THE RELATIONSHIP BETWEEN CLASSROOM PARTICIPATION AND DIGITAL LITERACY OF LOGISTICS MAJORING STUDENTS IN LINYI UNIVERSITY*

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Abstract

The objectives of this research were 1) to study classroom participation of logistics majoring students in Linyi University; 2) to study digital literacy of logistics majoring students in Linyi University.; and 3) to study the relationship between classroom participation and digital literacy of logistics majoring students in Linyi University. This study adopts a quantitative method to explore the relationship between integrated teaching strategies and students' comprehensive ability. The accidental random sampling was 210 students of logistics majoring at Linyi University, selected according to Krejcie and Morgan table (1970). The research instrument was a self-designed questionnaire. The statistics used were frequency, percentage, mean, standard deviation, and Pearson product moment correlation coefficient.

The research results were:

1. Classroom participation of logistics majoring students in Linyi University in 3 aspects was at a high level ($\bar{X}$=3.63, S.D.= 0.90). Considering the results of

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these 3 research aspects were as follows: the highest rank was "emotional engagement", indicates a high level ($\bar{X}$=3.69, S.D.=0.94). Followed by "cognitive engagement" ($\bar{X}$=3.62, S.D.=0.88), whereas "behavioral engagement" was the lowest rank ($\bar{X}$=3.58, S.D.=0.87).

2. Digital literacy of logistics majoring students in Linyi University in 5 aspects was at a high level ($\bar{X}$=3.66, S.D.=0.90). Considering the results of these 5 research aspects were as follows: the highest rank was "digital communication and collaboration", indicates a high level ($\bar{X}$=3.70, S.D.=0.89). Followed by "information literacy" ($\bar{X}$=3.67, S.D.=0.91), whereas "digital content creation" was the lowest rank ($\bar{X}$=3.63, S.D.=0.90).

3. It was found that the correlation between classroom participation and digital literacy has a positive correlation at the high level with statistical significance level at .01 (r=0.94**).

Keywords: Classroom Participation, Digital Literacy, logistics majoring students in Lin Yi University.

Introduction

Classroom participation is widely regarded as a key indicator of effective learning in higher education, reflecting students' behavioral, cognitive, and emotional engagement in instructional activities (Fredricks et al., 2004). With the increasing integration of digital technologies in teaching and learning, classroom participation has expanded beyond traditional face-to-face interaction to include digitally mediated engagement, such as online discussions and technology-supported collaborative tasks (Barkley & Major, 2022).

At the same time, digital literacy has become an essential competence for university students, particularly in technology-intensive disciplines such as logistics. Digital literacy refers to students' ability to access, evaluate, use, communicate, and create information through digital technologies. As learning

environments become increasingly digitalized, students' capacity to participate meaningfully in classroom activities is closely related to their level of digital literacy.

Empirical research has demonstrated a positive relationship between digital literacy and student engagement. Getenet et al. (2024) found that university students' digital literacy significantly predicted self-efficacy, which in turn enhanced behavioral, cognitive, emotional, and social engagement in online learning environments. Similarly, Novianti et al. (2025) reported that digital literacy significantly influenced students' engagement levels and learning outcomes, while Nkomo et al. (2021) highlighted that active participation in digital learning contexts promotes motivation and interaction, both of which are central to engagement and literacy development.

Despite increasing scholarly attention, most existing studies have examined classroom participation and digital literacy independently or within generalized student populations. Limited research has focused on their interrelationship in discipline-specific contexts such as logistics education, where digital technologies are integral to teaching and professional practice. Moreover, while prior studies emphasize the role of digital literacy in enhancing engagement, less is known about the potential reciprocal effect of classroom participation on digital literacy development.

Therefore, there is a clear need to systematically investigate the relationship between classroom participation and digital literacy among logistics majoring students at Linyi University. Such an investigation can provide empirical evidence to inform instructional design and curriculum development in digitally enriched higher education contexts.

Objectives

1. To study classroom participation of logistics majoring students in Linyi University.

2. To study digital literacy of logistics majoring students in Linyi University.

3. To study the relationship between classroom participation and digital literacy of logistics majoring students in Linyi University.

Literature Review

The literature review explores two keys relevant to the research areas.

1. Classroom participation

Classroom participation, as a core construct of student engagement, refers to students' active involvement in classroom learning activities through behavioral, cognitive, and emotional dimensions. It breaks away from the traditional view that equates participation solely with verbal responses and instead emphasizes multidimensional engagement, including interaction with teachers and peers, active thinking, and emotional investment in learning tasks (Fredricks et al., 2004). Supported by engagement theory and constructivist learning theory (Piaget, 1970; Vygotsky, 1978), classroom participation is commonly conceptualized as consisting of three interrelated components. Behavioral participation reflects observable actions such as asking questions, contributing to discussions, and participating in group activities (aligned with constructivism's emphasis on active learning). Cognitive participation emphasizes students' mental effort, strategic thinking, and self-regulation during learning processes (serving engagement theory's focus on deep information processing). Emotional participation refers to students' affective responses, including interest, enjoyment, and a sense of belonging, which sustain learning motivation and persistence (Fredricks et al., 2004). Empirical studies have demonstrated that higher levels of classroom participation are positively associated with academic

achievement, learning motivation, and persistence in higher education contexts (Dancer & Kamvounias, 2005).

2. Digital literacy.

Digital literacy is recognized as a comprehensive and essential competence for students in contemporary higher education, particularly in digitally intensive disciplines such as logistics. As a holistic concept, digital literacy goes beyond basic technical operation to integrate information processing, communication, collaboration, content creation, and ethical awareness in digital environments (Ng, 2012). Its core advantage lies in enabling students to effectively access, evaluate, create, and apply digital information to support learning, problem-solving, and professional development (UNESCO, 2018). Grounded in socio-cultural learning theory and digital competence frameworks (Carretero, G. S., Vuorikari, R., & Punie, Y, 2017), digital literacy typically comprises multiple interrelated components. These include technical skills that enable effective use of digital tools, information literacy that supports critical evaluation and ethical use of digital information, digital communication and collaboration that facilitate interaction and knowledge co-construction, digital content creation that encourages creative and productive use of technology, and digital ethics and security awareness that guide responsible participation in digital environments (Ng, 2012). Previous studies have shown that digital literacy is positively related to students' academic performance, self-efficacy, and learning engagement in online and blended learning contexts (Yuan et al., 2024; Getenet et al., 2024). Although existing research confirms the educational value of both classroom participation and digital literacy, there is a lack of in-depth empirical research examining their relationship within specific disciplinary contexts, particularly among logistics majoring students in Chinese universities. This research gap highlights the necessity of the present study, which aims to explore how digital

literacy relates to classroom participation among logistics majoring students at Linyi University.

3. Research Framework

In this study about the relationship between classroom participation and digital literacy of logistics majoring students in Linyi University, the independent variable refers to classroom participation, Fredricks, Blumenfeld, and Paris (2004) proposed that student engagement consists of three core dimensions: behavioral engagement, emotional engagement, and cognitive engagement. The dependent variable is digital literacy, Schwartz et al. (2004) proposed that digital literacy includes technical skills, information literacy, digital communication and collaboration, digital content creation and ethical, social responsibility and security awareness. Several educational theories provide a foundation for understanding the relationship between these variables.

The research framework can be described as the figure following.

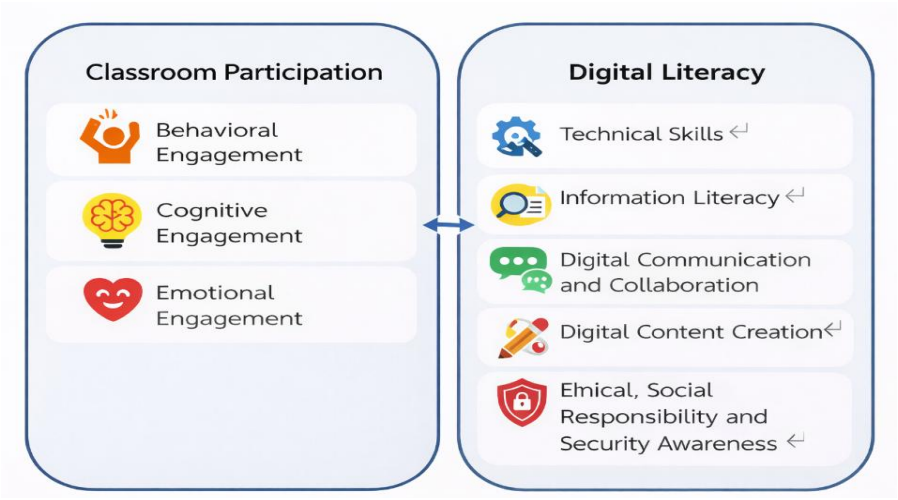

Figure 1 Research Framework

Methodology

This study adopts a quantitative research method to systematically explore the relationship between classroom participation and digital literacy of logistics majoring students in Linyi University. The research process includes population and sample determination, research instrument design, data collection, and data analysis.

Population and the Sample Group

Population

The research population is 460 logistics majoring students from Linyi University.

Sample

The sample group of this study is 210 logistics majoring students in Linyi University. The sample size was determined using the Krejcie and Morgan table (1970), and convenience sampling was employed to recruit participants who were readily available across academic departments.

Research Instrument

The research instrument is a questionnaire with 3 parts:

Part 1 General Information. This section has 4 questions to gather background information on the respondent's gender, specialty, grad and grade point average.

Part 2 Classroom Participation. This section uses a 5-point Likert scale with the standardized labels: "Strongly Disagree (1)" to "Strongly Agree (5)”- an academic norm for measuring attitudes and perceptions. It contains statements related to classroom participation, organized into 3 dimensions: 1) Behavioral engagement, 2) Cognitive engagement, 3) Emotional engagement.

Part 3 Digital Literacy. It has 5 rating scales. This main section has Students’ digital literacy statements measured on a 5-point Likert scale ranging from "the least agree" to "the most agree". It is organized into 5 dimensions: 1)

Technical skills, 2) Information literacy, 3) Digital communication and collaboration, 4) Digital content creation, 5) Ethical, Social Responsibility and Security Awareness.

All statements display consistency with the measurement target as evidenced by an average score of 0.67 to 1.00 on the acceptable consistency index (IOC). The reliability of a pilot test of questionnaires assessed using Cronbach's α, a statistic measuring internal consistency, with α value of 0.98, indicating excellent internal consistency.

3. Data Collection

To ensure the systematic collection of data, the researcher implemented the following procedures:

Distribution: The online questionnaires were distributed to logistics majoring students in Linyi University via digital channels. Each respondent was informed of the research objectives, confidentiality, and their voluntary participation.

Platform Utilization: Data were collected through the "Questionnaire Star" (Wenjuanxing) online platform, which facilitated efficient data gathering and management.

Data Screening: Upon completion of the collection period, the raw data were screened. Invalid responses, such as incomplete forms or patterned answers, were excluded to ensure the integrity of the results.

Preparation for Analysis: The final valid datasets were coded and organized for statistical processing and analysis.

Data analysis

Part 1 To study classroom participation of logistics majoring students in Linyi University, data analysis uses mean and stand deviation.

Part 2 To study digital literacy of logistics majoring students in Linyi University, data analysis uses mean and stand deviation.

Part 3 The relationship between classroom participation and digital literacy was analyzed by using the Pearson Product Moment Correlation Coefficient (r).

Results

Part 1: Classroom Participation

Table 1 The mean ($\bar{X}$) and standard deviation (*S.D.*) of classroom participation of logistics majoring students in Linyi University in 3 aspects

Classroom Participation	$\bar{X}$	*S.D.*	Level	Ranking
1. Behavioral Engagement (X1)	3.58	0.87	High	3
2. Cognitive Engagement (X2)	3.62	0.88	High	2
3. Emotional Engagement (X3)	3.69	0.94	High	1
Total	**3.63**	**0.90**	**High**	

From Table 1 consideration, the overall average of classroom participation of logistics majoring students in Linyi University was at a high level ($\bar{X}$=3.63, S.D.= 0.90). Considering the results of these 3 research aspects were as follows: the highest rank was “emotional engagement” ($\bar{X}$=3.69, *S.D.*= 0.94), indicates a high level. Followed by “cognitive engagement” ($\bar{X}$=3.62, *S.D.*=0.88), whereas “behavioral engagement” was the lowest rank ($\bar{X}$=3.58, *S.D.*=0.87).

Part 2: Digital Literacy

Table 2 The mean ($\bar{x}$) and standard deviation (*S.D.*) of digital literacy of logistics majoring students in Linyi University in 5 aspects.

Digital Literacy	$\bar{x}$	*S.D.*	Level	Ranking
1. Technical skills (Y1)	3.66	0.94	High	3
2. Information literacy (Y2)	3.67	0.91	High	2
3. Digital communication and collaboration (Y3)	3.70	0.89	High	1
4. Digital content creation (Y4)	3.63	0.90	High	5
5. Ethical, social responsibility and security awareness (Y5)	3.65	0.89	High	4
Total	**3.66**	**0.90**	**High**	

From Table 2 consideration, the overall average digital literacy of logistics majoring students in Linyi University in 5 aspects, was at a high level ($\bar{x}$=3.66, *S.D.*=0.90). Considering the results of these 5 research aspects were as follows: the highest rank was “Digital communication and collaboration” ($\bar{x}$ =3.70, *S.D.*=0.89), indicates a high level. Followed by “information literacy” ($\bar{x}$=3.67, *S.D.*=0.91), whereas “digital content creation” was the lowest rank ($\bar{x}$=3.63, *S.D.*=0.90).

Part 3: The relationship between classroom participation and digital literacy of logistics majoring students in Linyi University.

Table 3 The relationship between classroom participation and digital literacy.

Digital literacy (Y_{tt})	Classroom Participation (X_{tt})			
	X_1	X_2	X_3	X_{tt}
Y_1	0.81**	0.85**	0.83**	0.89**
Y_2	0.83**	0.87**	0.85**	0.91**
Y_3	0.80**	0.84**	0.82**	0.87**
Y_4	0.81**	0.87**	0.81**	0.89**
Y_5	0.78**	0.84**	0.82**	0.87**
Y_{tt}	**0.86****	**0.91****	**0.88****	**0.94****

****** refers to statistical significance level at .01

From table 4.16, it is shown that the overall relationship between classroom participation and digital literacy has a positive correlation at the high level with statistical significance level at .01 (r=0.94).

Discussion

1. Classroom participation among logistics majors at Linyi University was relatively high, with emotional engagement highest, followed by cognitive engagement, and behavioral engagement lowest. This pattern reflects the applied nature of logistics education, which enhances perceived relevance and strengthens affective and cognitive involvement while constraining observable participation. Consistent with prior research, emotional and cognitive engagement show stronger effects on learning than behavioral engagement. Xu et al. (2023) found that emotional and cognitive engagement significantly predicted learning outcomes, whereas behavioral engagement did not. Joshi et al. (2022) and ElSayary et al. (2022) similarly reported higher emotional and cognitive engagement, with emotional engagement preceding cognitive involvement. The

findings align with situated learning theory, suggesting authentic contexts heighten affective investment, but the lower behavioral engagement indicates structural constraints such as lecture-dominant formats or limited interaction opportunities. From a self-determination theory perspective, behavioral engagement requires supportive instructional design. Therefore, logistics curricula should incorporate simulation-based group tasks, digital response tools, and participation-weighted assessment to translate students' interest and cognition into collaborative professional behaviors.

2. Digital literacy among logistics majors at Linyi University was generally high. Among the five dimensions, digital communication and collaboration ranked highest, followed by information literacy, while digital content creation ranked lowest. This pattern reflects the logistics learning context, where frequent use of digital tools strengthens interaction and information skills but provides fewer opportunities for advanced digital production. Georgopoulou (2025) found high confidence in information literacy but moderate confidence in digital content creation, while Zhou et al. (2025) confirmed the uneven development of digital literacy across skill domains. From a competent development perspective, students function more as digital users than producers, consistent with task-based exposure theory. However, lower digital content creation competence suggests misalignment with smart logistics practices requiring dashboards, analytics, and simulations. Therefore, curricula should integrate data visualization, system reporting, and digital process-mapping projects to foster operational digital production skills.

3. The results revealed a strong, statistically significant positive correlation between classroom participation and digital literacy at the .01 level. This suggests that participatory learning, especially cognitive and interactive engagement—requires students to use digital tools for information access, communication, and collaboration, thereby promoting continuous digital literacy development. The

finding aligns with prior studies. Georgopoulou (2025) found cognitively engaged students demonstrated stronger information literacy, while Zhou et al. (2025) showed that interaction-oriented digital literacy was more developed among participatory learners. The relationship can be explained through a participation–practice mechanism: sustained engagement provides situated digital practice, consistent with social constructivism. However, the high correlation may also reflect construct overlaps between participation and certain digital literacy dimensions, suggesting mutual reinforcement rather than simple causality. Pedagogically, the findings highlight technology-embedded participatory approaches—such as digital supply-chain simulations, collaborative platform tasks, and real-time data discussions—as effective pathways to simultaneously enhance engagement and digital competence.

Recommendation

The implementation of the research results is as follows.

1. Enhance Students' Behavioral Engagement: Teachers should adopt active, task-based learning, universities should support instructors and interactive tools, and students should take greater responsibility for preparation and participation to achieve more effective classroom engagement.

2. Strengthen Digital Competencies: Teachers should incorporate digital content–creation tasks, universities should provide technical training and resources, and students should actively practice and collaborate using digital tools to promote balanced digital literacy development.

3. Coordinated Engagement and Digital Skills: Teachers should integrate digital tools into participatory activities, universities should provide infrastructure and pedagogical support, and students should actively engage in both in-class and digital learning to enhance participation and digital competence simultaneously.

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