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Factors Influencing Students' Learning Intentions in Online Design Education: A Case Study in Nanchang, China

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Abstract

Purpose: This study examines factors influencing students' learning behavior intentions in online design education. It aims to enhance understanding of how online learning environments can be optimized to meet evolving educational needs. **Research design, data and methodology:** The study develops hypotheses and constructs a model based on current research and relevant theories. Data is obtained through a questionnaire survey, which is then statistically analyzed to test the proposed theoretical hypotheses. The methodology includes evaluations such as Item-Objective Congruence (IOC), Pilot Testing, and Multiple Linear Regression (MLR) analysis to assess the reliability and validity of the findings, focusing on perspectives from both teachers and students. **Results:** The study identifies key factors influencing students' learning intentions in online design education, emphasizing the importance of communication, engagement, and the learning environment. Additionally, challenges such as the lack of face-to-face interaction and emotional connectivity are highlighted as significant barriers to effective learning. **Conclusions:** This study offers theoretical and empirical insights to improve online design education. Educators can apply these findings by fostering interactive learning spaces, incorporating real-time feedback, and using collaborative projects to enhance engagement. Recognizing these critical factors allows educators to refine their teaching strategies, foster motivation, and improve learning outcomes in online design education.

Keywords: Learning Behavioral Intentions, Design Education, Online Teaching, Teaching Methods, Intervention Design Implementation

JEL Classification Code: A20, I23, J44, L20, M10

1. Introduction

This study examines the impact of various factors on student learning behavioral intentions within the context of online teaching in design education. As technology continues to reshape the educational landscape, online teaching has become an essential mode of instruction, offering flexibility, accessibility, and diverse learning opportunities (Dhawan, 2020). Design education, in particular, stands to benefit from these advancements, as it fosters innovative thinking and creative problem-solving—skills that are crucial for students entering a highly competitive job market (Lee & Hannafin, 2016). However, despite the growing adoption of online learning, ensuring student engagement and effective pedagogical strategies remains a significant challenge (Martin & Bolliger, 2018).

A core challenge in online design education is maintaining student motivation, participation, and engagement in the absence of traditional face-to-face interaction (Richardson et al., 2017). The effectiveness of online learning is influenced by various factors, including instructional design, communication strategies, and the integration of digital tools (Bates & Poole, 2003). Yet, gaps remain in understanding how these elements collectively

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shape students' behavioral intentions toward online learning. This study addresses this gap by examining the interplay of external influences (learning environment, instructional strategies) and individual factors (motivation, emotional engagement) in determining students' willingness and readiness to actively engage with online design education (Artino, 2009).

Online design education leverages various digital platforms to facilitate content delivery, peer collaboration, and interactive learning (T. Anderson, 2008). The increasing use of AI-driven educational tools, virtual simulations, and interactive design platforms has transformed how students engage with coursework (Holmes et al., 2019). While these technologies can enhance personalized learning experiences, their direct impact on student behavioral intentions remains underexplored. This study integrates these evolving technological factors into its analysis, providing insights into how digital innovation influences student motivation and learning engagement (Zawacki-Richter et al., 2019).

By systematically analyzing the factors affecting students' behavioral intentions, this research provides empirical evidence to inform more effective online teaching strategies (Means et al., 2010). Educators can leverage these findings to design more engaging and interactive online learning experiences, optimize digital tool integration, and develop pedagogical approaches that enhance student motivation (Kebritchi et al., 2017). Ultimately, this study aims to contribute to the ongoing evolution of online design education by offering practical recommendations for fostering student engagement, improving learning outcomes, and ensuring a supportive virtual learning environment.

2. Literature Review

2.1 Trust (T)

rust in education refers to students' confidence in instructors, peers, and digital platforms. It is shaped by their experiences and perceptions of reliability, security, and instructional support (Tschannen-Moran, 2001). In online learning, trust is a critical component that influences engagement, motivation, and learning effectiveness.

Recent research highlights trust as a key factor in digital learning environments. Ooge et al. (2023) demonstrated that user control mechanisms and transparency in online platforms enhance trust, leading to improved student engagement with e-learning platforms. Similarly, Viberg et al. (2023) examined teachers' trust in AI-based educational tools, finding that self-efficacy and a clear understanding of AI's role significantly impact trust-building. These findings emphasize that trust extends beyond mere technological reliability; it also includes students' confidence in instructors, peer collaboration, and institutional support structures.

Furthermore, Garrison (2007) emphasized that trust in teachers and peers plays a pivotal role in shaping students' engagement and learning outcomes. Building on these insights, the current study explores how trust influences behavioral intentions in online instructional design education, particularly in fostering motivation and participation.

H1: Trust has a significant impact on student learning behavioral intentions in online instructional design discipline.

2.2 Leadership Enhancement (LE)

Student leadership involves guiding and influencing peers toward shared goals while fostering collaboration in academic settings (Komives et al., 2009). Leadership development is an essential skill in online education, as it helps students navigate group projects, digital teamwork, and self-directed learning. Recent studies have emphasized the role of leadership in enhancing online instructional methods. Sharma and Gupta (2024) highlighted that strong leadership fosters the integration of advanced digital tools, such as AI-driven adaptive learning systems, to improve student engagement and overcome challenges in online education. Petherbridge et al. (2023) further examined strategic leadership approaches in post-pandemic online education, emphasizing the role of e-leadership in fostering collaboration and community-building.

These studies suggest that innovative leadership practices are essential in online learning environments. However, research specifically examining the direct impact of leadership on learning behavioral intentions in instructional design education remains limited. The current study aims to address this gap by analyzing how leadership development in online learning environments influences students' engagement and motivation.

H2: Leadership enhancement has a significant impact on student learning behavioral intentions in online instructional design discipline.

2.3 Expression Improvement (EI)

Expression ability is a key academic skill that involves verbal, written, artistic, and digital communication (M. Anderson, 2016). Effective expression fosters academic success, creativity, and meaningful participation in discussions and collaborative learning (Peach et al., 2017). In online learning environments, student expression is often mediated through discussion forums, multimedia

presentations, and AI-assisted writing tools. Viberg et al. (2023) examined the role of AI-based educational technology in helping students express their thoughts more effectively. Sharma and Gupta (2024) emphasized that adaptive technologies facilitate inclusive learning strategies, enabling students to refine their expression skills in digital environments.

Despite these advancements, challenges persist, such as limited real-time feedback and reduced social interaction, which can hinder the development of expressive abilities in online learning. This study expands on previous research by exploring how expression improvement strategies influence student learning behavioral intentions in online instructional design education.

H3: Expression improvement has a significant impact on student learning behavioral intentions in online instructional design discipline.

2.4 Co-creation (CC)

Co-creation is the process of students actively collaborating with peers, educators, and stakeholders to generate knowledge, ideas, and creative solutions (McCulloch, 2016). It fosters critical thinking, problem-solving, and collective learning. While previous research has emphasized the importance of co-creation in traditional classroom settings, its role in fully online instructional design remains underexplored. Sharma and Gupta (2024) discussed how leadership in online education fosters innovative co-creation practices, promoting student ownership and engagement in learning processes. Petherbridge et al. (2023) examined how instructional designers are adapting post-pandemic education to emphasize collaboration and co-creation in digital learning environments.

These findings suggest that effective co-creation strategies can enhance problem-solving skills and motivation in online learning. However, further research is needed to understand how digital co-creation tools (such as collaborative software, virtual labs, and peer-reviewed content creation) influence students' learning behavioral intentions.

H4: Co-creation has a significant impact on student learning behavioral intentions in online instructional design discipline.

2.5 Student Learning Behavioral Intentions (SL)

Student learning behavioral intentions reflect a deliberate commitment to engaging in educational activities, such as attending online lectures, participating in discussions, and completing assignments (Ajzen, 1991). These intentions are shaped by multiple factors, including motivation, digital engagement, and perceived value of learning experiences. Recent research underscores the importance of integrating digital strategies to enhance student engagement. Sharma and Gupta (2024) highlighted the role of leadership in leveraging advanced educational technologies to improve student motivation and participation in online learning. Similarly, Ooge et al. (2023) found that enhancing user control mechanisms within e-learning platforms positively impacts students' engagement and willingness to participate in digital education.

While existing research has explored various psychological and pedagogical factors influencing learning behavioral intentions, there is still a need to examine how modern digital tools, adaptive learning technologies, and AI-driven platforms influence engagement and commitment in online instructional design education. This study aims to fill this gap by analyzing the combined impact of trust, leadership, expression improvement, and co-creation on student learning behavioral intentions.

3. Research Methods and Materials

3.1 Research Framework

The study adopted two major theoretical frameworks, the Human-Centered Design (HCD) concept and the Theory of Planned Behavior (TPB) and combined the works of five scholars to build the conceptual framework presented in Figure 1. Firstly, according to Tarhini et al. (2017), the theoretical framework of the thesis was extended from the UTAUT2 model by adding two additional factors: Trust (TR) and Self-Efficacy (SE). Secondly, Meyer and Norman (2020) proposed a theoretical framework consisting of several main parts. The authors emphasized pursuing an evolutionary, diverse, experimental, and iterative model. Thirdly, Zhou and Dong (2022) put forth a framework primarily based on a distributed co-creation teaching structure. This structure, designed for online design courses, is based on the principle of "co-creation" and aims to improve the effectiveness and quality of online teaching.

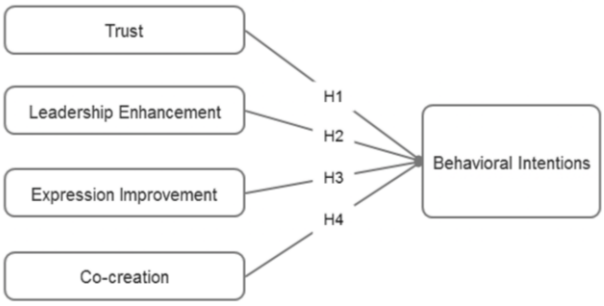

Figure 1: Research Framework

3.2 Research Methodology

This study employs a mixed-methods action research approach, integrating qualitative and quantitative methodologies for comprehensive data collection and analysis. The research began with qualitative methods, including interviews and observations, to develop the Pre-IDI questionnaire. The Index of Objective Coherence (IOC) assessment was used to ensure questionnaire consistency, stability, and reliability. Pilot testing followed to examine factor relationships and scale item validity. Finally, multiple linear regression (MLR) analysis was applied to validate the research model, assess variable relationships, and determine statistical significance.

The study was conducted at a public university in Nanchang, selected for its strong design education programs, diverse student body, and integration of online learning platforms in instructional design courses. This institution's commitment to digital pedagogy and technology-enhanced learning made it an ideal setting to explore students' learning behavioral intentions in online education. Ethical approval was obtained from the university's Institutional Review Board (IRB), ensuring compliance with institutional and international research ethics. Before participation, all students received a detailed information sheet outlining the study's purpose, objectives, benefits, and potential risks. Each participant signed a written informed consent form, confirming their voluntary participation and acknowledging their right to withdraw at any time. Data confidentiality and anonymity were strictly maintained, with responses used solely for academic research.

The study surveyed design major students, utilizing a combination of random and purposive sampling to ensure representation and relevance. Random sampling was used to achieve broad participation across academic levels, while purposive sampling targeted students with prior exposure to online learning. To mitigate self-selection bias, researchers actively recruited students from various disciplines and academic years. Future studies could enhance generalizability by incorporating larger, randomized samples across multiple institutions.

Based on initial observations and interviews, questionnaires were formulated to investigate variable correlations and causal relationships. A comprehensive demographic analysis was conducted after surveying 90 design students. Five education experts validated the questionnaire, followed by a reliability assessment with 30 participants. To examine the impact of independent variables on learning behavioral intentions, a structured 13-week intervention was implemented. Thirty students from the original sample participated, aligning with the academic semester to ensure an uninterrupted learning experience. A shorter period (e.g., 4–6 weeks) may not capture long-term behavioral changes, while a longer duration (e.g., a full academic year) could introduce external influences, such as course content evolution and instructor variations. A blend of qualitative and quantitative methods was used in the post-intervention phase to evaluate IDI results. The research team employed questionnaires, interviews, observations, and statistical analysis to assess the effectiveness of the intervention. Multiple linear regression was used to validate final research hypotheses, analyzing how independent variables influenced student learning behavioral intentions in online instructional design.

3.3 Population and Sample Size

3.3.1 Research Population

The population for this research comprises students enrolled in a comprehensive public art and design program in Nanchang, Jiangxi Province. These students have completed approximately two or three semesters of theoretical knowledge and have experienced in online learning for both professional and extension courses. The selected students were divided into three categories: undergraduate design students (4 years of study), industrial design engineering graduate students specializing in product design (3 years of study), and design graduate students specializing in product design (3 years of study). Students in each category were randomly selected following the sampling procedure.

3.3.2 Sample Size

Sekaran and Bougie (2016) thought that when the sample size is greater than 30 and less than 500 is appropriate for most studies. Therefore, the researchers first conducted a reliability test with 30 students and interviewed 6 teachers and 12 students to inquire about attitudes and suggestions regarding online instruction. Then, 40 students were selected as sample participants to complete the same questionnaires before and after the intervention, and the same six students were interviewed for their opinions.

3.3.3 Sampling Procedure

In most cases, sampling the entire population is not feasible; therefore, to avoid underestimating or overestimating the uncertainty of associated factors (Bodnar et al., 2013), this study begins with objective sampling. Based on the online course offerings, the author selected students majoring in product design and industrial design-related disciplines from the College of Art and Design at a university in Nanchang.

In this multivariate linear regression study, questionnaires were distributed proportionally according to the grades of the students. The author used platforms such as Wenjuanxing, WeChat, QQ, and other social media to

distribute the survey links. A total of 63 questionnaires were issued to undergraduate design students, 16 to undergraduate industrial design students, and 11 to postgraduate students, resulting in 90 completed and qualified questionnaires for further research. The results of the multiple linear regression analysis were used to establish the final action research plan.

After conducting the multiple linear regression analysis, 40 design students were selected as the experimental group. To ensure accountability for the experiment, the sample consisted of students who had prior online learning experience and had planned their coursework.

In the post-IDI (Instructional Design Intervention) stage, students who participated in the experiment were asked to complete the questionnaire again. Additionally, 10 students from the experimental group were randomly selected to participate in interviews to evaluate the IDI results.

3.4 Research Instruments

3.4.1 Questionnaire Design

The researcher designed the questionnaire following four key steps to meet the study's needs. First, the time points for distributing and recovering the questionnaires were determined, and a robust data management system was established to ensure accurate data recording and organization. Second, the researcher chose to distribute the questionnaires both online and offline simultaneously. Before distribution, the purpose of the study, along with privacy protection measures, was fully explained to participants. Third, a reward mechanism was introduced to encourage participation, including a randomly selected red packet reward ranging from 1 to 20 yuan to increase students' enthusiasm and initiative. Finally, after collecting the data, an initial inspection and cleaning process was conducted to exclude invalid responses and outliers, ensuring the data's accuracy and reliability.

The questionnaire consisted of three sections. The first section, Screening Questions, filtered out respondents who did not fit the study population, such as students who had not participated in online learning during their university studies. The second section, Basic Information Questions, collected demographic and background details such as gender, academic year, and attitudes toward studying in design programs. The final section, Main Survey Questions, assessed factors influencing the online learning intentions of the 90 students, including trust, leadership, expression, co-creation, and attitudes toward learning. To validate the questionnaire, five experts—three education specialists, two university professors, and an Institute of Education expert—evaluated it based on prior research frameworks. The IOC (Index of Congruence) results showed that all dimension scores met the 0.67 threshold, confirming validity. After refinement, a total of 28 questions remained in the final version.

3.4.2 Reliability and Validity

In this study, internal consistency was measured using the Cronbach's Alpha (CA) test, which is the most commonly used reliability coefficient to assess overall scale consistency, and CA was applied to the item response format using Likert scale measurements. A questionnaire comprising 28 questions was distributed to 30 participants for reliability assessment, and all items were preserved post-IOC analysis. The correlation results and test outcomes are detailed in Table 1 below. Each item in this research tool successfully cleared the reliability evaluation, scoring 0.7 or above (Nunnally & Bernstein, 1994), with trust at 0.852, leadership at 0.830, expression improvement at 0.785, co-creation at 0.847, and student learning behavioral intentions at 0.791.

Table 1: Pilot Test Result

Variable	No. of Items	Cronbach's Alpha	Strength of Association
Trust	6	0.852	Good
Leadership Enhancement	6	0.830	Good
Expression Improvement	5	0.785	Acceptable
Co-creation	6	0.847	Good
Student Learning Behavioral Intentions	5	0.791	Acceptable

4. Results and Discussion

4.1 Demographic Profile

This study surveyed 90 design students at a public university in Nanchang, ensuring diverse representation across gender, academic level, and year of study. Among the participants, 56 (62.2%) were female and 34 (37.8%) were male. In terms of academic standing, freshmen made up the largest group (42.2%), followed by sophomores (27.8%), juniors (18.9%), and seniors (11.1%), reflecting higher participation from early-year students. Undergraduate students comprised 70% (63) of the sample, while postgraduate students accounted for 30% (27), allowing for comparative insights into learning behavioral intentions across educational levels.

From this sample, 40 students participated in in-depth interviews (IDI), selected to maintain demographic balance and ensure diverse perspectives on online learning experiences. This subset provided deeper insights into students' motivation, engagement, and behavioral intentions in online instructional design courses.

The study's balanced demographic composition enhances the reliability of findings, offering a

comprehensive view of how different student groups engage with online design education.

Table 2: Demographic Profile

Research Population and IDI Participants (N=90)		Frequency	Percentage
Gender	Male	34	37.8
	Female	56	62.2
Grade	Freshman	38	42.2
	Sophomore	25	27.8
	Junior	17	18.9
	Senior	10	11.1
Student	Undergraduate	63	70.0
	Postgraduate	27	30.0

4.2 Multiple Linear Regression

The significance of relationships among variables of Trust, Leadership Enhancement, Expression Improvement, Co-creation, and Student Learning Behavioral Intentions were tested using Multiple Linear Regression (MLR) analysis. In MLR, stratified random sampling was used to analyze the data of a total of 444 freshmen undergraduate and postgraduate design students in the School of Design of a university in Nanchang, of which 63 questionnaires were randomly distributed by undergraduate design students, 16 questionnaires were randomly distributed by postgraduate students of industrial design engineering, and 11 questionnaires were randomly distributed by postgraduate design students, for a total of 90 questionnaires.

The relationship between the independent variables during the diagnostic stage and the dependent variable of Student Learning Behavioral Intentions is illustrated in Table 3.

Table 3: The multiple linear regression of T, LE, EI, and CC on SL

Variable	Standardized Coefficients Beta Value	t-value	p-value	VIF	R^2
Trust	.319	4.734	0.000	1.613	0.823
Leadership Enhancement	.272	3.876	0.018	1.384	
Expression Improvement	.283	2.915	0.005	1.769	
Co-creation	.226	5.019	0.000	1.432	

Note: p-value <0.05*

The regression analysis showed that Trust (T), Leadership Enhancement (LE), Expression Improvement (EI), and Co-creation (CC) collectively accounted for 82.3% of the variance in Student Learning Behavioral Intentions (SL) ($R^2 = 0.823$). Significant p-values ($p < 0.05$) confirmed that all four predictors had a meaningful impact on SL, supporting H1, H2, H3, and H4.

Among these variables, Trust had the strongest influence ($\beta = 0.32$, $p < 0.001$), reinforcing Ooge et al. (2023), who found that transparency and user control in e-learning platforms enhance trust and engagement. This study extends prior research by demonstrating that Trust is not only crucial for engagement but is the most significant predictor of students' willingness to learn online. Its dominance in online design education can be attributed to the heavy reliance on digital platforms, where students must trust both the learning system and instructors for guidance. Additionally, design education emphasizes collaboration and iterative feedback, making trust in peer contributions and instructor assessments critical to learning motivation.

Conversely, Co-creation had the weakest influence ($\beta = 0.23$, $p < 0.001$), contradicting traditional theories that emphasize collaboration as a driver of engagement (McCulloch, 2016). However, in an online instructional setting, Co-creation may be less effective due to challenges such as limited real-time interaction and reduced peer engagement in asynchronous environments. This aligns with Viberg et al. (2023), who found that students often struggle with AI-driven co-creation due to a lack of trust in peer-generated content. These findings provide new insights into the role of psychological and interactive factors in online instructional design education, highlighting the importance of trust-building strategies and the need for enhanced digital collaboration tools to improve Co-creation.

To ensure model reliability, a multicollinearity test was conducted, with VIF values (1.613, 1.384, 1.769, and 1.432) all below the accepted threshold of 5 (Hair et al., 1995). This confirms the absence of multicollinearity, indicating a sound and robust model. Therefore, the model was free of multicollinearity issues, indicating a sound and reasonable model construction.

The following hypotheses were then proposed for changes in pre-IDI and post-IDI stages analysis and testing:

H5: There is a significant difference in Trust between pre-IDI and post-IDI stages.

H6: There is a significant difference in Leadership enhancement between pre-IDI and post-IDI stages.

H7: There is a significant difference in Expression improvement between pre-IDI and post-IDI stages.

H8: There is a significant difference in Co-creation between pre-IDI and post-IDI stages.

H9: There is a significant difference in Behavioral intentions between pre-IDI and post-IDI stages.

4.3 IDI Intervention Stage

The IDI intervention cycle of this study lasted a total of 13 weeks. Based on the analysis of the results from the questionnaires collected during the pre-IDI period, including reliability, validity, MLR, and other data, the intervention activities are shown in Figure 2.

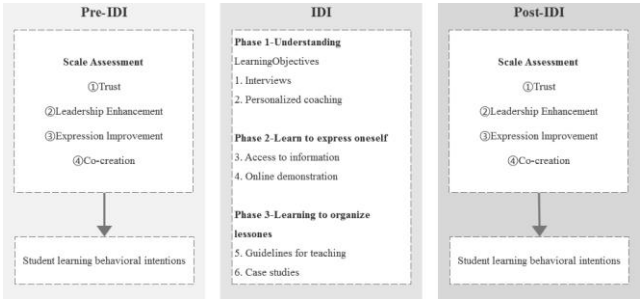

Figure 2: IDI Activities

4.4 Pre-IDI and Post-IDI Comparison Results

In this study, the researchers analyzed six variables using paired sample t-tests to determine whether students' trust, leadership enhancement, expression improvement, co-creation, and student learning behavioral intentions improved before and after the intervention. Table 4 provides a summary of the paired sample t-test results for the five variables:

Table 4: Paired-sample T-test Results

Variable	Mean	SD	t-value	p-value
Trust				
Pre-IDI	3.93	0.13	-5.881	0.000
Post-IDI	4.52	0.21		
Leadership Enhancement				
Pre-IDI	3.79	0.14	-11.120	0.000
Post-IDI	4.59	0.11		
Expression Improvement				
Pre-IDI	3.92	0.06	-9.949	0.000
Post-IDI	4.52	0.12		
Co-creation				
Pre-IDI	3.94	0.11	-13.138	0.000
Post-IDI	4.65	0.08		
Student Learning Behavioral Intentions				
Pre-IDI	3.95	0.09	-3.670	0.006
Post-IDI	4.41	0.27		

The following will present the data from the paired samples T-Tests conducted before and after the intervention for each variable and analyze whether the intervention had the desired effect.

There was a significant difference in Trust between pre-IDI (M=3.93, SD=0.13) and post-IDI (M=4.52, SD=0.21) condition; t (29) =-5.881, p =0.000 (<0.05), hence supported H5.

There was a significant difference in Leadership enhancement between pre-IDI IDI (M=3.79, SD=0.14) and post-IDI (M=4.59, SD=0.11) condition; t (29) =-11.120, p < .001, hence supported H6.

There was a significant difference in Expression improvement between pre-IDI (M=3.92, SD=0.06) and post-IDI (M=4.52, SD=0.12) condition; t (29) =-9.949, p =0.000 (<0.05), hence supported H7.

There was a significant difference in Co-creation between pre-IDI (M=3.94, SD=0.11) and post-IDI (M=4.65, SD=0.08) condition; t (29) =-13.138, p=0.000 (<0.05), hence supported H8.

There was a significant difference in Student learning behavioral intentions between pre-IDI (M=3.95, SD=0.09) and post-IDI (M=4.41, SD=0.27) condition; t (29) =-3.670, p=0.006 (<0.05), hence supported H9.

Based on the above quantitative results showed that there were significant differences between pre-IDI and post-IDI stages on Trust, Leadership Enhancement, Expression Improvement, Co-Creation in terms of student learning behavioral intentions.

5. Conclusions and Recommendation

5.1 Conclusions

This study examined factors influencing online learning behavioral intentions among design students at a public university in Nanchang, China, using the Human-Centered Design (HCD) framework and the Theory of Planned Behavior (TPB). The findings, based on multiple linear regression (MLR) and a 13-week intervention with 40 students, confirmed that Trust had the strongest influence, followed by Expression Improvement and Leadership Enhancement, while Co-creation had the weakest effect.

Trust emerged as the most significant predictor, aligning with TPB's concept of perceived behavioral control, as students are more likely to engage in learning when they trust instructors, peers, and platforms. HCD emphasizes that trust fosters a supportive learning environment, essential for student motivation. To strengthen trust, educators should implement student-teacher feedback loops, peer mentorship programs, and transparent grading criteria to enhance confidence in online learning.

Expression Improvement significantly influenced learning intentions, as TPB suggests that reducing communication barriers increases engagement, while HCD highlights the role of self-expression in design education. Strategies such as virtual design critiques, AI-powered feedback tools, and multimodal expression formats (video, sketches, 3D modeling) can help students communicate ideas effectively in online settings.

Leadership Enhancement played a notable role, with TPB linking leadership to increased responsibility and engagement and HCD supporting student-driven learning. Educators can encourage leadership through student-led discussions, virtual design workshops, and interactive role-playing activities to foster collaboration and decision-making skills.

Co-creation, while significant, had the weakest impact, likely due to challenges in asynchronous communication and limited real-time collaboration in online learning. HCD suggests that co-creation thrives in interactive environments, which can be improved through digital collaboration tools (Miro, Figma), live brainstorming sessions, and cross-disciplinary online projects to enhance teamwork and shared creativity.

These findings emphasize the importance of trust-building, expressive communication, leadership development, and enhanced digital collaboration in online design education. By integrating structured feedback, AI-supported learning, and interactive peer collaboration, educators can create engaging and effective online learning environments aligned with both TPB and HCD principles.

5.2 Recommendations

China's ongoing efforts to expand online education have significantly improved accessibility and quality in learning. This study confirms that Trust, Leadership Enhancement, Expression Improvement, and Co-creation are key factors influencing student engagement and learning behavioral intentions in online design education. Based on these findings, several actionable strategies are recommended to enhance the effectiveness of online learning environments.

To enhance trust, educators should establish transparent and interactive learning environments where students feel supported and valued. Teachers can build credibility by sharing their expertise, incorporating real-world case studies, and maintaining clear assessment criteria. Regular student-teacher feedback loops, through anonymous surveys and interactive discussions, allow students to express concerns and receive tailored support. Hosting virtual Q&A sessions or "family meetings" fosters a sense of connection, helping students feel more engaged. Additionally, implementing peer mentorship programs, where senior students guide newer ones, reinforces trust and creates a collaborative learning culture.

Leadership skills play a crucial role in student participation, particularly in group-based learning. To nurture leadership, educators should assign project-based learning tasks where students take on specific leadership roles within teams. Encouraging student-led discussions, peer-moderated forums, and student-organized virtual workshops provides learners with opportunities to develop organizational and decision-making skills. Simulated leadership exercises, such as role-playing different leadership styles, help students refine their ability to manage group dynamics and collaborative decision-making. Recognizing leadership contributions through certificates or digital badges can further motivate students to take initiative in online courses.

Expression Improvement is critical for online learning engagement, as students must effectively communicate ideas through digital platforms. Educators should integrate virtual design critiques that replicate in-person studio discussions, encouraging students to articulate their creative concepts. AI-powered tools can provide real-time feedback on written and verbal expression, helping students refine their communication skills. Encouraging multimodal expression formats, such as videos, sketches, and 3D modeling, allows students to present ideas in ways that best suit their strengths. Additionally, incorporating interactive speaking and writing activities, such as debates, speech contests, and reflective journaling, builds confidence in self-expression.

Although co-creation is essential for collaborative learning, asynchronous online environments often hinder real-time interaction, making it less impactful than other factors. To strengthen co-creation, institutions should integrate digital collaboration tools such as Google Drive, Miro, Slack, or Figma, enabling students to co-design and iterate on projects in real time. Hosting live co-creation sessions and interdisciplinary teamwork activities—where students collaborate with peers from fields such as engineering or business—can enrich their design perspectives. Educators should also act as facilitators in structured team discussions, ensuring equitable participation and maximizing the benefits of co-creation in online settings.

By implementing these strategies, educators and institutions can create more engaging, student-centered online learning environments. Strengthening trust through structured feedback, fostering leadership through project-based roles, improving expression through AI-supported learning, and enhancing co-creation with interactive digital tools ensures that online design education remains effective, collaborative, and engaging. These recommendations align with TPB's focus on motivation and perceived behavioral control and HCD's learner-centered approach, reinforcing the need for interactive, trust-based, and student-driven online learning experiences.

5.3 Limitation and Further Study

This study mainly employed quantitative research methods, collecting data through questionnaires and conducting correlation analyses to explore influencing factors. While this approach provides quantitative results, it fails to delve into the underlying reasons affecting students' learning behavioral intentions. Future research could incorporate qualitative methods, such as interviews and case studies, to gain a more comprehensive understanding of the challenges and needs students face in online learning, as well as the psychological motivations behind their learning behaviors.

The research primarily focuses on specific educational institutions and the student populations involved, resulting in a relatively limited sample size and diversity. Consequently, the findings may not broadly represent students' learning behavioral intentions in other educational contexts or cultural environments. Future research should consider a more extensive sample selection to enhance the external validity of the results.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Anderson, M. (2016). Teaching to learn: Communication practices for student engagement and understanding. *Communication Education, 65*(3), 341-361. https://doi.org/10.1080/03634523.2015.1101778

Anderson, T. (2008). *The theory and practice of online learning* (2nd ed.). AU Press.

Artino, A. R. (2009). Online learning: Are subjective perceptions of instructional context related to academic success? *The Internet and Higher Education, 12*(3-4), 117-125. https://doi.org/10.1016/j.iheduc.2009.07.003

Bates, A. W., & Poole, G. (2003). *Effective teaching with technology in higher education: Foundations for success.* Jossey-Bass.

Bodnar, M., Namieśnik, J., & Konieczka, P. (2013). Validation of a sampling procedure. *Trends in Analytical Chemistry, 51,* 117-126. https://doi.org/10.1016/j.trac.2013.06.011

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems, 49*(1), 5-22. https://doi.org/10.1177/0047239520934018

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks, 11*(1), 61-72.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis*. Prentice-Hall.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology Systems, 46*(1), 4-29. https://doi.org/10.1177/0047239516661713

Komives, S. R., Lucas, N., & McMahon, T. R. (2009). *Exploring leadership: For college students who want to make a difference.* John Wiley & Sons.

Lee, E., & Hannafin, M. J. (2016). A design framework for enhancing engagement in student-centered learning: Own it, learn it, and share it. *Educational Technology Research and Development, 64*(4), 707-734. https://doi.org/10.1007/s11423-015-9422-5

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning, 22*(1), 205-222. https://doi.org/10.24059/olj.v22i1.1092

McCulloch, A. (2016). The student as co-producer: Learning from public administration about the student–university relationship. *Studies in Higher Education, 41*(9), 1598-1610. https://doi.org/10.1080/03075079.2014.914914

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Department of Education.

Meyer, M. W., & Norman, D. (2020). Changing design education for the 21st century. *She Ji: The Journal of Design, Economics, and Innovation, 6*(1), 13-49. https://doi.org/10.1016/j.sheji.2019.12.002

Nunnally, J. C., & Bernstein, I. H. (1994). *The assessment of reliability* (3rd ed.). McGraw-Hill.

Ooge, J., Dereu, L., & Verbert, K. (2023). Steering recommendations and visualizing its impact: Effects on adolescents' trust in e-learning platforms. *28th International Conference on Intelligent User Interfaces Proceedings,* 1-15. https://doi.org/10.48550/arXiv.2303.00098

Peach, M., Ruiter, R. A. C., & Jones, A. (2017). Developing the storytelling skills of university students: An analysis of pedagogy and practice. *Journal of Higher Education Outreach and Engagement, 21*(3), 65-84.

Petherbridge, D., Bartlett, M., White, J., & Chapman, D. (2023). *Instructional designers' perceptions of the practice of instructional design in a post-pandemic workplace.* ODU Digital Commons.

Richardson, J. C., Maeda, Y., Lv, J., & Caskurlu, S. (2017). Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Computers in Human Behavior, 71*, 402-417. https://doi.org/10.1016/j.chb.2017.02.001

Sekaran, U., & Bougie, J. R. G. (2016). *Research methods for business: A skill-building approach* (5th ed.). Wiley.

Sharma, M., & Gupta, S. (2024). *Enhancing online teaching methods through leadership innovations.* ResearchGate. https://www.researchgate.net/publication/387139085_Enhancing_Online_Teaching_Methods_Through_Leadership_Innovations

Tarhini, A., Masa'deh, R., Al-Busaidi, K. A., Mohammed, A. B., & Maqableh, M. (2017). Factors influencing students' adoption of e-learning: A structural equation modeling approach. *Journal of International Education in Business, 10*(2), 164-182. https://doi.org/10.1108/JIEB-09-2016-0032

Tschannen-Moran, M. (2001). Collaboration and the need for trust. *Journal of Educational Administration, 39*(4), 308-331. https://doi.org/10.1108/EUM0000000005493

Viberg, O., Cukurova, M., Feldman-Maggor, Y., Alexandron, G., Shirai, S., Kanemune, S., Wasson, B., Tømte, C., Spikol, D., Milrad, M., Coelho, R., & Kizilcec, R. F. (2023). What explains teachers' trust of AI in education across six countries?. *arXiv preprint arXiv:2312.01627,* 1-29. https://doi.org/10.48550/arXiv.2312.01627

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 39. https://doi.org/10.1186/s41239-019-0171-0

Zhou, Z., & Dong, X. (2022). Research on online co-creation teaching and design of design courses in higher education. *Design, 35*(7), 80-83.