THE EFFECT OF INTERACTION ON LEARNER SATISFACTION WITH OPEN DISTANCE LEARNING

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Abstract. Understanding the rules and characteristics of online teaching is of great importance in ensuring the teaching effectiveness of open and distance education. Assessing students' online learning satisfaction is crucial, as it not only reflects the "learner-centered" approach but also serves as a vital measure of the quality of online teaching in open universities, particularly in the context of the Internet. One significant characteristic of open distance learning is the "separation of teaching and learning", which can lead to feelings of loneliness among learners, ultimately affecting their online learning experience and outcomes. In this study, we conducted an electronic questionnaire survey involving 1,419 learners from an open university in China. The research aimed to explore the predictive effects of four types of interaction-learner-instructor interaction, learner-learner interaction, learner-content interaction and learner-platform interaction-on learner satisfaction. Using Pearson correlation analysis and stepwise regression analysis, our findings indicate that three types of interaction-learner-platform interaction, instructor-learner interaction, and learner-learner interaction-positively influence distance learning satisfaction. These results underscore the importance of fostering meaningful interactions in online learning environments to enhance learner engagement and satisfaction, thereby contributing to the overall effectiveness of open and distance education programs.

Keywords: *learner-platform interaction, instructor-learner interaction, learner-learner interaction, learner-content interaction*

Introduction

The advent of digital technologies has revolutionised educational practices, especially in distance and online learning environments. ICT has transformed many areas of our lives, including education and learning (Mohammadi et al., 2021). The introduction of advanced technology has transformed classrooms into intelligent learning environments (Tinmaz and Lee, 2020). Despite the widely recognised benefits of open distance learning, challenges such as keeping students motivated and fostering supportive learning communities remain. Effective interaction strategies are critical to addressing these challenges by creating meaningful engagement opportunities and improving the overall quality of the learning experience. In this paper, we will explore the critical role of instructional interaction in open distance learning environments and its far-reaching impact on student satisfaction with the online learning experience. Student interaction involves multiple facets of engagement, such as student-to-student interaction, student-to-instructor interaction, and interaction with course content (Moore, 1989). Each type of interaction has a unique role in promoting collaborative learning, knowledge construction, and social presence (Garrison et al., 1999). Effective strategies not only replicate traditional classroom interactions, but also leverage digital capabilities to enrich the learning experience (Picciano, 2021). Instructional interactions include various forms of contact between educators and students, including

communication, providing feedback, collaborative activities, and instructional support. In traditional face-to-face instructional environments, these interactions occur naturally and play a critical role in student engagement and academic success. However, in distance learning environments, especially those that are open and accessible online, the nature and effectiveness of instructional interactions can have a significant impact on student learning outcomes and satisfaction.

The research emphasizes the critical role of interactive strategies in online education. For instance, collaborative activities among students can promote peer learning and support, which are crucial for alleviating loneliness and enhancing engagement (Jiang and Ting, 2000). Furthermore, frequent and meaningful interactions among students and teachers can create a supportive learning environment, aiding in improving learning outcomes and student satisfaction (Martin et al., 2020). There are various forms of student interaction in online learning management systems, including peer interaction, teacher-student interaction, and student-material interaction. Each type plays a unique role in shaping the learning environment, fostering learners' sense of community and collaboration. Teaching interactions such as teacher-student and peer interactions have a positive impact on learner satisfaction (Kurucay and Inan, 2017; Thurmond et al., 2002). Research shows that carefully designed interactive strategies can alleviate the loneliness often associated with online learning, promote active learning practices, and improve overall academic performance (Ngan et al., 2018). Timely and constructive feedback is crucial for guiding student progress and reinforcing learning outcomes (Hattie and Timperley, 2007). In online environments, automated feedback systems and personalized teacher feedback are crucial components of effective interaction (Bawa, 2016). The form of interaction, including the selection and accessibility of communication tools such as video conferencing, discussion forums, and email, impacts the frequency and quality of interaction between teachers and students (Means et al., 2009). Opportunities for collaboration and peer interaction can enhance student engagement and deepen understanding through shared learning experiences (Garrison and Cleveland-Innes, 2005). Virtual group projects and discussions can cultivate learners' collaboration skills and interpersonal relationships.

Students' satisfaction with online learning is influenced by various factors, among which instructional interaction stands out as a key determinant. Effective instructional interaction fosters a sense of community among students, reduces feelings of loneliness, and enhances motivation for learning (Moore, 1989). Conversely, insufficient interaction may lead to decreased engagement, higher dropout rates, and decreased satisfaction (Picciano, 2021). Research indicates a positive correlation between the quality of instructional interaction in online learning environments and student satisfaction (Bernard et al., 2009). High levels of interaction contribute to improved learning efficiency, enjoyment of courses, and overall satisfaction with the educational experience (Alavi and Leidner, 2001). Despite the numerous benefits of effective instructional interaction in open remote learning environments, challenges such as technological limitations, teacher workload, and diverse learner needs persist (Anderson, 2004). Strategies to overcome these challenges include providing professional development for educators in online teaching methodologies, leveraging advanced learning technologies, and fostering a culture of interaction and participation in virtual classrooms (Swan, 2001). In summary, instructional interaction plays a crucial role in shaping student satisfaction and learning outcomes in open remote learning environments. Effective communication, meaningful feedback, and collaborative

activities significantly enhance the educational experiences of online learners. Therefore, investigating the impact of instructional interaction on university students' satisfaction with distance learning and developing effective models of instructional interaction are paramount to ensuring the quality of open remote online education.

Materials and Methods

Questionnaire design and distribution

Prior to conducting a large-scale survey, this study conducted a pilot survey with a subset of students from a Chinese open university to assess the reliability, validity, and clarity of dimensions in the questionnaire, checking for any ambiguities perceived by respondents. The finalized questionnaire consisted of three parts: demographic information of the participants, levels of instructional interaction in online teaching, and a survey on students' satisfaction with distance learning. From November to December 2023, a convenience sampling method was employed to select 1,419 university students with over 8 weeks of distance learning experience from a Chinese open university as survey participants. Questionnaires with highly consistent answers to individual items and those completed in unusually short times were excluded, resulting in 1,342 valid responses. The questionnaire was distributed and data collected using the Questionnaire Star online platform, disseminated through platforms like WeChat and the university's learning management system via QR codes and survey links.

Interaction & learner satisfaction questionnaire

Building upon survey on the quality of interaction in online learning, the questionnaire was adapted to fit the context of open remote teaching. It measured the degree of instructional interaction in distance learning across four dimensions: learner-instructor interaction (LII), learner-learner interaction(LLI), learner-content interaction(LCI), and learner-platform interaction(LPI). The questionnaire comprised 17 items rated on a 5-point Likert scale (1=strongly disagree, 5=strongly agree), where higher scores indicated deeper levels of instructional interaction in distance learning. The Cronbach's Alpha coefficient for this scale in our study was 0.986.

Drawing on performance scale for online learning and theories of customer satisfaction, this study assessed learner satisfaction with open distance learning on three variables: goal attainment, learning satisfaction, and self-harvesting perceptions. Higher scores indicated greater satisfaction with distance learning. The Cronbach's Alpha coefficient for this scale in our study was 0.953. The overall reliability of the survey questionnaire was confirmed with a Cronbach's Alpha coefficient of 0.993, indicating strong internal consistency. The Kaiser-Meyer-Olkin (KMO) measure was 0.990, exceeding the acceptable threshold of 0.90, and Bartlett's test of sphericity was significant, affirming the suitability of the data for factor analysis. Cronbach's Alpha coefficients for individual dimensions ranged from 0.953 to 0.990, demonstrating high reliability across all survey dimensions.

Statistical analysis

The data analysis process comprises three stages: (1) The questionnaire’s reliability and validity, descriptive analysis of participants’ basic characteristics, dimensions of instructional interaction, and students’ satisfaction with distance learning are examined

using SPSS 23.0; (2) Differences in students' satisfaction with distance learning based on various background factors are explored using t-tests and analysis of variance (ANOVA); (3) The correlation between students' satisfaction with distance learning and interaction is investigated using Pearson correlation analysis; and (4) Stepwise regression analysis is employed, with four dimensions of interaction as independent variables, and the three variables of goal attainment, learner satisfaction, and self-harvesting perceptions in distance learning as dependent variables, to explore the predictive role of interaction on students' satisfaction with open distance learning.

Results and Discussion

Survey on interaction and learner satisfaction

Descriptive analysis of basic personal characteristics

In the survey, there were 357 male students (26.6%) and 985 female students (73.4%), consistent with the university's gender distribution. Among them, there are 734 freshmen (54.7%), 369 sophomores (27.4%), 208 juniors (15.5%), and 31 seniors (2.3%). A total of 463 respondents (34.5%) reported experiencing issues such as unstable internet connection, disconnection, or buffering during online learning. Regarding daily online learning duration, 203 students (15.1%) studied 0-3 hours per day, 666 students (49.6%) studied 3-6 hours, 394 students (29.4%) studied 6-9 hours, 67 students (5.0%) studied 9-12 hours, and 12 students (0.9%) studied over 12 hours. During online learning, 691 students (51.5%) preferred interacting with classmates or teachers in the course activity area or discussion forum of the teaching platform, 239 students (17.8%) preferred voice communication on teaching platforms, and 209 students (15.6%) preferred using the platform's bullet screen feature to communicate with teachers or classmates. Additionally, 1091 students (81.3%) perceived their relationship with teachers positively, while 251 students (18.7%) perceived it as average or poor.

Descriptive analysis of dimensions of interaction and learner satisfaction

Using SPSS 23.0 software, descriptive statistics were conducted on four dimensions of interaction. The interaction levels were as follows: SII (4.23±0.79), LLI (4.19±0.84), LCI (4.26±0.80), and LPI (4.20±0.83), with an overall interaction level of (4.22±0.78). Generally, scores across the dimensions of LII, LLI, LCI, and LPI were similar, indicating little variation. The interaction levels from highest to lowest were LCI, LII, LPI, and LLI, suggesting that most teachers recognize the importance of interaction in online teaching. Notably, LCI and LII were rated higher, while LPI and LLI were rated lower. The average score for satisfaction with online learning was 4.03. Additionally, the scores for three measurement indicators-goal attainment (4.03±0.95), learning satisfaction (4.01±0.99), and self-harvesting perceptions (4.04±0.96)-all exceeded 4 points and were closely aligned, indicating a "comparatively satisfactory" level. These scores surpassed the midpoint of 5 points, suggesting that online teaching generally meets learners' needs and achieves their learning goals effectively.

Correlational analysis of interaction and satisfaction with online learning

Pearson correlation analysis was employed to examine the significant positive correlations (P<0.001) among variables of interaction dimensions and variables of learner goal attainment, learning satisfaction, and self-harvesting perceptions (*Table 1*). The results revealed Pearson correlation coefficients ranging from 0.682 to 0.741, indicating a moderate level of correlation.

Table 1. *Correlation analysis of interaction and learning satisfaction.*

Category	LS	GA	SP	LII	LLI	LCI	LPI
LS	1						
GA	0.849**	1					
SP	0.847**	0.923**	1				
LII	0.715**	0.732**	0.722**	1			
LLI	0.702**	0.726**	0.713**	0.893**	1		
LCI	0.682**	0.716**	0.707**	0.911**	0.907**	1	
LPI	0.725**	0.741**	0.738**	0.880**	0.880**	0.902**	1

Note: LS=Learning Satisfaction; GA=Goal Attainment; SP=Self-harvesting Perceptions; LII=learner-instructor interaction; LLI=learner-learner interaction; LCI=learner-content interaction; LPI=learner-platform interaction.

Regression analysis on interaction impact on learner satisfaction with distance learning

Building on the previous findings, this study utilizes multiple linear regression in SPSS 23.0 to explore the specific influence of interaction on students' satisfaction with distance learning, and to diagnose the analysis results based on the outputted SPSS parameters.

Regression analysis of interaction impact on learning satisfaction

This research employs a stepwise regression approach to investigate the impact of interaction factors on learning satisfaction. Variables including LII, LLI, LCI and LPI are set as independent variables using the stepwise method. According to the results in *Table 2*, LII, LLI, LCI and LPI all significantly influence learning satisfaction (Sig=0.000<0.05). Tolerance values exceed 0.1, and VIF values are less than 10, indicating no issues of multicollinearity among variables. Specifically, the regression coefficient for LPI is 0.496, for LII is 0.410, for LLI is 0.237, and for LCI is -0.219.

Table 2. *Regression analysis of learner satisfaction with distance learning.*

	Unstandardized coefficients		Standardized coefficient	t	Sig.	Covariance statistics	
	B	SE	Beta			Tolerance	VIF
Constant	0.127	0.070		1.820	0.069		
LPI	0.496	0.038	0.418	12.888	0.000	0.157	6.387
LII	0.410	0.043	0.330	9.542	0.000	0.137	7.276
LLI	0.237	0.040	0.201	5.903	0.000	0.142	7.052
LCI	-0.219	0.048	-0.178	-4.594	0.000	0.109	9.144

Note: a. Dependent variable: Learner satisfaction.

Regression analysis of interaction impact on goal attainment

Using LII, LLI, LCI, and LPI as independent variables, and goal attainment as the dependent variable, a stepwise selection strategy was employed. As shown in *Table 3*, tolerance values exceed 0.1, and VIF values are less than 10, indicating no issues of multicollinearity among variables. In the final t-test results, both the independent variables and the constant are significant, thus all should be retained in the equation.

This reveals that LPI, LII, and LLI respectively have significant predictive roles in learners' goal attainment, with coefficients of 0.398, 0.300, and 0.218. However, the impact of LCI on learners' goal attainment was not confirmed.

***Table 3**. Regression analysis of goal achievement with distance learning.*

	Unstandardized coefficients		Standardized coefficient	t	Sig.	Covariance statistics	
	B	SE	Beta			Tolerance	VIF
Constant	0.177	0.065		2.732	0.006		
LPI	0.398	0.033	0.349	11.957	0.000	0.182	5.499
LII	0.300	0.037	0.252	8.166	0.000	0.163	6.128
LLI	0.218	0.035	0.193	6.256	0.000	0.163	6.138

Note: a. Dependent variable: Goal achievement.

Regression analysis of interaction impact on self-harvesting perceptions

Using LII, LLI, LCI, and LPI as independent variables, and learners' self-harvesting perceptions as the dependent variable, a stepwise selection strategy was employed. As shown in *Table 4*, tolerance values exceed 0.1, and VIF values are less than 10, indicating no issues of multicollinearity among variables. In the final t-test results, both the independent variables and the constant are significant, thus all should be retained in the equation. This reveals that LPI, LII, andLLI respectively play significant predictive roles in learners' self-harvesting perceptions in online learning, with coefficients of 0.449, 0.291, and 0.174. However, the impact of LCI on learners' self-harvesting perceptions was not confirmed.

***Table 4**. Regression analysis of learners' self-harvesting perceptions.*

	Unstandardized coefficients		Standardized coefficient	t	Sig.	Covariance statistics	
	B	SE	Beta			Tolerance	VIF
Constant	0.196	0.066		2.971	0.003		
LPI	0.449	0.034	0.391	13.197	0.000	0.182	5.499
LII	0.291	0.038	0.242	7.728	0.000	0.163	6.128
LLI	0.174	0.036	0.153	4.892	0.000	0.163	6.138

Note: a. Dependent variable: Self-harvesting perceptions.

Impact of LPI on learner satisfaction

The research findings indicate that among the four dimensions of online teaching interaction, LPI has the greatest impact on three dimensions of learner satisfaction. Concurrently, during online learning, 691 participants (51.5%) prefer to interact and communicate with classmates or teachers in the course activity area or discussion forum of the teaching platform. Additionally, 239 participants (17.8%) favor voice communication via the teaching platform, while 209 participants (15.6%) prefer using the platform's interface barrage function to communicate with teachers or classmates. This demonstrates that learners in online education significantly desire interaction and communication via the teaching platform, highlighting the importance of developing and utilizing interactive features on platforms. Ensuring smooth platform use and navigation, facilitating quick access to necessary functions, and enriching interface interaction functionalities are effective ways to meet learners' needs, thereby enhancing learners' satisfaction with online learning.

Impact of LII on learner satisfaction

The research reveals that among the four dimensions of interaction, LII ranks second only to LPI in predicting three dimensions of learner satisfaction. LII in distance

education refers to the use of information technology by instructors and students to achieve educational goals such as knowledge, skills, and emotional development through cooperation and dialogue. Previous studies indicate that interactions including learner-instructor, learner-learner, and learner-content interactions significantly predict learners' motivation and learning outcomes in online environments. Among these, interactions between instructors and students are particularly crucial (Kuo et al., 2014; Zhu, 2012; Battalio, 2007). Existing research demonstrates that instructor-student interaction in online education not only encompasses interactions between intructors and learners in a networked environment but also includes cognitive and psychological changes resulting from interactions involving information and behavior between teachers and students. Timely feedback from teachers on student questions, discussions, or assignments during online learning, active responses from students to teachers, whether the feedback stimulates deeper thinking by students, the sense of teaching presence, and the frequency of interaction between teachers and students all play important roles in promoting various dimensions of students' online learning satisfaction. Therefore, when designing courses, formulating teaching strategies, and allocating teaching resources, teachers should fully consider dimensions such as interactive response, interaction level, and frequency, which are crucial for improving online teaching processes and enhancing student learning experiences and satisfaction.

Impact of LLI on learner satisfaction

LLI has been a focal point in educational research in recent years. Traditional educational studies often place teachers as the central figures in instructional activities. This study's findings indicate that within the four dimensions of interactions, LLI is significantly less predictive than LPI and LII of the three dimensions of learner satisfaction with distance learning. This could be attributed to the fact that many open university learners engage in studies outside of their work commitments, relying heavily on teacher participation and guidance during interactions, thereby maintaining the central role of teachers in the interaction network. However, as open and distance learning practices evolve, learners are increasingly assuming a central role in educational activities, with instructors facilitating communication and collaboration in group discussions or cooperative learning settings. During these times, LLI is expected to have an increased predictive effect on student satisfaction in online learning.

Impact of LCI on learner satisfaction

The results reveal that among the four dimensions of interaction, LCI negatively predicts learner satisfaction in distance learning. Conversely, its predictive effects on goal attainment and self-harvesting perceptions are not significant. In distance learning, learners not only interact with others but also engage with learning resources and content. Teaching staff or platforms provide learners with various learning resources such as course-related videos, instructional materials, references, and supplementary links, enabling learning at any time and place. Currently, LCI mostly involves one-way information transmission from resources to learners, lacking substantial two-way communication between learners and learning content. Hence, the coherence of interaction between learners and learning content may not significantly influence student satisfaction in online learning. The study discusses aspects of learner-content

interaction, including relevance, novelty, and learner feedback on content selection, within the context of courses.

Conclusion

This study explores the predictive effects of four types of interactions on satisfaction in distance learning. Findings indicate that LPI, LII and LLI positively influence learner satisfaction with open distance learning. In online teaching, instructors are encouraged to foster interactive approaches by initiating discussions, responding actively, and sharing viewpoints, emphasizing the impact of emotional exchanges on the psychological distance between participants. Utilizing online tools and modes of interaction, educators facilitate active engagement among learners, fostering diverse online learning communities that promote collaborative learning and enhance interaction frequencies among peers. This encourages learners to express their opinions and collectively progress within an online learning environment. Due to limitations in research capacity, this study did not classify courses by nature or difficulty, nor did it extensively explore process dimensions of learner-instructor interactions such as interaction frequency and response. Subsequent research will address these areas for further enhancement.

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Conflict of interest

The authors confirm that there is no conflict of interest associated with any parties involved in this research study. All contributors to this work have disclosed any potential conflicts, and the research was conducted independently and without any external influence.

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