI 5. This course encouraged me to work in small groups/teams.	Adapted from Sher (2009)
Instructor Interactivity (II)	5	II1. The instructor encouraged me to become actively involved in the course discussions. II 2. The instructor provided me feedback on my work through comments. II 3. I was able to interact with the instructor during the course discussions. II 4. The instructor treated me as an individual. II 5. The instructor informed me about my progress periodically.	Adapted from Sher (2009)
Student Engagement (SE)	16	Behavioral engagement: SE1. I listen carefully in class. SE 2. I try very hard at school. SE 3. The first time my instructor talks about a new topic, I listen very carefully. SE 4. I work hard when we start something new in class. SE 5. I pay attention in class. Emotional Engagement: SE 6. I enjoy learning new things in class. SE 7. When we work on something in class, I feel interested. SE 8. When I am in class, I feel curious about what we are learning. Cognitive Engagement: SE 9. When doing schoolwork, I try to relate what I'm learning to what I already know. SE 10. When I study, I try to connect what I	Adapted from Reeve and Tseng (2011)

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Variable	Number of items	Items	Reference
		am learning with my own experiences. SE 11. I try to make all the different ideas fit together and make sense when I study. SE 12. I make up my own examples to help me understand the important concepts I study. SE 13. Before I begin to study, I think about what I want to get done. SE 14. When I'm working on my schoolwork, I stop once in a while and go over what I have been doing. SE 15. As I study, I keep track of how much I understand, not just if I am getting the right answers. SE 16. If what I am working on is difficult to understand, I change the way I learn the material.	

Intervention Procedure

The intervention was structured using the TARGET framework (Ames, 1992), which promotes student engagement through six key elements: Task, Authority, Recognition, Grouping, Evaluation, and Time. The instructional redesign was embedded in the "Online Store Operations and Management" course and delivered over eight consecutive weeks, with one session per week.

Each dimension was translated into specific strategies. For instance, tasks emphasized real-world problem solving and goal setting; students exercised autonomy by choosing group roles and participating in decision-making; peer collaboration was fostered through heterogeneous groups; and formative feedback replaced traditional summative evaluation. Flexible pacing and dedicated time for reflection were also incorporated.

The intervention was theoretically grounded in Self-Determination Theory (Deci & Ryan, 1985) and Social Cognitive Theory (Bandura, 1986), ensuring support for autonomy, competence, and relatedness throughout the learning process. A total of 38 students participated, with engagement assessed through pre- and post-intervention surveys and follow-up interviews.

Table 2 Structure of the TARGET Model

Structure	Instructional Strategies
Task	Meaningful, Novelty, Variety, Student interest, Reasonable challenge, Establish short-term, self-referenced goals.
Authority	Develop responsibility and independence, decision-making, Self-management and monitoring skills.
Recognition	Recognize students' efforts and provide opportunities for improvement.
Grouping	Heterogeneous grouping structures that promote peer collaboration and cooperation.
Evaluation	Focus on individual improvement, progress, and mastery; make evaluation private.
Time	Flexibility in learning pace, Adequate time for mastery, Effective use of class time, and Personalized time adjustments.

Source: Developed from Ames (1992).

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Data Analysis

Quantitative data were analyzed using Jamovi. In the pre-intervention phase, multiple linear regression was conducted to examine the impacts of the five predictors on student engagement. During the evaluation phase, paired samples t-tests were used to assess within-group changes in student engagement scores. For qualitative interview data, thematic analysis based on key terms was used to support the interpretation of quantitative results and assess the intervention's effectiveness.

Results

To establish the content validity of the questionnaire, an Item-Objective Congruence (IOC) assessment was conducted. Three experts in educational research independently evaluated each item based on its alignment with the intended construct. Items achieving an average IOC score of 0.67 or above were retained, while one item (SE9: "Class is fun") was removed due to a low score (0.33). The finalized version included 38 items covering six constructs: active collaborative learning, motivation to learn, self-efficacy, student-student interactions, instructor interactivity, and student engagement.

Following the revision, a pilot test was administered to 30 participants to assess internal consistency. Cronbach's alpha coefficients for all constructs exceeded 0.88, indicating strong reliability. Specifically, values ranged from 0.884 (active collaborative learning) to 0.959 (student engagement), confirming the questionnaire's robustness.

Table 3 Number of Measurement Items and Cronbach's Alpha of Each Construct (n=30)

Variable	Number of items	Cronbach's Alpha	Strength of Association
Active Collaborative Learning (ACL)	4	0.884	Good
Motivation to Learn (MTL)	4	0.909	Excellent
Self-Efficacy (SFE)	5	0.897	Good
Student-Student Interactions (SSI)	5	0.909	Excellent
Instructor Interactivity (II)	4	0.907	Excellent
Student Engagement (SE)	16	0.959	Excellent

Subsequently, multiple linear regression analysis was performed to examine the impacts of the five independent variables on student engagement. The overall model demonstrated strong explanatory power, with an R^2 of 0.847 and an adjusted R^2 of 0.843 ($F(5,194) = 214$, $p < 0.001$), indicating that approximately 84.7% of the variance in student engagement could be explained by the model.

Table 4 Multiple Regression Results Predicting Student Engagement (n=200)

Variable	t-value	p-value	Stand. Estimate (β)	R2
Active Collaborative Learning (ACL)	-0.534	0.594	-0.0333	
Motivation to Learn (MTL)	3.223	0.001	0.2241	
Self-Efficacy (SFE)	2.592	0.01	0.1641	0.847
Student-Student Interactions (SSI)	0.368	0.713	0.0251	
Instructor Interactivity (II)	9.438	< .001	0.5850	

Further analysis showed that motivation to learn ($\beta = 0.224$, $p = 0.001$), self-efficacy ($\beta = 0.164$, $p = 0.01$), and instructor interactivity ($\beta = 0.585$, $p < 0.001$) had significant positive effects on student engagement. In contrast, active collaborative learning ($\beta = -0.033$, $p = 0.594$) and student-student interactions ($\beta = 0.025$, $p = 0.713$) did not show statistically significant effects. These findings highlight the critical role of intrinsic motivation, self-belief, and teacher-student interaction in fostering engagement among students.

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Results of Hypotheses Testing

Multiple linear regression was used to examine the study's five hypotheses, with the following testing results:

H1: Active collaborative learning has no significant impact on student engagement (β=-.0333, p= .594).

H2: Motivation to learn has a significant impact on student engagement (β=.2241, p=.001).

H3: Self-efficacy has a significant impact on student engagement (β = .1641, p=.01).

H4: Student-student interactions have no significant impact on student engagement (β= .0251, p=.713).

H5: Instructor interactivity has a significant impact on student engagement (β=.585, p<.001).

Therefore, the results support H2, H3, and H5, but not H1 and H4.

Intervention Design and Implementation Stage

Based on the collected data and results from multiple linear regression analysis, active collaborative learning and student-student interactions were not found to have a statistically significant influence on student engagement. In contrast, motivation to learn, self-efficacy, and instructor interactivity exhibited significant positive effects. Nevertheless, all variables will be included in the subsequent intervention phase. This approach acknowledges that certain impacts may not be immediately evident through initial quantitative analysis but could emerge through targeted educational strategies. The study will assess changes before and after the intervention (IDI), aiming to uncover potential indirect or delayed effects on student engagement.

Drawing on the analysis of pre-IDI interview data, this study employed the TARGET framework to guide the design and implementation of the intervention. This model offers a systematic approach to fostering an effective learning environment by addressing six essential components: task, authority, recognition, grouping, evaluation, and time management. The intervention was conducted over eight weeks and involved 38 undergraduate students from the researcher's own class. The instructional activities were embedded within the e-commerce course titled Online Store Operation and Management.

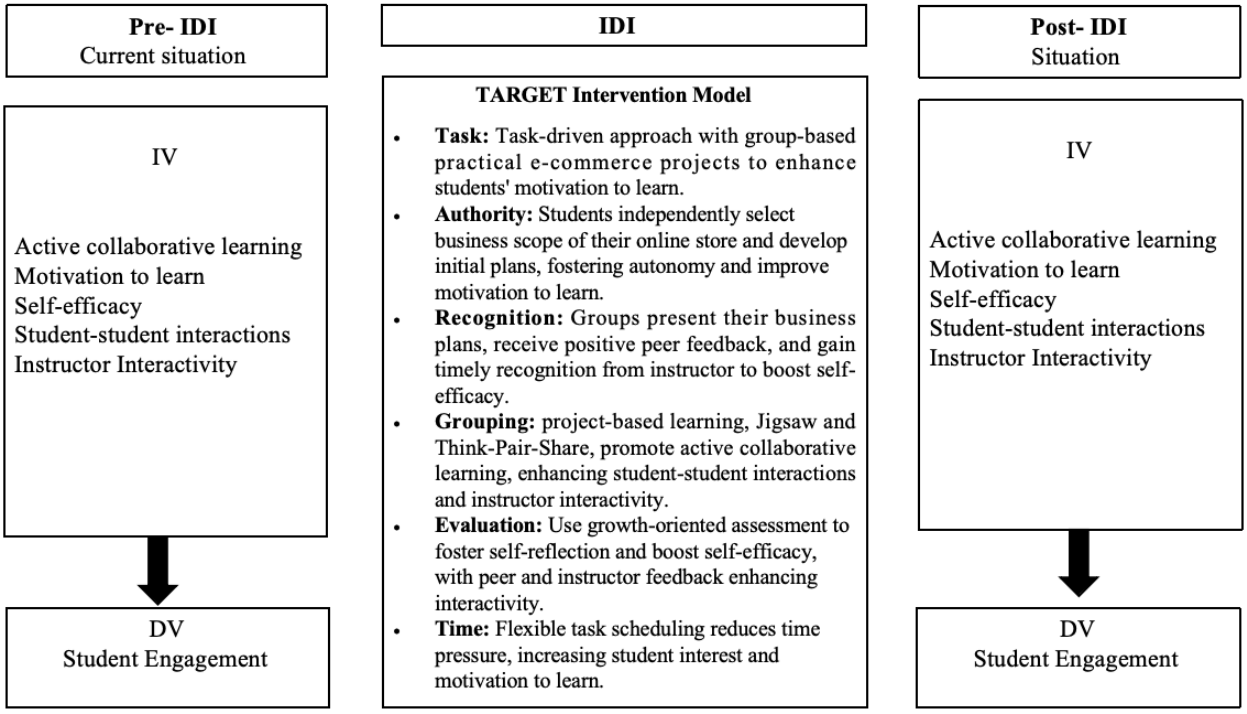

Figure 2 Proposed Intervention Design Implementation Model

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Hypothesis:

H6: There is a significant difference in Active collaborative learning pre-IDI and post-IDI.
H7: There is a significant difference in Motivation to learn Pre-IDI and Post-IDI.
H8: There is a significant difference in Self-Efficacy Pre-IDI and Post-IDI.
H9: There is a significant difference in Student-student interactions between Pre-IDI and Post-IDI.
H10: There is a significant difference in Instructor Interactivity Pre-IDI and Post-IDI.
H11: There is a significant difference in Student Engagement between Pre-IDI and Post-IDI.

Results of Paired Samples T-test Between Pre-IDI and Post-IDI

series of paired samples t-tests were conducted to assess changes in the six key variables before and after the instructional design intervention (IDI). The results indicated statistically significant improvements across all measured dimensions.

Table 5 Paired Samples T-test Results

Variables		N	Mean	St. Deviation	t-value	df	p-value
Pair 1	Pre_ ACL	38	3.88	0.535	-7.37	37.0	< .001
	Post_ ACL	38	4.59	0.392			
Pair 2	Pre_ MTL	38	3.84	0.534	-5.83	37.0	< .001
	Post_ MTL	38	4.51	0.528			
Pair 3	Pre_ SFE	38	3.66	0.508	-5.47	37.0	< .001
	Post_ SFE	38	4.28	0.586			
Pair 4	Pre_ SSI	38	3.78	0.513	-4.81	37.0	< .001
	Post_ SSI	38	4.37	0.432			
Pair 5	Pre_ II	38	3.58	0.531	-4.73	37.0	< .001
	Post_ II	38	4.22	0.522			
Pair 6	Pre_ SE	38	3.70	0.492	-4.57	37.0	< .001
	Post_ SE	38	4.25	0.491			

According to Table 5, for Active Collaborative Learning (ACL), the mean score increased from 3.88 (SD = 0.535) to 4.59 (SD = 0.392), with a significant difference ($t(37) = -7.37$, $p < .001$). Similarly, Motivation to Learn (MTL) rose from 3.84 (SD = 0.534) to 4.51 (SD = 0.528), also showing a significant difference ($t(37) = -5.83$, $p < .001$). Self-Efficacy (SEF) demonstrated a notable increase, with pre-IDI and post-IDI means of 3.66 (SD = 0.508) and 4.28 (SD = 0.586), respectively ($t(37) = -5.47$, $p < .001$).

The dimension of Student-Student Interactions (SSI) improved significantly from 3.78 (SD = 0.513) to 4.37 (SD = 0.432), ($t(37) = -4.81$, $p < .001$). Likewise, Instructor Interactivity (II) increased from 3.58 (SD = 0.531) to 4.22 (SD = 0.522), ($t(37) = -4.73$, $p < .001$). Finally, Student Engagement (SE) showed a significant improvement from 3.70 (SD = 0.492) to 4.25 (SD = 0.491), ($t(37) = -4.57$, $p < .001$).

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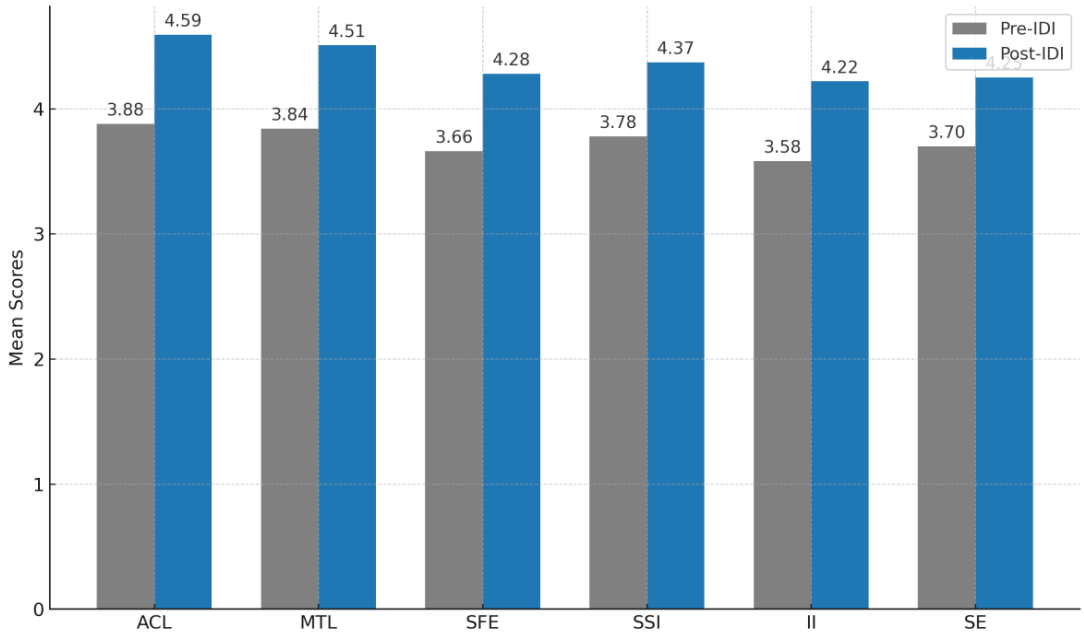

Figure 3 Comparison of Pre-IDI and Post-IDI Scores Across Six Constructs

In sum, all post-IDI scores were significantly higher than their corresponding pre-IDI scores, indicating that the instructional intervention had a positive effect on all measured constructs. These findings provide empirical support for Hypotheses H6 through H11, confirming that significant changes occurred across all targeted variables following the intervention.

Although these results are promising, one potential limitation should be noted. The instructor who conducted the intervention was also the researcher, which may have introduced unintended bias. Students' awareness of the dual role might have impacted their engagement or responses, potentially impacting the internal validity of the findings. Future research could address this by engaging independent instructors to minimize such confounding impacts.

Discussion

This study explores the key factors influencing student engagement in the context of e-commerce education, particularly focusing on the impact of a structured instructional intervention. The findings reveal that motivation to learn, self-efficacy, and instructor interactivity play significant roles in shaping student engagement.

Motivation to learn, especially intrinsic motivation, was found to be a primary driver of active participation. When students perceive learning tasks as meaningful and aligned with their personal goals, their engagement increases notably. This supports the core assumption of Self-Determination Theory (SDT), which highlights the importance of autonomy and relevance in fostering motivation.

Self-efficacy emerged as a strong predictor of engagement. Students who have confidence in their learning abilities are more likely to persist in academic challenges and maintain a high level of involvement. This aligns with Social Cognitive Theory (SCT), which emphasizes the role of self-beliefs in impacting behavior. Instructional strategies that include attainable goal-setting and constructive feedback can be particularly effective in strengthening students' sense of efficacy.

Instructor interactivity also significantly affected student engagement, especially when feedback was personalized and communication was supportive. These interactions contributed to students' sense of belonging and purpose, reinforcing the educator's role not only as a facilitator of knowledge but also as a motivator and guide.

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Initially, active collaborative learning (ACL) and student-student interactions (SSI) did not demonstrate significant impacts. This result may reflect cultural and contextual factors, such as students' limited exposure to collaborative pedagogies within traditionally teacher-centered Chinese classrooms. During the intervention, however, when structured techniques such as Project-Based Learning (PBL), the jigsaw method, and think-pair-share were introduced, meaningful collaboration emerged. Peer discussions evolved from superficial exchanges to deeper, reflective dialogue, suggesting that the success of ACL and SSI depends heavily on intentional instructional design and facilitation.

These findings highlight that while motivation to learn, self-efficacy, and instructor interactivity are foundational, collaborative learning can become a powerful contributor to student engagement when integrated thoughtfully into course design. The results underscore the importance of culturally responsive, theory-informed, and systematically implemented instructional strategies.

Conclusion

This study investigated the factors that influence student engagement in university classrooms, focusing on e-commerce students in a context where traditional, instructor-centered teaching methods dominate. The pre-intervention analysis revealed that motivation to learn, self-efficacy, and instructor interactivity had significant positive effects on student engagement, while active collaborative learning and student-student interactions initially did not. This could be explained by students' limited prior exposure to collaborative learning methods and the relatively superficial nature of their peer interactions, which did not contribute significantly to student engagement in the early stages of the study.

In response, a structured intervention strategy was designed, drawing on the TARGET framework and incorporating elements from Self-Determination Theory (SDT) and Social Cognitive Theory (SCT). The intervention introduced active learning techniques, such as Project-Based Learning (PBL), Jigsaw, and Think-Pair-Share, alongside adjustments in task design, evaluation methods, and group collaboration strategies. These changes aimed to enhance students' autonomy, promote more meaningful interactions, and support their motivation to engage more deeply with the learning process.

The results after the intervention were striking. All five core variables—motivation to learn, self-efficacy, instructor interactivity, active collaborative learning, and student-student interactions—showed significant improvements. Notably, active collaborative learning and student-student interactions, which had been ineffective before the intervention, became crucial contributors to student engagement. Students reported that the quality of group collaboration had greatly improved, leading to more substantial intellectual exchanges. The intervention's success highlights the importance of structured, theory-driven approaches to fostering student engagement and improving the quality of learning interactions.

In conclusion, this research demonstrates the effectiveness of a structured intervention strategy in enhancing student engagement, particularly in educational environments where traditional, lecture-based teaching remains dominant. The study shows that when active learning strategies are systematically implemented and supported by targeted interventions, they can significantly improve student engagement in the learning process. These findings provide valuable insights for educators and curriculum designers, offering a practical framework for increasing student engagement in higher education through well-designed, evidence-based teaching strategies.

Recommendations

Align Instructional Interventions with the TARGET Framework

Structured instructional interventions grounded in the TARGET framework (Task, Authority, Recognition, Grouping, Evaluation, Time) offer a coherent and evidence-informed approach to enhancing student engagement. Rather than applying the model rigidly, instructors should adapt each dimension to their specific classroom environment. For example, offering task options with varying difficulty levels can promote autonomy and competence. Similarly, involving students in certain instructional decisions can foster a greater sense of ownership.

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Systematic Implementation of Active Collaborative Learning

The study indicates that active collaborative learning, though initially showing limited impact, contributed meaningfully to engagement after structured implementation. Thus, embedding methods such as Project-Based Learning, Jigsaw, and Think-Pair-Share into course design is recommended. For success, these methods require clear guidance, timely feedback, and training in teamwork skills. Attention should also be paid to group composition and task interdependence to prevent unequal participation.

Enhance Instructor Interactivity

Instructor interactivity plays a pivotal role in promoting engagement. Recognition of student progress, both academic and collaborative, enhances motivation and a sense of belonging. Instructors should provide individualized feedback and use diverse evaluation methods—including self- and peer-assessment—to emphasize growth over comparison. Creating opportunities for dialogue, mentorship, and feedback fosters a supportive environment that encourages participation and sustained engagement.

Foster Self-Efficacy and Motivation

Students' belief in their ability and the perceived relevance of tasks influence sustained engagement. Learning experiences that bridge theory and real-world application, such as e-commerce simulations used in this study, can boost both motivation and confidence. Allowing students to make choices in tasks and assessment formats increases their sense of ownership. Providing structured feedback and emphasizing learning progress over performance encourages intrinsic motivation and persistence. Educators should design environments that reinforce students' agency and competence to support long-term engagement.

Limitations and Future Research

This study offers valuable insights into student engagement, yet several limitations should be considered.

First, the sample was limited to e-commerce students from a single institution, which may restrict the applicability of findings to broader educational settings. Engagement mechanisms often vary across disciplines and academic cultures; thus, future research should involve diverse student populations from multiple institutions and subject areas to enhance external validity.

Second, the relatively modest sample size (n = 200), though sufficient for initial statistical analysis, may not fully capture the variability in student experiences and contextual influences. Larger-scale studies would improve reliability and allow for more granular subgroup analysis.

Third, the intervention period was relatively short, limiting assessment of long-term impacts. While post-intervention improvements were observed, their sustainability remains uncertain. Longitudinal research designs are needed to examine whether such gains persist over extended periods and to compare outcomes across varying intervention durations.

Fourth, instructor influence may have played a role in the results, as the interventions were conducted primarily by the researcher. Instructor characteristics—including teaching style, familiarity with active learning methods, and classroom management—may affect implementation fidelity and student responses. Future studies should involve multiple instructors to explore how such variations impact student engagement outcomes.

Finally, future research should also explore the integration of emerging educational technologies, particularly AI-driven tools, in promoting engagement. AI-based feedback systems offer real-time, formative guidance that supports self-regulated learning. Moreover, intelligent tutoring systems and natural language processing technologies could enhance collaborative learning environments by facilitating meaningful peer and instructor interactions. Investigating the interplay between these technologies and pedagogical strategies may yield deeper insights into scalable, effective student engagement models.

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