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Effects of WeChat-Enhanced Gamified Teaching on Academic Performance and Satisfaction in Entrepreneurship and Career Guidance Courses Among Chinese Vocational College Students

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Abstract

Background and Aim: The impact of WeChat on vocational education is enormous, and more researchers apply it to the gamified teaching process of Entrepreneurship and Career Guidance Course (ECGC). This study aims to reveal the tremendous impact of gamified teaching with the WeChat application on vocational college students at Guangdong Communication Polytechnic (GDCP), China.

Materials and Methods: Targeting 86 freshmen at GDCP from two classes of ECGC, the research used a quasi-experimental design to assess students' academic performance of gamified teaching via the WeChat application. Following the intervention, course satisfaction surveys were distributed to the experimental group students.

Results: Remarkably, ANCOVA analysis results revealed statistically significant improvements in students' desire to explore careers and positive attitudes towards entrepreneurship with the WeChat application. While career decision-making self-efficacy ($t=0.52$, $p < 0.05$) and entrepreneurial self-efficacy ($t=3.52$, $p < 0.05$) showed minimal change, using the WeChat application cannot make freshmen feel confident that they can find a good job or succeed in entrepreneurship.

Conclusion: These findings challenged the assumptions of Self Determination Theory (SDT), suggesting that further exploration needs to refine the theoretical frameworks in this context. Moreover, feedback from post-experiment questionnaires underscored students' ability to leverage WeChat as a powerful tool for engaging in classroom activities, making the gamified teaching experience effective. This research highlighted a promising approach that gamified teaching strategies and the WeChat application can be effectively combined to build an actively engaged learner community, providing empirical support for cognitivism theory.

Keywords: WeChat Application; Gamified Teaching; Entrepreneurship and Career Guidance Course; Vocational College Students; Effective Teaching Experience

Introduction

In recent years, the Entrepreneurship and Career Guidance Course (ECGC) has been offered to assist vocational college students in finding jobs or starting businesses (Motta & Galina, 2023). However, traditional teaching methods of ECGC may limit the potential of vocational college graduates to find their ideal job (Ahmad et al., 2018). In the blended learning environment, students' online engagement is generally low, leading to low learning outcomes (Bizami et al., 2023). Vocational college students attach great importance to factors such as convenient learning platforms and interesting teaching methods that may affect their participation in classroom activities (Alsubhi et al., 2020).

While research has explored gamified methods (Grivokostopoulou et al., 2019; Rodríguez & Lieber, 2020), and WeChat's use in education (Huang, 2019; Wu & Song, 2019) separately, few studies have investigated their combined effects on specific learning outcomes in ECGC. Furthermore, existing research often lacks a rigorous experimental design to isolate the impact of WeChat-based gamification (Isabelle, 2020; Huang et al., 2023). This study addresses this gap by examining the effects of a WeChat-integrated gamified approach on both academic performance and course satisfaction in a Chinese vocational college context.

Considering the interactivity of teaching activities, ECGC teaching has the advantage of combining gamification pedagogy with the WeChat application (Ji et al., 2023). The application of gamified teaching

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is more effective with WeChat, but there is little research on the design (Zhou et al., 2022). Therefore, the purpose of this study is to investigate the effects of WeChat-integrated gamified teaching on academic performance and course satisfaction compared to traditional teaching methods in an ECGC at a Chinese vocational college. A secondary purpose is to explore student perceptions of the WeChat-based gamified learning experience.

Objectives

1. To determine the differential effects of WeChat-enhanced gamified teaching versus traditional teaching on students' career-related performance dimensions (Career Exploration, Career Decision-Making Self-Efficacy, and Career Self-Management).
2. To examine how WeChat-enhanced gamified teaching affects students' entrepreneurship-related performance dimensions (Entrepreneurial Attitude, Entrepreneurial Self-Efficacy, and Entrepreneurial Intention) compared to traditional teaching methods.
3. To assess how students in the experimental group perceive the effectiveness and satisfaction of WeChat-enhanced gamified teaching in ECGC.

Literature review

The integration of WeChat in gamified teaching can be understood through Mayer's Cognitive Theory of Multimedia Learning (CTML), which suggests that multimedia tools reduce cognitive load through dual-channel processing (Mayer, 2024). Recent applications of CTML to mobile learning environments have demonstrated that properly designed mobile applications can enhance learning outcomes by balancing cognitive load (Xin & Zhang, 2024). In the context of this study, WeChat's multimedia capabilities may facilitate better processing of career and entrepreneurship concepts compared to traditional teaching methods. This theoretical foundation directly supports hypotheses H1-H3, which predict improved career-related outcomes through WeChat-enhanced gamified teaching. Flow theory indicates a mental state of complete absorption in energetic activities (Csikszentmihalyi et al., 2014). Lafortune et al. (2024) explored the impact of gamified design in entrepreneurship education, which can inspire students to immerse themselves, which is more likely to fall into the flow state. This theoretical foundation directly supports hypotheses H4-H6, which predict improved entrepreneurship-related outcomes through WeChat-enhanced gamified teaching.

The Theory of Planned Behavior (TPB) states that behavioral achievement depends on motivation and behavioral control (Ajzen, 2011). Wang et al. (2021) further proposed that the extended theory of TPB was used to predict student's positive attitudes to explore their careers in gamified activities. In line with Ajzen's TPB, the WeChat application can provide real-time feedback (Xu et al., 2020), which may help students believe that they can make wise career decisions and have career self-management capabilities with the guidance of teachers. Moreover, as a fundamental theory of human motivation, Self Determination Theory (SDT) focuses on the internal psychological needs of individuals to complete tasks (Ryan & Deci, 2000). WeChat application provides emotional support, which is more effective for cultivating students' positive entrepreneurial attitude than traditional teaching (Ahmad et al., 2018). A positive entrepreneurial attitude implies that students have more enthusiasm for entrepreneurial activities, increasing their entrepreneurial self-efficacy (Toding et al., 2023). An individual with high self-efficacy is more likely to start a business, which enhances their entrepreneurial intention (Liu et al., 2019). Therefore, this research has proposed the hypotheses as follows.

H1: Career Exploration (CE) has a greater impact on student's academic performance of the experiment group (gamified teaching with WeChat) than the control group (traditional method).

H2: Career Decision-Making Self-Efficacy (CDMSE) has a greater impact on student's academic performance of the experiment group (gamified teaching with WeChat) than the control group (traditional method).

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H3: Career Self-Management (CSM) has greater impact on students' academic performance of the experiment group (gamified teaching with WeChat) than in the control group (traditional method).

H4: Entrepreneurial Attitude (EA) has a greater impact on student's academic performance in the experiment group (gamified teaching with WeChat) than in the control group (traditional method).

H5: Entrepreneurial Self-Efficacy (ESE) has a greater impact on student's academic performance of the experiment group (gamified teaching with WeChat) than the control group (traditional method).

H6: Entrepreneurial Intention (EI) has a greater impact on student's academic performance in the experiment group (gamified teaching with WeChat) than in the control group (traditional method).

Conceptual Framework

There are three main distinct viewpoints in learning theory: Cognitivism, Constructivism, and Behaviorism (Ertmer & Newby, 1993). In the instructional design of this research, the theoretical foundation is cognitivist and constructivist learning theory, which consist of two theories related to treatment, and three for variables (see Figure 1).

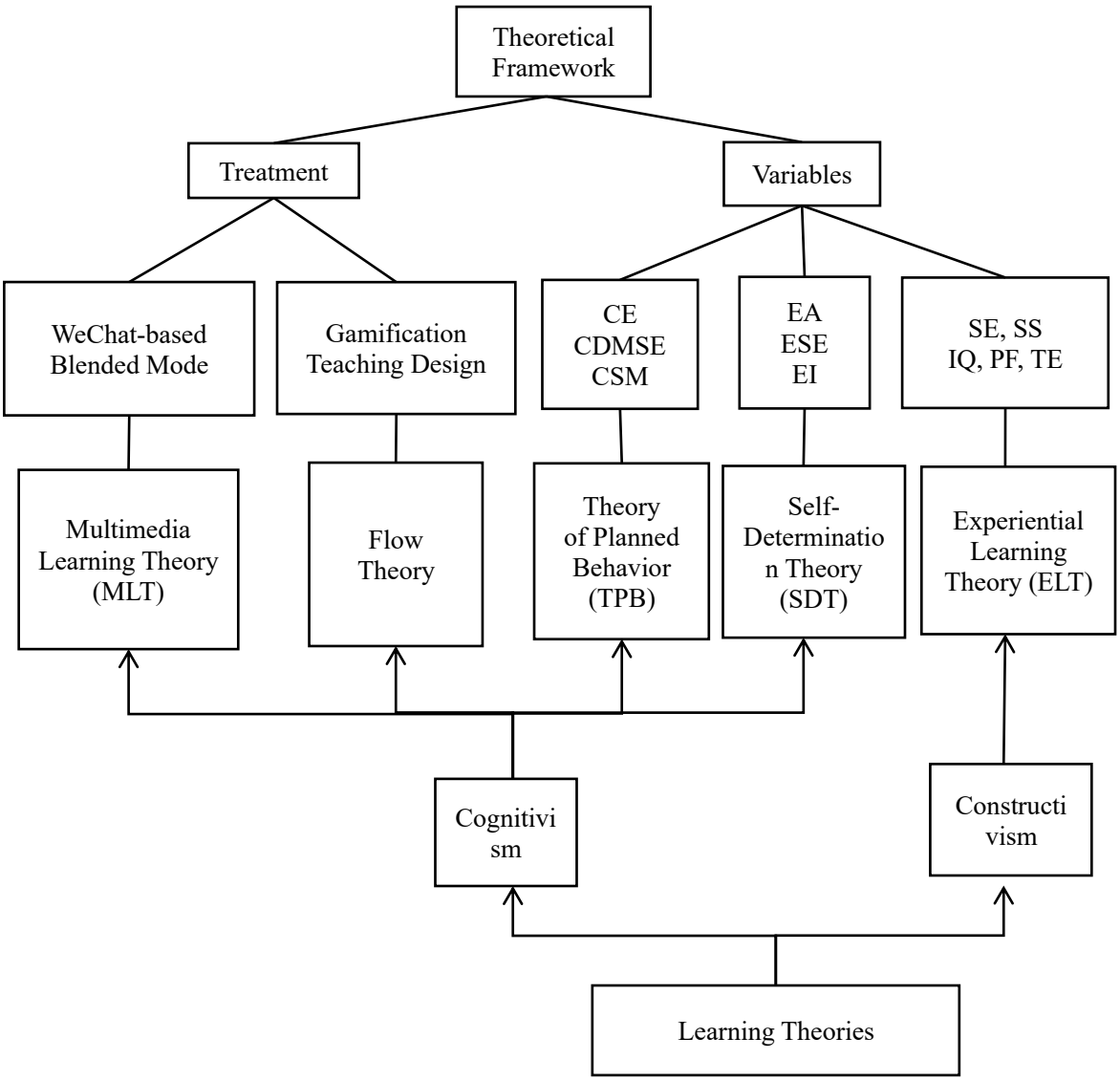

Figure 1 Conceptual Framework

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Methodology

This study employed a quasi-experimental pretest-posttest control group design to investigate the effects of WeChat-integrated gamified teaching on students' academic performance and course satisfaction. The design was selected due to the inability to randomly assign individual students to experimental conditions within the existing class structure, a common constraint in educational research (Campbell & Stanley, 2015).

A. Participants and Sampling

This research chose students from Guangdong Communication Polytechnic (GDCP), the researcher's workplace, which is convenient for getting statistical data. During the academic year 2023-2024, the researcher selected two ECGC classes, all of which were freshmen with the same major. The researcher was responsible for teaching these two classes, so certain key variables can be controlled to remain constant, such as teaching resources and instructor qualifications. GDCP has several instructors who have implemented gamified teaching methods in similar EDGC classes. Participants were students who had previously experienced gamified teaching but did not use the WeChat application in the related courses.

Based on the sampling techniques of previous studies on blended learning (Klar & Leeper, 2019), utilized purposive sampling to select participants. Accordingly, we chose students from two different classes (44 for the experiment group and 42 for the control group) for the quasi-experiment to compare their academic performance during eight weeks of treatment.

Participants included 86 freshmen (47 female, 39 male; age range 18-20 years, M = 18.7, SD = 0.5) enrolled in ECGC. All participants had similar educational backgrounds (high school graduates) and reported regular use of WeChat for personal communication (average daily use: 2.8 hours). Based on Cohen's (1992) guidelines for statistical power analysis, this sample size was sufficient to detect medium effect sizes ($d = 0.5$) with 80% power at $\alpha = .05$ for the primary analyses.

The course satisfaction questionnaire collected data from 44 experiment group students after the performance test. To ensure our research is ethical, we first obtained consent from GDCP for data collection. Then, we explained the purpose of the data gathering to the participants. In the process of data collection, participants remained anonymous, and we also ensured the confidentiality of the participant's personal information.

B. Research Design and Intervention

To minimize threats to internal validity, several controls were implemented: (1) both groups received the same amount of instructional time (4 hours per week); (2) the same instructor taught both groups to control for teaching style; (3) pre-test scores were used as covariates in the analysis to account for initial differences; and (4) course materials covered identical content topics, differing only in delivery method.

The eight-week intervention for the experimental group integrated WeChat with gamified learning in three specific ways: (1) WeChat Mini-Programs were used to deliver interactive "Job Search Adventure Game" challenges where students earned points for completing simulated job application tasks; (2) students participated in synchronous "Career Exploration Game" activities during class using WeChat's polling and discussion features; and (3) asynchronous "Business Simulation Game" scenarios were shared through WeChat groups, requiring collaborative problem-solving. The control group covered identical content through traditional lecture-based instruction, case studies, and paper-based exercises without technology integration or gamification elements.

C. Data Collection and Analysis

In this research, the quasi-experiment consists of three parts: pre-test, experiment, and post-test. Before the class, students are required to complete the performance test to ensure that their academic levels are at the same level. In the eight-week treatment (weeks 2-9), the control group (42 students) was taught using traditional teaching methods, while the experimental group (44 students) was in the WeChat gamification class. After the class, they were also required to do the performance test to measure academic performance. Three senior professors were invited to design the pre-test and post-test questions according to the course standards, and the researcher would upload them to the WeChat application. Additionally, the

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experimental group students were required to fill out the course satisfaction questionnaire after finishing 8 weeks of teaching. The questionnaire consisted of 21 questionnaire items from 6 variables.

Statistical analyses were conducted using SPSS 26.0. After verifying the assumptions of normality and homogeneity of variance, an Analysis of Covariance (ANCOVA) was performed to examine between-group differences in post-test scores while controlling for pre-test performance. Paired samples t-tests were used to assess within-group changes from pre-test to post-test. For the satisfaction questionnaire, descriptive statistics were calculated, and Spearman rank correlations were computed to examine relationships between satisfaction dimensions and performance outcomes. Statistical significance was set at $p < .05$ for all analyses, and effect sizes were reported using partial eta squared (η^2) for ANCOVA and Cohen's d for t-tests.

D. Research Instruments

There are two research instruments in this research. The performance test measures students' academic performances. The quasi-experiment was conducted among two groups of students. Additionally, the attitude test distributed a questionnaire to experiment with group students to find their satisfaction with game-based teaching with the WeChat application.

For the performance test, the researcher conducted an eight-week quasi-experiment from September to November 2024. Two groups of students were required to finish pre-test and post-test and obtain corresponding scores. The academic performance test assessed six dimensions: Career Exploration (7 items, $\alpha = .83$), Career Decision-Making Self-Efficacy (5 items, $\alpha = .85$), Career Self-Management (6 items, $\alpha = .79$), Entrepreneurial Attitude (6 items, $\alpha = .88$), Entrepreneurial Self-Efficacy (5 items, $\alpha = .82$), and Entrepreneurial Intention (6 items, $\alpha = .84$). The test comprised multiple-choice and short-answer questions, with each dimension scored on a 0-20 scale for a total possible score of 120. Content validity was established through expert review by three professors with expertise in career education and entrepreneurship. The instrument demonstrated strong test-retest reliability ($r = .87$) in a pilot study with similar students ($n = 25$).

For the attitude test, the course satisfaction questionnaire was distributed to the experiment group students, and all questionnaire items were assessed using a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). Given that the participants were Chinese students, the questionnaire was translated into Chinese with the assistance of two senior English professors with master's degrees in translation to enhance its reliability and validity. Based on their feedback, we slightly modified the description of the measurement items to align with the WeChat gamified teaching mode and to ensure the reliability and validity of the questionnaire.

Results

A. Descriptive Statistics

The results are presented in three sections aligned with the research questions: (1) comparison of academic performance between groups, (2) analysis of course satisfaction in the experimental group, and (3) examination of relationships between variables. Table 1 shows the performance test scores (pre-test =ECGC_1, post-test=ECGC_2) of two groups of students (Class A=Experiment Group; Class B=Control Group). The mean value of pre-test scores in the experiment group is 76.8, which is similar to the mean value of the control group (76.4). This means that the two groups of students have the same knowledge level of the course. The difference in the mean value of the pre-test and post-test scores showed that the experiment group (8.06) was greater than the control group (2.95). Overall, the experiment group students had better academic performance in the WeChat gamified class.

Table 1 Pre-test, Post-test of Two Classes

Quasi-experiment	Class	N	Mean	SD	Minimum	Maximum
ECGC_1	Class A	44	76.8	1.67	74	80.8
	Class B	42	76.4	1.75	73.1	80

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Quasi-experiment	Class	N	Mean	SD	Minimum	Maximum
ECGC_2	Class A	44	84.8	1.64	81.8	88.6
	Class B	42	79.3	1.85	75.4	83.3
ECGC_Imp	Class A	44	8.06	0.74	6.49	9.23
	Class B	42	2.95	0.66	1.75	4.39

Table 2 shows the experiment group students' attitudes towards ECGC associated with gamification teaching through the WeChat application. The total mean was 4.71, which when compared to the arbitrary level represents 'strongly agree'. The students agreed that learning through the WeChat application can make them more confident to perform well (with a mean score of 4.63), and made them more satisfied with learning through WeChat (with a mean score of 4.80). They also agreed that learning through the WeChat application can feel the enthusiasm of the instructor (with a mean score of 4.77), and the well-organized course design (with a mean score of 4.73). Overall, the students agreed that the WeChat application makes course learning more convenient.

Table 2 Descriptive Statistics of Course Satisfaction Questionnaire

		Item Statement	Mean	SD	Interpretation
SE	1	Even when faced with difficulties, I am confident that I can learn the content of the course.	4.61	.49	Strongly Agree
	2	I am confident that I will be able to perform well in the various tasks in the course.	4.61	.49	Strongly Agree
	3	I am sure I can understand the hardest content in the course.	4.68	.47	Strongly Agree
SS	4	Overall, I was satisfied with the experience of the course.	4.73	.45	Strongly Agree
	5	The learning activities and assignments of this course met my learning expectations.	4.68	.47	Strongly Agree
	6	The level of learning that took place in this course was of the highest quality.	4.77	.42	Strongly Agree
	7	This course was a useful learning experience.	5	0	Strongly Agree
IQ	8	The instructor was generally respectful of student learning.	4.75	.44	Strongly Agree
	9	The instructor facilitated the course effectively.	4.82	.39	Strongly Agree
	10	In this class, I gained more knowledge by using WeChat technology.	4.77	.42	Strongly Agree
CD	11	The instructor was enthusiastic about teaching.	4.75	.44	Strongly Agree
	12	The course was well organized.	4.70	.46	Strongly Agree
	13	The course was designed to allow assignments to be completed across different learning environments.	4.73	.45	Strongly Agree
	14	WeChat was used to create an efficient learning environment.	4.75	.44	Strongly Agree
PF	15	The course was designed to allow me to take responsibility for my learning.	4.75	.44	Strongly Agree
	16	The instructor responded promptly to my questions about the use of WeChat.	4.61	.49	Strongly Agree
	17	The instructor responded promptly to my questions about general course requirements.	4.68	.47	Strongly Agree
	18	The instructor responded promptly to my questions about the course assignment.	4.73	.45	Strongly Agree
TE	19	I feel confident using WeChat as a learning tool.	4.68	.47	Strongly Agree

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	Item Statement	Mean	SD	Interpretation
20	I feel confident downloading the necessary materials from the WeChat teaching platform.	4.61	.49	Strongly Agree
21	I feel confident uploading the necessary materials to the WeChat teaching platform.	4.64	.49	Strongly Agree
	Total	4.71	.43	Strongly Agree

B. ANCOVA Test Result

Regarding the first objective, covariance (ANCOVA) analysis was performed to see the linearity between the outcome variable and the covariate as well as the homogeneity among the experiment group and control group. As was shown in Table 3, ANCOVA results revealed a significant difference between groups in post-test performance after controlling for pre-test scores, $F(1, 83) = 492.30$, $p < .001$, partial $\eta^2 = .86$. According to Cohen (1988) guidelines, this represents a large effect size, indicating that the intervention accounted for 86% of the variance in post-test scores when controlling for pre-test performance.

Table 3 Dependent Variable: Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Consent Parameter	Observed Power
Corrected Model	542.460[a]	2	271.23	501.466	.000	.924	1002.932	1.000
Intercept	4.711	1	4.711	8.71	.004	.095	8.71	0.831
SRL_Pre Test	209.998	1	209.998	388.257	.000	.824	388.257	1.000
Group	266.274	1	266.274	492.304	.000	.856	492.304	1.000
Error	44.893	83	0.541					
Total	569369.523	86						
Corrected Total	587.353	85						

a. R Squared=.924(Adjusted Squared=.922)

b. Computed using alpha=.05

The analysis for the second question of the study concerned the impact of WeChat gamified teaching intervention on the post-test score. The correlation coefficient (i.e. Spearman rank correlation) was to answer this research question. As was shown in Table 4, the four variables were significantly correlated, but Career Decision-Making Self-Efficacy and Entrepreneurial Self-Efficacy were not significantly correlated. This indicated that embedding WeChat technology into gamified teaching mode has not affected students' Career Decision-Making Self-Efficacy and Entrepreneurial Self-Efficacy. Additionally, Career Decision-Making Self-Efficacy does not correlate statically significantly with other variables. There was also no significant correlation between Entrepreneurial Self-Efficacy and other variables. Career

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Exploration was moderately and positively correlated with Entrepreneurial Attitude (r = .47, p < .001), indicating that students with higher exploration scores also tended to have more positive attitudes toward entrepreneurship. Similarly, Career Self-Management showed a strong positive correlation with Entrepreneurial Attitude (r = .58, p < .001).

Table 4 Correlation Analysis Result (Post-test)

Spearman's rho	**CE**	**CDMSE**	**CSM**	**EA**	**ESE**	**EI**
CE	1					
CDMSE	.206	1				
CSM	.216*	.064	1			
EA	.471**	-.002	.581**	1		
ESE	.152	.12	.07	.121	1	
EI	.425**	.189	.329**	.447**	-.037	1

**p＜0.01; *p＜0.05

As shown in Table 5, the researcher used a paired sample t-test to analyze the impact of intervention for experimental group students. The paired samples t-tests revealed no significant changes in CDMSE (t(43) = 1.32, p = .194) or ESE (t(43) = -0.05, p = .961) for the experimental group. However, significant improvements were observed in CE (t(43) = 15.67, p < .001, d = 2.36), CSM (t(43) = 14.93, p < .001, d = 2.25), EA (t(43) = 17.82, p < .001, d = 2.69), and EI (t(43) = 16.41, p < .001, d = 2.47).

Table 5 Paired Sample Statistics

Paired Sample Test	**The control group (n=42)**			**The experiment group (n=44)**		
	Mean	**SD**	**t**	**Mean**	**SD**	**t**
CE2-CE1	2.6905	1.4097	12.369	7.4909	2.3175	21.441
CDMSE2-CDMSE1	3.0381	1.409	13.974	3.1455	1.4392	14.497
CSM2-CSM1	3.0357	1.6357	12.028	7.8386	2.0155	25.797
EA2-EA1	2.981	1.2311	15.692	8.4682	2.004	28.029
ESE2-ESE1	3.0476	2.1998	8.978	3.0455	1.6168	12.494
EI2-EI1	2.8333	1.4171	12.958	7.9114	22.935	21.441

**p＜0.01; *p＜0.05: Correlation is significant at the 0.01level (2-tailed)

Hypothesis testing results are summarized in Table 6. Hypotheses H1, H3, H4, and H6 were supported, indicating that WeChat-integrated gamified teaching had significant positive effects on Career Exploration, Career Self-Management, Entrepreneurial Attitude, and Entrepreneurial Intention. However,

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Hypotheses H2 and H5 were not supported, as no significant differences were found for Career Decision-Making Self-Efficacy or Entrepreneurial Self-Efficacy.

Table 6 Hypothesis Testing Results

Hypotheses	Statements	Result after Analysis
H_a1	Career Exploration has a greater impact on students' academic performance in the experiment group than in the control group.	Supported
H_a2	Career Decision-Making Self-Efficacy has a greater impact on students' academic performance in the experiment group than in the control group.	Not supported
H_a3	Career Self-Management has a greater impact on students' academic performance in the experiment group than control group.	Supported
H_a4	Entrepreneurial Attitude has a greater impact on student's academic performance in the experiment group than in the control group.	Supported
H_a5	Entrepreneurial Self-Efficacy has a greater impact on students' academic performance in the experiment group than in the control group.	Not supported
H_a6	Entrepreneurial Intention has a greater impact on student's academic performance in the experiment group than in the control group.	Supported

Discussion

The findings partially support Mayer's Cognitive Theory of Multimedia Learning (CTML), as the WeChat platform appeared to enhance knowledge acquisition through multiple channels of information processing. Students in the experimental group demonstrated significantly higher scores in career exploration and entrepreneurial attitude, suggesting that the multimedia aspects of WeChat-based instruction facilitated deeper engagement with the content. This aligns with Mayer's (2024) assertion that well-designed multimedia instruction can reduce cognitive load and enhance learning outcomes.

The significant improvement in entrepreneurial intention among experimental group students is consistent with recent findings by Yang et al. (2022), who reported that gamified entrepreneurship education enhanced students' willingness to consider entrepreneurial careers. However, unlike Primario's (2023) study, which found significant improvements in entrepreneurial self-efficacy through gamification, our results showed no significant change in this dimension. This discrepancy may be attributed to the shorter intervention period in our study (8 weeks versus 16 weeks in Primario's research) or differences in participant characteristics.

The lack of significant improvement in self-efficacy measures presents an interesting contrast to the positive changes in attitude and intention. This finding challenges the assumption in Self-Determination Theory that enhanced engagement automatically leads to increased confidence. One possible explanation is that while WeChat-based gamification effectively stimulated interest and knowledge acquisition, the development of self-efficacy requires more extended practice and successful experiences than our eight-week intervention provided. As Pajares (2006) noted, self-efficacy is primarily developed through mastery experiences and requires sufficient time to internalize successes. Our freshman participants may have

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gained knowledge and interest without yet developing the confidence that comes from repeated success in authentic contexts.

Conclusion

This study investigated the effects of WeChat-integrated gamified teaching on vocational college students' academic performance and course satisfaction in Entrepreneurship and Career Guidance Courses. The findings revealed that this innovative approach significantly enhanced students' career exploration activities, career self-management capabilities, entrepreneurial attitudes, and entrepreneurial intentions compared to traditional teaching methods. However, contrary to expectations, the intervention did not significantly impact students' career decision-making self-efficacy or entrepreneurial self-efficacy, suggesting that self-confidence in these domains may require different or more extended interventions.

These findings contributed to educational theory by demonstrating that technology-enhanced gamification can have differential effects across cognitive, affective, and confidence-related outcomes. The results suggested a refinement of Self-Determination Theory in educational technology contexts: while technology-enhanced gamification may effectively support the autonomy and relatedness components of SDT through engaging activities and social interaction, the competence component (manifested as self-efficacy) may require additional scaffolding and success experiences beyond what typical gamified activities provide.

For vocational education practitioners, these findings suggested that WeChat-integrated gamification can be particularly effective for developing students' knowledge base and fostering positive attitudes toward career exploration and entrepreneurship. However, educators should complement these approaches with structured opportunities for mastery experiences to build self-efficacy. This might include scaffolded real-world projects, mentoring relationships with industry professionals, or staged competency development that ensures students experience success before advancing to more challenging tasks.

Recommendation

Based on the findings of this study, we offer recommendations in three areas: (1) educational practice, (2) institutional policy, and (3) future research directions.

For educational practitioners, we recommend:

1) Implementing WeChat-integrated gamification specifically for enhancing knowledge acquisition and attitude formation in entrepreneurship and career education.

2) Supplementing technology-enhanced gamification with structured real-world experiences to build self-efficacy, such as job shadowing, micro-internships, or mentored entrepreneurial projects.

3) Extending the duration of gamified interventions beyond eight weeks when targeting self-efficacy development, as confidence building likely requires sustained engagement.

4) Designing developmentally appropriate gamification elements that match students' current knowledge level, gradually increasing in complexity as competence develops.

Future research should address the limitations of this study by:

1) Conducting longitudinal investigations to determine whether effects on knowledge and attitudes translate to self-efficacy development over extended periods (e.g., one academic year).

2) Employing mixed-methods designs that include qualitative data to explore students' perceptions of how WeChat-sintegrated gamification influences their learning and confidence.

3) Comparing different implementations of WeChat-based gamification to identify the most effective design elements for various learning outcomes.

4) Investigating potential moderating variables such as prior technology experience, learning styles, and career aspirations that may influence the effectiveness of WeChat-integrated gamification.

5) Expanding to diverse vocational college settings to enhance generalizability.

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