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Effects of EFL Students' Interaction on Their Subjective Learning Performance in UNIPUS-LMS Facilitated College English Learning

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ABSTRACT

This study explores the impact of four types of student interaction—learner-content, learner-learner, learner-instructor, and learner-technology—on EFL learners' subjective learning performance in a blended College English course supported by the UNIPUS LMS. Grounded in the Community of Inquiry (CoI) framework and social constructivist theory, the research adopts a mixed-methods design, combining quantitative data from 504 EFL student questionnaires with qualitative data from classroom observations. Multiple regression analysis revealed that all four interaction types significantly predicted students' perceived learning outcomes, accounting for 46% of the variance. Learner-content interaction ($\beta = 0.317$) was the strongest predictor, followed by learner-learner ($\beta = 0.213$), learner-instructor ($\beta = 0.194$), and learner-technology ($\beta = 0.115$) interactions. Thematic analysis of classroom observations further illustrated how content engagement promoted language mastery, peer collaboration enhanced motivation and understanding, and instructor support boosted learner confidence and accountability. Technology, while a less influential predictor, enabled meaningful interaction when supported by instructional guidance and digital readiness. These findings underscore the critical role of cognitive, social, and teaching presence in blended EFL contexts and highlight the need for intentional instructional design. The study concludes that interaction is central to learning in technology-enhanced environments and that pedagogical strategies should balance content delivery, peer collaboration, and responsive teaching support.

Keywords: EFL Student Interaction; UNIPUS-LMS Facilitated Learning; Subjective Learning Performance

1. Introduction

Learning Management Systems (LMSs) have reshaped EFL education by offering structured, interactive environments that support student engagement with course materials, peers, and instructors [1,2]. This evolution calls for a deeper understanding of how students interact within these digital platforms, especially in blended learning contexts. Interactions such as learner-learner, learner-instructor, learner-content, and learner-technology are all considered essential components of successful language acquisition [3,4].

LMSs play a pivotal role in facilitating EFL learning by promoting social interaction, collaborative learning, and efficient content delivery [5,6]. However, studies have revealed ongoing issues with the quality of interaction in both online and blended settings [7,8]. Moreover, while much of the existing literature emphasizes technological features, fewer studies have examined how these different types of interaction influence learning performance from a pedagogical perspective [9].

The value of interaction in second language acquisition has been widely acknowledged [10–12]. Although advancements in online language instruction have improved EFL teaching [10,13,14], face-to-face communication remains central due to its inherently interactive nature [12,15,16]. Blended learning, which combines digital tools with traditional instruction, offers a promising way to maximize interaction opportunities [4,17,18]. Whether synchronous or asynchronous, these interactions significantly shape students' learning experiences, satisfaction, and perceived outcomes [15,16]. Nonetheless, how these interaction types specifically influence students' subjective learning performance—particularly within platforms like UNIPUS LMS—has not been sufficiently investigated.

To address this gap, the present study investigates the effects of learner-learner, learner-instructor, learner-content, and learner-technology interactions on EFL students' subjective learning performance within a UNIPUS LMS-supported College English course. Specifically, it aims to answer the following research question: How do the four types of student interaction—learner-learner, learner-content, learner-instructor, and learner-technology—affect EFL students' subjective learning performance in a UNIPUS-facilitated College English course? By examining these four types of interaction as independent variables, this study offers a nuanced view of how specific interaction modalities contribute to students' perceived learning outcomes. This approach not only contributes to the existing body of knowledge by integrating pedagogical insights with digital learning analytics, but also responds to recent calls for more student-centered evaluations of LMS effectiveness. The study's innovation lies in its focus on subjective learning performance as a key indicator of instructional impact in blended EFL contexts—an area often overshadowed by test scores or objective metrics. By clarifying the distinct and overlapping roles of each interaction type, this research advances a more comprehensive understanding of interaction-driven learning and informs instructional design within technologically mediated environments.

2. Literature Review

2.1. The Community of Inquiry Framework and Student Interaction

Grounded in Dewey's educational philosophy and social constructivist principles, the Community of Inquiry (CoI) framework offers a collaborative model for understanding effective online learning in higher education [19]. It highlights the importance of critical thinking and the co-construction of knowledge that is both personally relevant and socially shared. The framework is built on three interrelated elements—social presence, cognitive presence, and teaching presence—which together foster a meaningful and engaging learning experience. These elements help learners develop a sense of identity, promote purposeful communication, and encourage shared responsibility for learning.

In the CoI framework, interaction is not limited to basic communication or the transmission of information. Rather, it involves meaningful engagement among students, instructors, course materials, and the online environment [20–23]. The synergy among social, cognitive, and teaching presence is considered vital to achieving educational outcomes [24,25], especially in EFL settings, where language development is shaped through consistent interaction with teachers, peers, and online tools.

A major development in the application of the CoI framework has been the creation of a survey instrument

designed to measure learners' experiences in online and blended learning environments [26]. This instrument has gained wide use in educational research. In the present study, selected items from the CoI survey were adapted to explore how EFL students perceive various types of interaction. Specifically, the study focuses on four dimensions of interaction: learner-learner, learner-instructor, learner-content [22], and learner-technology interaction [23]. These dimensions are examined as potential factors influencing EFL learners' subjective learning performance within the UNIPUS LMS-supported College English classroom.

2.2. Social Constructivism and Language Learning

Social constructivism, which builds on Piaget's constructivist theory and was later expanded by Vygotsky [27], views learning as a fundamentally social process. Knowledge, from this perspective, is not simply acquired but co-constructed through interaction, dialogue, and collaboration within a social and cultural context [28,29]. Rather than being an individual endeavor, learning occurs through shared experiences, particularly in group settings. As Creswell [30] noted, social constructivism serves as a useful lens for interpreting the qualitative dimensions of learner engagement.

This theoretical approach is especially applicable to English as a Foreign Language (EFL) learning, where communication and interaction are central to language development. Collaborative learning environments, supported by social constructivist principles, have been shown to enhance vocabulary acquisition and overall language proficiency [31]. Studies have found that constructivist-based strategies—such as active participation, peer collaboration, and context-rich tasks—positively influence learning outcomes by promoting deeper engagement and meaningful interaction [32–34].

In LMS-supported blended learning settings like UNIPUS, students are not passive recipients of content but active participants in their own learning processes. Through peer exchanges, instructor feedback, and self-directed activities, they construct knowledge in both face-to-face and online environments. These interactions foster autonomy while simultaneously benefiting from social support and scaffolding.

In this study, social constructivism provides the theoretical foundation for examining student interaction in a blended EFL context. The four types of interaction—learner-learner, learner-instructor, learner-content, and learner-technology—reflect key tenets of this theory, as they all involve the co-construction of meaning through active social engagement. The UNIPUS LMS environment enables and shapes these interactions, making it an ideal context for applying social constructivist principles to EFL learning.

2.3. Subjective Learning Performance

Regardless of the delivery mode—whether online, face-to-face, or blended—the primary objective of any educational experience is to structure the learning process in a way that supports intended learning outcomes [35]. Learning performance encompasses a range of indicators, including students' self-reported understanding, knowledge acquisition, skill development, and motivation to continue learning [36].

This study integrates the theoretical dimensions of the four interaction types to explore how different forms of engagement within the UNIPUS LMS shape students' perceived learning achievements. Specifically, it focuses on subjective learning performance, which is assessed through subjective learning outcomes (SLO), a concept first introduced by Ekwunife-Orakwue and Teng [37] in their examination of interaction effects on educational outcomes. In this context, SLO refers to students' perceptions of their academic progress and engagement, as influenced by interactions with peers, instructors, course content, and the UNIPUS LMS, both online and in the physical classroom. By examining learners' self-evaluations in a blended learning environment, it aims to provide a nuanced understanding of how interaction-driven experiences contribute to EFL students' perceived learning success in UNIPUS-facilitated College English courses.

2.4. The Application of LMSs in Foreign Language Teaching and Learning

Learning Management Systems extend traditional classroom interactions into digital spaces, enabling students to engage more flexibly with instructors, peers, and

course materials. They streamline the delivery of educational resources and support a variety of instructional methods within online and blended learning environments [1,38]. By offering a range of multimedia resources and interactive tools, LMSs create a more inclusive and comfortable learning environment that encourages student participation [2], thereby supporting language development. This digital integration not only strengthens linguistic competence but also promotes learner autonomy—an essential skill for sustained language learning beyond the classroom [39,40]. When thoughtfully designed for language instruction, LMSs can enhance outcomes through structured, engaging, and adaptable learning experiences [1,2,41].

The use of LMSs in foreign language education aligns well with the Community of Inquiry (CoI) framework, which highlights the importance of social, cognitive, and teaching presences in online learning contexts [19]. Building on this foundation, the current study explores how four distinct forms of interaction—learner-learner, learner-instructor, learner-content, and learner-technology—within the UNIPUS LMS influence EFL learning outcomes. Existing literature suggests that active engagement with LMS features can improve student involvement, comprehension, and overall academic performance in language courses [42,43].

However, research specifically focused on EFL learners' perceptions of interaction within the UNIPUS LMS remains limited. The present study addresses this gap by investigating how various types of interaction influence students' subjective learning performance. In doing so, it aims to deepen the understanding of how learning management systems like UNIPUS can be effectively leveraged to support EFL learning in higher education.

2.5. Summary

Although existing literature has acknowledged the importance of interaction in EFL learning, few studies have systematically examined how different types of student interaction—specifically learner-learner, learner-instructor, learner-content, and learner-technology—jointly influence subjective learning performance in LMS-supported blended learning environments. Given the complexity and potential interdependence of these variables, formulating directional hypotheses may oversimplify the dynamic and context-sensitive nature of interaction in the UNIPUS-facilitated College English course. Therefore, this study does not advance formal hypotheses. Instead, it adopts a flexible, data-driven approach using multiple regression analysis to explore how these interaction types collectively and individually affect students' perceived learning outcomes. This approach allows for a more comprehensive understanding of the interplay among interaction types and their influence on learner experience, without constraining the inquiry to predefined assumptions.

3. Methodology

3.1. Research Design

Based on the research question, this study adopted a mixed-methods approach. Specifically, it combined a quantitative questionnaire and a qualitative observation method. It was conducted at a private tertiary university located in a south-west bordering city in China. This location was chosen based on criteria suggested by Taylor and Bogdan [44], which include ease of access, a rich environment with willing participants, teachers' interest and enthusiasm for research interaction, and the overall structure. General English course, which refers to College English, was a compulsory course for all freshmen and sophomore undergraduates at this university. Particularly, College English was the course chosen for the present study and UNIPUS was the learning management system designated to implement College English education.

The quantitative phase of the research was conducted at the end of the first semester of the 2024/2025 academic year, which spanned from September 2024 to January 2025. According to the curriculum schedule, the College English course lasted for 18 weeks of instruction. Students and the instructor met twice a week, with each session comprising two class periods (40 minutes per period), totaling four periods per week.

Since the final week (Week 18) was designated for the final examination, students would primarily focus on exam preparation. To ensure the validity and reliability of the data, Weeks 17 and 18 were excluded from data collection. The questionnaire was distributed via a web link hosted on *wjx.cn*, a widely used China-based platform for on-

line survey data collection. Specifically, the questionnaire was administered during Week 19 (January 6–10, 2025), when students had completed their exams and were relatively relaxed. It was distributed to intact classes to ensure consistent delivery.

Qualitative data were collected through classroom observations, conducted during Weeks 3, 7, and 11, with the consent of the EFL instructors. The observations aimed to capture real-time interaction types—learner-learner, learner-instructor, learner-content, and learner-technology—and to explore how these interactions manifested within the UNIPUS LMS-facilitated learning environment.

To mitigate the potential for common method bias during data collection, several procedural remedies were implemented. These included ensuring participant anonymity, and using both positively and negatively worded items in the questionnaire. Moreover, classroom observation field notes served as a secondary, non-self-report data source to triangulate and validate the findings, further reducing the risk of common methods bias.

3.2. Sampling

Random sampling was applied in this study. It targeted all non-English-major freshmen enrolled in the College English course during the first semester of the 2024/2025 academic year at the selected university. The total population consisted of approximately 3,450 students, divided into 80 intact classes, each with 40 to 45 students. Based on Krejcie and Morgan's [45] sample size formula, a minimum of 346 participants was deemed sufficient.

Eligibility required students to be enrolled in the College English course and actively use the UNIPUS LMS. Considering the possible outliers and the participants' voluntariness, 15 intact classes were randomly selected to represent the sample. Specifically, the 15 intact classes comprised 738 freshmen, primarily aged 18 or

19, spanning in various disciplines. Among the selected classes, all students were invited to participate in the questionnaire survey. That is to say, the questionnaire was distributed to all the targeted classes. Consequently, 574 valid responses were collected, yielding a response rate of 77.8%. While this response rate is considered acceptable for educational research, several factors may account for the non-response. These include students' varying levels of motivation, limited availability during the data collection period, and potential survey fatigue due to overlapping academic commitments. Additionally, as participation was voluntary and anonymous, some students may have chosen not to engage due to a lack of perceived relevance or time constraints.

To ensure data quality, 70 responses were excluded from the analysis because they were completed in less than 200 seconds. After thorough discussion among the researchers, this completion time was deemed insufficient for thoughtful engagement with the questionnaire items, given its length and complexity. Such rapid responses likely reflect inattentive or careless answering behavior, and their removal helps enhance the validity of the dataset. Therefore, the final sample consisted of 504 valid responses. This sampling strategy ensured a representative and manageable sample size, while also meeting the minimum requirement of participants [45].

The final sample consisted of 187 male and 317 female students, as detailed in **Table 1**. A gender imbalance naturally occurred, as it was difficult to control for gender distribution given the large student population. In addition, only respondents who completed the questionnaire in full were included in the final dataset. Regarding academic majors, 235 participants were from science and engineering fields, while 269 were from liberal arts disciplines, as shown in **Table 2**.

Table 1. Participants for the questionnaire by gender.

	Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	187	37.1	37.1	37.1
	Female	317	62.9	62.9	100.0
	Total	504	100.0	100.0	

Table 2. Participants for the questionnaire by academic major.

	Academic Major	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SE	235	46.6	46.6	46.6
	LA	269	53.4	53.4	100.0
	Total	504	100.0	100.0	

LA: Liberal Arts; SE: Science and Engineering.

In sum, the selected university follows the Guidelines for College English Teaching in China and uses the UNIPUS LMS platform, which is widely adopted across Chinese higher education institutions. Therefore, the sample reflects the typical instructional and technological environment experienced by similar student populations. Moreover, participants came from a range of academic majors including engineering, business, and liberal arts. This diversity enhances the representativeness of the sample.

3.3. Research Instruments

A five-point Likert questionnaire (See **Appendix A**) was used to examine relationship between the four types of interaction and subjective learning performance from the perspective of EFL learners. The scale ranged from 1 (strongly disagree) to 5 (strongly agree). The instrument was primarily adapted from three established sources. Details regarding the origins of the questionnaire constructs, along with their reported validity and reliability, were presented in **Table 3**.

The questionnaire comprised three sections. Section 1 collected demographic information, including age, gender, and academic major. Section 2 contained 42 items measuring students' perceptions of the four types of in-teraction: learner-instructor interaction (13 items), learner-learner interaction (5 items), learner-content interaction (9 items), and learner-technology interaction (15 items). Section 3 consisted of 6 items assessing subjective learning outcomes. To ensure contextual relevance, all questionnaire items were slightly modified to fit the specific characteristics of the EFL learning environment.

To facilitate participant understanding, the questionnaire was translated into Chinese, the participants' native language. However, 27 of the interaction-related items in section 2—covering learner-instructor, learner-content, and learner-technology interactions—were adapted from the validated Chinese version of the Community of Inquiry survey instrument developed by Lan et al. [46], and thus did not require translation. To ensure the accuracy and conceptual equivalence of the remaining items, a rigorous back-translation procedure was conducted. The original English items were first translated into Chinese, then independently back-translated into English by two experts with expertise in language assessment and applied linguistics. Any discrepancies between the original and back-translated versions were carefully reviewed and resolved through discussion to ensure semantic clarity and conceptual consistency across both language versions.

Table 3. An introduction to the Questionnaire by section.

Section	Content	Items	Source (Adapted from)	Reported Validity	Reported Reliability
1	Demographic information	Grade, gender, academic major,			
2	EFL students' perception towards the four types of interaction	13 items for learner-instructor interaction 5 items for learner-learner interaction 9 items for learner-content interaction	Chinese version of CoI Survey Instrument [46]	Factor analysis: The total variance explained was 69.857%	Standardized Cronbach's α = 0.955.

Table 3. *Cont.*

Section	Content	Items	Source (Adapted from)	Reported Validity	Reported Reliability
		15 items for learner-technology interaction	Computer Self-Efficacy Survey [47]	Construct validity: Experience correlated at r = 0.79, p < 0.0005, N = 212 and familiarity correlated at r = 0.75, p < 0.0005, N = 210. Criterion validity: F (4, 207) = 50.66, p < 0.0005	Standardized Cronbach's α = 0.97.
3	EFL students' perception towards their subjective learning outcomes	6 items	Questionnaire on subjective learning outcomes [48]	PCA: Factor loadings ranged from .623 to .848	Standardized Cronbach's α = 0.811.

In addition to the questionnaire, classroom observations (see Observation Protocol in **Appendix B**) were conducted during three separate lessons in College English course utilizing the UNIPUS LMS. The course content was based on the textbook *College English: Over to You—An Integrated Course*, published by the Foreign Language Teaching and Research Press in China. According to the teaching schedule, three intact classes were purposively selected as observation sites. Each class was observed for one complete lesson, consisting of two consecutive 40-minute periods. In total, the classroom observations spanned 6 periods, or 240 minutes. The observation field notes—labelled FN01, FN02, and FN03—focused on how the four types of student interaction (learner-content, learner-instructor, learner-technology, and learner-learner) were manifested in practice. Additional attention was given to the three presences outlined in the Community of Inquiry framework, as well as students' comfort with and ability to use technology, specifically the UNIPUS LMS.

3.4. Research Process

For the quantitative research, first, the students were briefed about this research. Then the consent form was signed by them before they volunteered in the study. The questionnaire link was shared to the online class chatting room by the EFL teacher respectively. The data from the questionnaire were analyzed by SPSS23.0.

For the qualitative research, first, the researcher introduced to corresponding EFL teachers about the study. Then the permission to enter the classroom for data collection was gained. Sequentially, field notes were taken during the observations. The field notes from classroom observation were handled via thematic analysis.

3.5. Validity of the Quantitative ReSsearch

The validity was tested in two stages: one was for the 42 items on student interaction, while the other was for the 6 items on student' perceptions towards learning performance. Exploratory factor analysis was conducted to perform KMO and Bartlett's sphericity test. The Kaiser-Meyer-Olkin (KMO) value for the student interaction scale was 0.968 (see **Table 4**), and 0.889 for the subjective learning performance scale (see **Table 5**), both exceeding the recommended threshold of 0.70. In addition, Bartlett's Test of Sphericity was significant for both scales (p < 0.001), indicating that the data were suitable for factor analysis.

Table 4. KMO and Bartlett's Test for student interaction.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.968
Bartlett's Test of Sphericity	Approx. Chi-Square	15886.942
	df	861
	Sig.	0.000

Principal component analysis (PCA) with varimax rotation was conducted to extract the underlying factor structure. Factors were retained based on eigenvalues greater than 1. An orthogonal rotation (varimax) was applied to maximize the variance explained by each factor. As shown in **Table 6**, four distinct factors were extracted for the student interaction scale and one factor for the subjective learning performance scale. The total variance explained was 63.697% and 67.324% respectively, both exceeding the commonly accepted threshold of 50%, indicating satisfactory explanatory power.

Factor loadings were presented in **Table 7**. Loadings for Factor 1 (learner-technology interaction) ranged from 0.591 to 0.838; Factor 2 (learner-instructor interaction), from 0.659 to 0.848; Factor 3 (learner-content interaction), from 0.669 to 0.770; Factor 4 (learner-learner interaction), from 0.595 to 0.731; and Factor 5 (subjective learning performance), from 0.713 to 0.877. All item loadings for student interaction exceeded 0.50, and all cross-loadings were below 0.40, indicating good construct validity. Similarly, all items measuring subjective learning performance showed loadings above 0.50, suggesting that each item made a moderate to strong contribution to the underlying construct.

Table 5. KMO and Bartlett's Test for subjective learning performance.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.889
Bartlett's Test of Sphericity	Approx. Chi-Square	1880.108
	df	15
	Sig.	0.000

Table 6. Factor Analysis: Eigenvalues and Variance for student interaction and subjective learning performance.

Total Variance Explained								
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Independent variables: four types of student interaction									
1	17.553	41.793	41.793	17.553	41.793	41.793	9.532	22.694	22.694
2	4.283	10.197	51.990	4.283	10.197	51.990	8.218	19.567	42.261
3	3.205	7.631	59.620	3.205	7.631	59.620	5.897	14.041	56.302
4	1.712	4.077	**63.697**	1.712	4.077	63.697	3.106	7.396	**63.697**
Dependent variable: subjective learning performance									
1	4.039	67.324	**67.324**	4.039	67.324	**67.324**			

Extraction method: Principal Component Analysis. Rotation used: Varimax.

The independent variables yielded a four-factor structure, while the dependent variable was represented by a single-factor solution.

Table 7. Factor loading for student interaction and subjective learning performance.

Rotated Component Matrix					
Component					
	1. LT	2. LI	3. LC	4. LL	5. SLO
LT3	**0.838**	0.220	0.173	0.142	--
LT8	**0.813**	0.194	0.117	0.151	--
LT10	**0.805**	0.229	0.158	0.140	--
LT6	**0.802**	0.171	0.203	0.114	--
LT15	**0.801**	0.190	0.168	0.192	--

Table 7. *Cont.*

	1. LT	2. LI	3. LC	4. LL	5. SLO
		Rotated Component Matrix			
			Component		
LT5	**0.796**	0.184	0.167	0.084	--
LT2	**0.723**	0.137	0.164	0.117	--
LT9	**0.721**	0.235	0.238	0.145	--
LT13	**0.721**	0.186	0.109	0.150	--
LT7	**0.718**	0.176	0.250	0.146	--
LT11	**0.715**	0.158	0.150	0.119	--
LT4	**0.706**	0.175	0.198	0.152	--
LT12	**0.680**	0.204	0.138	0.191	--
LT1	**0.665**	0.137	0.155	0.122	--
LT14	**0.591**	0.192	0.231	0.097	--
LI6	0.229	**0.848**	0.146	0.100	--
LI7	0.191	**0.786**	0.130	0.205	--
LI5	0.201	**0.776**	0.153	0.146	--
LI3	0.207	**0.752**	0.138	0.114	--
LI8	0.159	**0.748**	0.173	0.162	--
LI9	0.158	**0.743**	0.148	0.171	--
LI11	0.211	**0.731**	0.190	0.243	--
LI13	0.245	**0.727**	0.155	0.065	--
LI1	0.144	**0.716**	0.141	0.045	--
LI10	0.216	**0.698**	0.163	0.030	--
LI4	0.144	**0.693**	0.223	-0.033	--
LI12	0.258	**0.677**	0.215	0.177	--
LI2	0.103	**0.659**	0.100	0.139	--
LC5	0.175	0.190	**0.770**	0.116	--
LC1	0.210	0.217	**0.767**	0.107	--
LC2	0.187	0.158	**0.763**	0.124	--
LC3	0.208	0.198	**0.744**	0.138	--
LC7	0.149	0.106	**0.735**	0.072	--
LC9	0.240	0.187	**0.727**	0.167	--
LC6	0.232	0.258	**0.720**	0.137	--
LC4	0.183	0.182	**0.707**	0.154	--
LC8	0.242	0.177	**0.669**	0.072	--
LL4	0.273	0.239	0.266	**0.731**	--
LL3	0.324	0.201	0.257	**0.720**	--
LL5	0.303	0.194	0.157	**0.709**	--
LL2	0.282	0.154	0.150	**0.708**	--
LL1	0.198	0.391	0.192	**0.595**	--
SLO4	--	--	--	--	**0.877**
SLO1	--	--	--	--	**0.867**
SLO3	--	--	--	--	**0.866**
SLO6	--	--	--	--	**0.848**
SLO2	--	--	--	--	**0.736**
SLO5	--	--	--	--	**0.713**

Bolded values indicate primary factor loadings above   0.50.

3.6. Reliability of the Quantitative Research

The internal consistency of each construct in the questionnaire was assessed using Cronbach's alpha reliability test. As shown in **Table 8**, the Cronbach's alpha coefficient was 0.940 for learner-instructor interaction, 0.870 for learner-learner interaction, 0.921 for learner-content interaction, 0.958 for learner-technology interaction, and 0.899 for subjective learning performance (SLO). All values exceeded the commonly accepted threshold of 0.70, indicating a high level of internal consistency for each construct.

Table 8. Cronbach's Alpha for the questionnaire by constructs.

Variable	Cronbach's Alpha	N of Items
LI	0.94	13
LL	0.87	5
LC	0.921	9
LT	0.958	15
Interaction	0.964	42
SLO	0.899	6

3.7. Credibility and Trustworthiness of the Qualitative Research

To ensure the credibility and trustworthiness of qualitative findings, this study employed multiple strategies. Credibility was enhanced through triangulation of data from quantitative research. Besides, the specific EFL teachers were invited to question the coding and interpretations of the field notes. Dependability was ensured via a clear audit trail throughout data collection and analysis. Additionally, 20% of the data was independently coded by the second researcher, and discrepancies were resolved through discussion.

4. Results

4.1. Pearson Correlation Analysis

To explore the relationships between four types of student interactions and their subjective learning performance in the UNIPUS LMS-facilitated English courses, a Pearson correlation analysis was conducted among five variables: learner-instructor (LI) interaction, learner-learner (LL) interaction, learner-content (LC) interaction, learner-technology (LT) interaction, and subjective learning performance (SLO). The results were demonstrated in **Table 9**.

Table 9. Pearson correlation analysis.

	LI	LL	LC	LT	SLO
LI	1				
LL	0.526**	1			
LC	0.487**	0.515**	1		
LT	0.511**	0.586**	0.519**	1	
SLO	0.520**	0.546**	0.581**	0.504**	1

**: $p < 0.01$

Independent variables: Learner-instructor (LI) interaction, Learner-learner (LL) interaction,

Learner-content (LC) interaction, Learner-technology (LT) interaction.

Dependent variable: Subjective learning performance (SLO)

As shown in **Table 9**, all four types of interaction were significantly and positively correlated with each other ($p < 0.01$). The strongest correlation was observed between LL and LT (r = 0.586), indicating that students who actively engage with peers also tend to engage more frequently with technological tools. Similarly, LL and LC (r = 0.515), and LT and LC (r = 0.519), showed moderately strong associations, suggesting that interactive behavior tends to be

cohesive across modalities.

All four types of interaction were significantly and positively correlated with the dependent variable subjective learning performance: Even stronger correlations were found for LI (r = 0.520), LL (r = 0.546), LC (r = 0.581), and LT (r = 0.504). Among the interaction types, LC and LT consistently showed the strongest correlations with SLO, suggesting that deep engagement with learning materials and technological resources plays a key role in influencing both perceived and actual learning gains.

4.2. Data from Multiple Regression Analysis

To examine the predictive effects of different types of learner interaction on students' subjective learning performance, a multiple stepwise regression analysis was performed (N=504). The dependent variable was students' subjective learning performance (SLO), while the independent variables included learner-instructor (LI) interaction, learner-learner (LL) interaction, learner-content (LC) interaction, and learner-technology (LT) interaction. As presented in **Table 10**, the overall model was statistically significant (F = 106.139, p < 0.001). It accounted for approximately 46.0% of the variance in learning outcomes (R^2 = 0.460), indicating a substantial collective effect of

the interaction variables on student success in the blended English learning context.

Moreover, all four predictors made significant positive contributions to the model: Learner-content interaction emerged as the strongest predictor (β = 0.317, t = 7.652, p < 0.001), suggesting that students' engagement with learning materials plays a critical role in determining learning outcomes. Learner-learner interaction was the second strongest predictor (β = 0.213, t = 4.822, p < 0.001), highlighting the value of peer collaboration and communication in the online learning process. Learner-instructor interaction also significantly predicted learning outcomes (β = 0.194, t = 4.682, p < 0.001), indicating that teacher guidance, feedback, and presence contribute meaningfully to student achievement. Learner-technology interaction, while the weakest among the four, remained a statistically significant predictor (β = 0.115, t = 2.622, p = 0.009), demonstrating that technological engagement supports learning, albeit to a lesser extent than the other interaction types. The unstandardized coefficients (B values) further confirm the relative impact of each predictor, with LC (B = 0.324) exerting the largest raw influence on the dependent variable.

Table 10. Summary of multiple regression analysis: Student interaction and subjective learning performance.

	Unstandardized Coefficients		Standardized Coefficients	t	p	R^2	F
	B	Std. Error	Beta				
(Constant)	0.499	0.157		3.169	0.002		
LI	0.206	0.044	0.194	4.682	0.000		
LL	0.207	0.043	0.213	4.822	0.000	0.460	106.139***
LC	0.324	0.042	0.317	7.652	0.000		
LT	0.107	0.041	0.115	2.622	0.009		

***:p < 0.001

Predictors: Learner-instructor (LI), Learner-learner (LL), Learner-content (LC), Learner-technology (LT).

Dependent variable: Subjective learning performance (SLO).

4.3. Data from Classroom Observations

According to the teaching curriculum, the observation took place in teaching weeks 3, 7 and 11. The teaching mainly focused on text appreciation on three texts respectively titled 'Are Universities Slowly Becoming a Thing of the Past?', 'Love is sociological' and Eat 'Together, Stay

Together'. The reason to observe these teaching episodes was based on communication with and admission of the specific EFL teachers of these classes. All the students were encouraged to autonomously do some course-related tasks on the UNIPUS LMS before going to the classroom. Subsequently, their learning records could be traced on the system and would be briefed at the start-up stage of face-

to-face learning and teaching in the classroom.

The process of extracting themes from classroom observation field notes involved several systematic steps to ensure meaningful interpretation of student interaction in UNIPUS LMS-supported learning environment. First, researchers read through the observation data thoroughly to become familiar with the classroom context and interaction patterns. Then, short descriptive labels were assigned to specific behavioral events or spoken exchanges (e.g., peer assistance, teacher prompts). These codes were grouped into broader categories that represent recurring forms of classroom behavior, such as technology facilitation, peer collaboration. From these categories, researchers identify emerging themes that reflect deeper insights into the nature and impact of classroom interactions. Particularly, the thematic analysis of data from classroom observation identified four prominent themes corresponding to the learner-content, learner-learner, learner-instructor, and learner-technology interaction dimensions. The corresponding results were illustrated as following four subsections.

4.3.1. Learner-Content Interaction as the Core Driver of Engagement and Mastery

Consistent with the quantitative result that identified learner-content interaction (LC) as the strongest predictor of subjective learning outcomes ($\beta = 0.317$), classroom observations further revealed that learners who regularly engaged with the platform's listening activities showed greater confidence during listening tasks in class. Students demonstrated enhanced abilities to respond to spoken instructions, summarize audio texts, and answer comprehension questions with higher accuracy. Additionally, some learners were observed using note-taking strategies, likely developed through repeated online listening tasks.

It was observed that, in blended College English learning sessions, the instructor often prompted students to repeat after model recordings or participate in pair readings. Students who had previously practiced at home using the UNIPUS LMS appeared more confident and accurate in pronunciation during in-class speaking tasks. Observations also revealed that these students were more likely to self-correct or support peers with pronunciation guidance, demonstrating growing phonological awareness and learn-

er autonomy. Moreover, instructors often incorporated platform-based texts into class discussions and comprehension checks. Students who had pre-read the materials appeared more prepared, engaged, and capable of handling higher-order reading tasks, such as inference and synthesis. These learners also demonstrated greater lexical recognition and were more confident in sharing interpretations, indicating an improved ability to process academic texts.

4.3.2. Peer Interaction Enhances Understanding and Motivation

Aligned with the quantitative result showing learner-learner interaction (LL) as the second most influential predictor ($\beta = 0.213$), observational data confirmed that students were more engaged during interactive sessions. In one observed lesson involving group poster presentations, the instructor facilitated peer-led feedback rounds. The following field notes demonstrated:

"During peer feedback, students leaned in, nodded, and asked follow-up questions. Even quieter students appeared more relaxed and contributed when addressed by peers rather than the teacher." (FN02)

In another session featuring a group-based problem-solving task, the field notes stated:

"Students collaborated actively. One group member used body language and simplified vocabulary to explain to a struggling peer. The peer responded with a smile and repeated the explanation, showing clear understanding." (FN03)

These instances highlighted how peer interaction fosters an inclusive and encouraging learning environment that supports both comprehension and confidence.

4.3.3. Instructor Support and Engagement Boost Confidence and Accountability

A consistent theme across classroom observations was the critical role of instructor support in building learners' confidence and sense of responsibility in a blended EFL learning environment. This aligned with the quantitative finding that learner-instructor interaction made a

significant contribution to learning outcomes ($\beta = 0.194$). Classroom observations confirmed the impact of instructor presence on student engagement and classroom dynamics. In a peer discussion activity, the teacher's movement among groups and verbal encouragement noticeably improved participation:

"The teacher moved between groups, asking questions and offering encouragement. Students who were previously disengaged began contributing more actively after brief interaction with the teacher." (FN01)

In a writing-focused session, teacher modeling provided structure and clarity:

"The teacher provided a clear model and walked students through each step. The classroom atmosphere was calm, and students appeared confident in completing the task independently afterward." (FN03)

Another observed lesson involved a vocabulary game, during which the teacher used non-verbal encouragement to reduce student anxiety:

"When students hesitated or appeared nervous, the teacher maintained eye contact, smiled, and used encouraging language. This visibly calmed the students and increased their willingness to participate." (FN02)

These observations reinforced that instructor presence, especially when interactive and supportive, can positively influence student confidence, willingness to engage, and overall class participation.

4.3.4. Technology: A necessary but Occasionally Frustrating Medium

A recurring theme that emerged from classroom observations was the complex role of technology in students' EFL learning experiences through the UNIPUS LMS. While technology was often viewed as a convenient and empowering tool, it also introduced moments of frustration and stress, especially when technical issues interfered with access or task completion.

Although learner-technology interaction had the smallest effect size in the regression analysis ($\beta = 0.115$), UNIPUS LMS emerged as a learning enabler. The observation revealed that most students successfully accessed the UNIPUS LMS at the beginning of class using personal digital devices (laptops and mobile phones). The UNIPUS LMS interface was used to retrieve pre-assigned multimedia materials, including vocabulary tasks, a video lecture with subtitles, and embedded dictionary functions.

Moreover, the use of UNIPUS's interactive features such as discussion forums, real-time polling tools, and assignment feedback enabled meaningful learner-instructor interaction beyond the physical classroom. The teacher posed pre-class questions via UNIPUS, which were later revisited during the in-person session, demonstrating pedagogical continuity and responsiveness. Several students interacted with the instructor asynchronously by submitting reflections and receiving individualized comments, indicating that the UNIPUS LMS served as a psychologically safe platform for engaging with the instructor. It also highlighted the importance of teaching presence in supporting learner-technology interaction. Even though technology served as the medium, it was effective instructional support that often determined whether learners experienced it as a tool for empowerment or a source of stress.

Despite these advantages, many students encountered technical problems that disrupted their learning flow. Classroom observations documented episodes in which content failed to load, videos lagged, or students were unable to submit assignments on time. During one class session, nearly a fourth of the students were unable to play the assigned video due to platform delays, forcing the instructor to adjust the lesson plan. In another segment, differences in digital literacy were observed; several students required peer support to navigate specific LMS functions. This pointed to the importance of technical readiness in blended learning contexts.

4.4. Summary

The above results revealed a multifaceted understanding of how different types of interaction influence EFL learners' perceived learning performance in a blended English learning environment facilitated by the UNIPUS LMS. It suggested that while all interaction types contribute to learning, learner engagement with content was the

most powerful factor, with peer and instructor interactions also playing substantial roles. Though learner-technology interaction had the smallest effect, it remained statistically significant, suggesting that technological engagement, while less influential, was still a meaningful aspect of learning.

5. Discussion

This study explored how different types of student interaction within a UNIPUS LMS-facilitated blended College English course affected EFL learners' subjective learning performance. Drawing upon the Community of Inquiry (CoI) framework [49], social constructivist learning theory [50], and recent developments in blended language learning research [51,52], the findings contributed to a nuanced understanding of how interaction shapes learning in UNIPUS LMS supported EFL environments. The results underscored that while all four types of interaction, LC, LL, LI, and LT, significantly predicted learning outcomes, their relative influences vary in meaningful ways.

5.1. Learner-Content Interaction: The Core of Cognitive Presence

The most significant predictor of students' perceived learning performance was learner-content interaction ($\beta = 0.317$), highlighting the centrality of content engagement in driving cognitive development and linguistic mastery. Observational data revealed that learners who frequently interacted with multimedia listening, reading, and vocabulary resources on the UNIPUS LMS demonstrated enhanced comprehension, phonological awareness, and participation during class discussions. This finding aligns with the cognitive presence element in the CoI framework, wherein learners construct meaning through sustained reflection and direct interaction with instructional materials [24,25,49].

Recent research corroborates the growing emphasis on content interaction in digital learning contexts. A study by Yang [53] found that EFL learners' frequent engagement with interactive LMS materials significantly enhanced vocabulary retention and self-regulation skills. Similarly, Slamet and Basthomi [54] argued that in blended environments, interaction with digital content fosters learner

autonomy, particularly through asynchronous tasks that allow for individualized pacing and repeated exposure. The present study supported these claims, suggesting that learner-content interaction was foundational not only for knowledge acquisition but also for self-directed learning, especially when scaffolded by digital resources.

From a social constructivist lens, engaging with content is not a passive reception of knowledge but a dialogic process wherein learners internalize external representations, thereby constructing personal meaning [26,33,34]. The UNIPUS LMS environment, by offering repeated access to multimodal resources, aligns with the notion of mediated learning [28,29,50], allowing students to build on prior knowledge through structured input and practice. For example, Fiock [24] emphasized that content-centered instructional design, when aligned with CoI principles, enhances learner cognitive engagement and fosters sustained inquiry, especially in asynchronous environments. Similarly, Al Abri et al. [34] demonstrated that constructivist pedagogical models that emphasize reflection, knowledge construction, and learner control improve students' engagement with digital content in blended and online settings.

Moreover, Palincsar [28] and Saleem et al. [29] affirmed that learning occurs through purposeful interaction with structured, culturally mediated content, and that such interactions are most effective when learners are supported in making personal meaning from instructional materials. This reinforces the argument that content interaction should not be designed as a static delivery process but as a dynamic, student-centered experience.

Finally, by integrating learner–content interaction into a broader pedagogical design informed by the CoI model, instructors can more effectively cultivate cognitive presence—a sustained cycle of exploration, integration, and resolution [24,35]. The strength of this interaction type in the current study reaffirms its foundational role in the learning process and signals that future LMS development should prioritize adaptive, multimodal, and conceptually rich content engagement pathways.

5.2. Learner-Learner Interaction: Enhancing Social Presence and Collaborative Learning

Learner-learner interaction emerged as the second most influential factor ($\beta = 0.213$), reinforcing the role of peer collaboration in enhancing both engagement and

comprehension. Field notes from classroom observations indicated that students participated more willingly and effectively when working with peers, particularly during poster presentations, group discussions, and problem-solving tasks. These peer interactions contributed not only to cognitive development but also to increased learner confidence, emotional support, and motivation.

This aligns with the social presence dimension of the Community of Inquiry (CoI) framework, which posits that meaningful interpersonal connections contribute to a sense of community and belonging in online or blended learning environments [19,55–57]. Kreijns et al. [55] proposed a more nuanced understanding of social presence, emphasizing not only emotional expression and open communication but also group cohesion as a crucial mediator of collaborative engagement. In the context of the present study, student feedback and classroom behavior reflected these exact indicators—empathy, encouragement, and task-focused peer engagement—thus illustrating a strong social presence.

The findings are further supported by recent work from Deng and Sitthitikul [58], who emphasized that peer interaction in blended language learning environments enhances communicative competence and fosters the co-construction of knowledge through dialogic processes. In similar ways, Edumadze and Govender [56] confirmed that collaborative engagement in blended MOOCs significantly increased student participation and academic satisfaction, even in resource-limited environments—highlighting the universal applicability of the CoI social presence across contexts.

From a social constructivist perspective, learning is inherently social and mediated by interaction with more capable others [28,29]. In the present study, peer explanation, gesture-based communication, and collaborative meaning negotiation were commonly observed. These practices illustrate how learners act as both knowledge constructors and supporters of each other's development. Paramma et al. [57] also found that peer learning fostered accountability and deep engagement in ELT classrooms, especially when collaborative tasks were well-structured and culturally resonant.

Importantly, these peer-based interactions were not only affectively supportive but also cognitively enriching. This echoes prior findings by Khodabandeh, Khoshsima,

and Abbaszadeh [59], who suggested that peer scaffolding is critical to sustaining language learning in blended settings. As Fiock [24] further argued, well-designed online or blended learning environments should intentionally foster collaborative tasks to amplify social presence, thereby enhancing both learning outcomes and learner satisfaction.

5.3. Learner-Instructor Interaction: Supporting Teaching Presence and Affective Engagement

Learner-instructor interaction also significantly predicted students' subjective learning outcomes ($\beta = 0.194$), reaffirming the importance of teaching presence in blended learning environments. Observations indicated that instructors who provided real-time feedback, modeled tasks, and offered encouragement helped foster learner confidence, accountability, and participation. These actions support the key components of teaching presence in the CoI framework—namely, instructional design, facilitation, and direct instruction [19,25,49,60]. Fiock [24] emphasized that teaching presence is a foundational element that enhances the coherence of online learning experiences through scaffolding and facilitation. Similarly, Li [60] found that teaching presence directly predicts cognitive presence, with social presence and sense of community acting as mediators—highlighting the emotional and relational aspects of teacher support.

Recent studies have emphasized the pivotal role of instructor support in enhancing student motivation and reducing anxiety in online and blended learning environments. For instance, Cheng, Liu, and Wang [61] highlighted how responsive instructor feedback increased Chinese EFL learners' engagement and performance in a blended English course. From a constructivist viewpoint, instructors function as mediators who guide, scaffold, and support learners in navigating complex tasks [29,32]. The emotional encouragement and modeling observed in this study created a psychologically safe space for learners to take risks, clarify misunderstandings, and internalize academic language practices. In this way, the affective dimension of teaching presence, while often overlooked, emerged as critical to sustaining student engagement and effort in a blended setting. This finding resonates with Garrison's [19] emphasis on the importance of balancing all three pres-

ences—teaching, cognitive, and social—to foster deep and meaningful learning experiences. Moreover, Matiso and Makena [16] call attention to the need for emotionally supportive instructor-student interactions in the post-pandemic language classroom to rebuild trust and engagement, reinforcing the affective value of instructor presence.

5.4. Learner-Technology Interaction: Enabling Infrastructure with Conditional Impact

Although learner-technology interaction had the smallest effect size (β = 0.115), it remained statistically significant, suggesting that technological engagement is a necessary but insufficient condition for successful learning. In essence, technology functions as a necessary infrastructure that enables access to learning but does not, on its own, guarantee meaningful engagement or improved performance.

Classroom observations corroborated this interpretation: while many students effectively navigated the UNIPUS LMS to access course materials, submit assignments, and receive feedback, intermittent technical disruptions—such as video playback lags, system downtime, or login failures—occasionally hindered participation. These incidents, though not pervasive, served as critical reminders that learner-technology interaction is contingent on the reliability of the digital environment and students' digital literacy levels. As suggested by prior research [62,63], the successful use of LMS platforms presupposes a baseline of technological readiness among both students and instructors. Similar concerns were raised by Nur et al. [1], who found that in Islamic higher education contexts, limited infrastructure, insufficient training, and affordability of access remain major barriers to LMS adoption, despite its potential for innovation and inclusion.

It is worth noting that technology is not conceptualized as a distinct "presence" in the original Community of Inquiry (CoI) framework. Instead, it operates as a mediating tool that undergirds and amplifies cognitive, social, and teaching presence [19,64]. In this study, technology proved most effective when integrated to support other forms of interaction—particularly learner-content and learner-instructor engagement. For example, automated quizzes, embedded video lectures, and instructor feedback delivered through the UNIPUS LMS were consistently high-lighted in qualitative data as enhancing students' learning experiences. This aligns with Wang's [65] findings that EFL students' perceptions of technological value are largely shaped by the degree to which technology is pedagogically embedded into the course design. Likewise, Slamet and Mukminatien [2] demonstrated that formative assessment tools developed within an LMS significantly improved listening performance, provided they were meaningfully aligned with instructional goals.

The asynchronous affordances of LMSs offered flexible participation pathways that accommodated different schedules and learning paces [66]. However, such flexibility did not translate equally for all learners. Variability in digital skills, confidence, and device access resulted in unequal utilization of these affordances. As Zhu et al. [67] emphasized, inclusive blended learning requires not only robust technological tools but also tailored support systems that reduce barriers for less digitally fluent students. Wulandari and Budiyanto [38] also emphasized this in their review, noting that while LMS platforms theoretically improve foreign language learning, actual benefits depend heavily on students' digital readiness and access equity.

Compared to broader LMS adoption trends in EFL and higher education contexts, the findings here echo recurring challenges in the learner-technology interface. For instance, Mukhibat and Wilujeng [40] found that during the pandemic, the effectiveness of LMSs in Islamic universities improved when supported by structured instructional strategies and faculty training—highlighting the need to move beyond technical deployment toward integrative pedagogical support. Qaddumi and Smith [42] similarly reported that the impact of Moodle on students' English language acquisition was mediated by learners' attitudes and prior exposure to digital tools; students with positive LMS experiences reported better language gains and more motivation.

In the context of this study, the UNIPUS LMS functioned more as a facilitator than as a driver of learning. Its effectiveness was conditional: students who possessed adequate digital competence and received timely guidance from instructors were able to benefit more from the system's affordances. Conversely, students who faced technical difficulties or lacked confidence in navigating the platform often disengaged, even when content was readily

available. This reinforces the need for blended learning environments to prioritize not only functional access to technology but also equitable and pedagogically meaningful integration.

5.5. Summary

Synthesizing these findings through the lens of the Community of Inquiry framework, it becomes clear that effective blended learning in EFL contexts requires a dynamic interplay of cognitive, social, and teaching presence, each underpinned by specific types of learner interaction. The prominence of learner-content interaction affirms the centrality of cognitive engagement, while peer and instructor interactions enrich the learning process through social and instructional support. Technology, though not a presence in itself, enables and extends these interactions across temporal and spatial boundaries.

Moreover, the results reaffirmed the relevance of social constructivism as a guiding pedagogical approach for blended language learning. Students learn not in isolation but through mediated, interactive, and collaborative processes that blend individual practice with social negotiation. The UNIPUS LMS-facilitated College English course thus becomes a sociocultural space for interaction, where learning is constructed through the orchestration of dialogue, feedback, reflection, and shared inquiry.

Finally, this study supports contemporary theories of blended language learning, which view digital technologies not merely as delivery mechanisms but as integral pedagogical agents that afford autonomy, interactivity, and multimodality. When thoughtfully integrated, these technologies scaffold language development in ways that extend and complement traditional classroom practices.

6. Conclusions and Contributions

This study explored how four types of student interaction—learner-content, learner-learner, learner-instructor, and learner-technology—within a UNIPUS LMS-supported blended College English course influenced EFL learners' subjective learning performance. By combining quantitative regression analysis with qualitative classroom observations, the findings provide empirical validation for both the Community of Inquiry (CoI) framework and social constructivist theory in the context of blended language instruction.

Of the four interaction types, learner-content interaction proved to be the strongest predictor of students' perceived learning outcomes. This emphasizes the critical role of cognitive engagement and suggests that thoughtfully designed, pedagogically aligned digital content can significantly enhance learning when integrated effectively into blended environments like UNIPUS LMS. Learner-instructor and learner-learner interactions also showed meaningful contributions, reinforcing the importance of teaching and social presence in fostering learner motivation, confidence, and collaboration. Although learner-technology interaction was the weakest predictor, it served as a crucial enabler—supporting and amplifying other forms of engagement, particularly when supported by appropriate guidance and digital literacy support.

Overall, the findings highlight that successful blended language learning extends beyond access to online materials. It requires the deliberate integration of interactive experiences that balance cognitive, social, and instructional dimensions. The study affirms that interaction is not an incidental feature but a core component of effective learning in EFL settings, shaped through the combined influence of content, peers, instructors, and technology.

7. Limitations

Like all empirical research, this study has several limitations that should be considered when interpreting its findings.

First, the study was conducted within the context of a single Chinese university using the UNIPUS LMS, and focused exclusively on College English courses. While this setting provided a consistent environment for investigating interaction types and learning performance, the findings may not be generalizable to other institutional contexts, disciplines, or learning management systems with different affordances and pedagogical designs.

Second, the study relied on self-reported measures for key variables, including perceived interaction and subjective learning performance. Although the instruments demonstrated acceptable internal reliability, self-report data are inherently susceptible to social desirability bias, response tendencies, and variability in self-assessment accuracy. While the inclusion of classroom observation data partially addressed this issue, the reliance on subjective

perceptions remains a constraint.

Third, although the use of a mixed-methods design enhanced the interpretive depth of the findings, the qualitative data from classroom observations were not strong enough since there were only three classes involved with only two consecutive 40-minute periods per class.

Despite these limitations, the present study provides a meaningful contribution to understanding the interplay between interaction and learning performance in UNIPUS LMS-supported EFL contexts.

8. Implications and Suggestions for Further Studies

Building on the findings and acknowledging the limitations of this study, several directions for future research are recommended to further advance understanding of interaction-driven learning in UNIPUS LMS-supported EFL environments.

First, future studies should examine the impact of student interaction across a broader range of institutional and cultural contexts. Including diverse types of universities, regions, and LMS platforms would enhance the generalizability of findings and reveal how contextual variables shape interaction patterns and their effects on learning outcomes.

Second, given that interaction is a dynamic process that evolves over time, future research could adopt longitudinal designs to capture changes in interaction patterns, perceptions, and learning performance throughout different stages of a course or academic term. Such approaches would provide insights into how learners develop their interactional strategies and how instructional interventions influence these trajectories.

Third, more qualitative researches are recommended to triangulate the data, such as semi-structure interviews of both EFL teachers and students, and reflective journal writing from EFL students, or more classroom observations. The use of multiple data sources contributes significantly to the richness of the findings and strengthens the internal validity of the research.

Author Contributions

Conceptualization, F.H. and S.H.; methodology, F.H.;

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Data will be made available upon request.

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Conflicts of Interest

The authors declare no conflict of interest.

Appendix A

The Questionnaire Regarding Effects of EFL Students' Interaction on Their Subjective Learning Performance in UNIPUS-LMS Facilitated College English Learning

Section 1 Demographic information

Year _____   Gender: _____ Academic major_____

Section 2 EFL learners' perception towards the four types of interaction

Learner-instructor interaction

LI1R. The instructor did not effectively communicate important course topics.

LI 2. The instructor clearly communicated important course goals.

LI 3 The instructor provided clear instructions on how to participate in course learning activities.

LI4R. The instructor did not clearly communicate important due dates/time frames for learning activities.

LI 5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.

LI 6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.

LI 7. The instructor helped to keep course participants engaged and participating in productive dialogue.

LI 8. The instructor helped keep the course participants on task in a way that helped me to learn.

LI 9. The instructor encouraged course participants to explore new concepts in this course.

LI 10R. Instructor actions did not help develop a sense of community among course participants.

LI 11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.

LI 12. The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.

LI 13R. The instructor did not provide feedback in a timely fashion.

Learner-learner interaction

LL1. Online or Web-based communication is an excellent medium for social interaction.

LL 2R. I felt uncomfortable conversing through the online medium.

LL 3. I felt comfortable participating in the course discussions.

LL 4. I felt comfortable interacting with other course participants.

LL5. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.

Learner-content interaction

LC1. Problems posed increased my interest in course issues.

LC2. Course activities piqued my curiosity.

LC3R. I did not feel motivated to explore content-related questions.

LC4. Brainstorming and finding relevant information helped me resolve content related questions.

LC5. Online discussions were valuable in helping me appreciate different perspectives.

LC6. Combining new information helped me answer questions raised in course activities.

LC7R. Learning activities did not help me construct explanations or solutions.

LC 8. Reflection on course content and discussions helped me understand fundamental concepts in this class.

LCR9. I am not able to apply the knowledge created in this course to my work or other non-class related activities.

Learner-technology interaction

LT1.Most difficulties I encounter when using computers, I can deal with.

LT 2. I find working with computers very easy.

LT 3R. I am very unsure of my abilities to use computers. (reversed coded item)

LT 4. I enjoy working with computers.

LT 5. Computers make me much more productive.

LT 6R. I often have difficulties when trying to learn how to use a new computer software package.

LT 7. I am very confident in my abilities to use computers.

LT 8R. At times I find working with computers very confusing.

LT 9. Using computers makes learning more interesting.

LT 10R. I always seem to have problems when trying to use computers.

LT 11. Some computer software packages definitely make learning easier.

LT 12. Computers are good aids to learning.

LT 13R. I find working with computers very frustrating.

LT 14. I consider myself a skilled computer user.

LT 15R. When using computers, I worry that I might press the wrong button and damage it.

Section 3 Learners' perception towards subjective learning outcomes

SLO1. Using UNIPUS improved my College English learning.

SLO 2R. I did not acquire any useful knowledge through interacting with other users on the UNIPUS platform.

SLO 3. Engaging in the activities within the UNIPUS LMS-facilitated English learning enhanced my language competence.

SLO 4. I am very satisfied with this UNIPUS LMS-facilitated College English course.

SLO 5R. The UNIPUS LMS-facilitated College English course did not meet my learning needs.

SLO 6. While participating the UNIPUS LMS-facilitated College English course, I experienced a sense of pleasure.

**Those marked with letter 'R' are reversed coded items.

Appendix B

A Classroom Observation Protocol for Identifying Student Interaction

1. Observation Context

Course: _____   Instructor Name: _____ Number of Students Present: _____

Date: _____ Time (Start - End): _____

Platform/Tools Used: UNIPUS LMS, other tools (specify)

Classroom Setting: _____

2. Observation Framework

This observation focuses on the manifestations of the four types of student interaction (LC, LI, LT, LL), the three presences of Community of Inquiry framework, as well as student comfort and capability with technology (Here refers to UNIPUS LMS).

Some sample questions for the observation focus are as following:

How does the instructor encourage interaction (e.g., discussions, Q&A, group work)? How often does the instructor clarify doubts or guide students' participation?

Does the instructor actively use the UNIPUS LMS tools (e.g., forums, quizzes) to facilitate learning? Are instructions clear for both online and offline components?

Do students appear comfortable sharing ideas or asking questions (online or in-person)? Is there evidence of collaborative problem-solving via the UNIPUS LMS?

Are students actively engaging with UNIPUS LMS content (e.g., reading, quizzes, assignments)? Are LMS activities linked to deeper learning (e.g., reflective questions, discussions)?

Are students confident in using UNIPUS LMS features (e.g., navigating forums, uploading tasks)? How often do students require technical support during online activities?

3. Observation Notes

Descriptive Notes	Reflective notes

4. Summary of Observations

Patterns of Interaction Observed:

Challenges Faced (Technical/Instructional):

Positive and Negative Student Behaviors:

Instructor Strategies for Facilitation:

Student Engagement Trends:

Suggestions for Improvement (If Any):

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