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Factors Affecting Students' Satisfaction in Design Courses: A Case Study of University Students in Chengdu, China

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Abstract

The purpose of this study is to investigate how students' satisfaction is affected by six independent variables: namely perceived value, teaching quality, learning resources, instructors, course content, and technology. The study mainly adopts the questionnaire survey method, comprehensive research combining quantitative and qualitative approaches, to explore the factors influencing the satisfaction of students majoring in design at Sichuan University of Media and Communications (SUMC), and to improve students' satisfaction by implementing strategic plans. Cronbach's Alpha was employed as a pilot test (n=30) and the Item-Objective Congruence (IOC) was employed to assess the validity of this study. Then, 90 valid questionnaires were collected from SUMC. Multiple linear regression was used to analyze the quantitative data to verify the hypotheses. Subsequently, a group of 30 students participated in the implementation of a strategic plan for 16 weeks. The strategic plan stage was designed based on the results of multiple linear regression. Data were collected through questionnaires and structured interviews, and then the paired samples t-test was used to compare the results of the quantitative data before and after the strategic planning. Multiple linear regression results show that perceived value, teaching quality, learning resources, and instructors have significant effects on student satisfaction, while course content and technology have no significant effects on student satisfaction. Finally, the comparison results of the paired sample T-test show significant differences in perceived value, teaching quality, learning resources, and instructors in the post-strategic and pre-strategic planning stages.

Keywords: Student Satisfaction, Perceived Value, Teaching Quality, Learning Resources, Instructor, Course Content, Technology

Introduction

Today, design is constantly innovative, focusing on sustainable development and user experience, emphasizing the harmonious coexistence of people and the environment. As an important base for training design talents, the development of design majors in universities

deserves our attention. At present, the courses of design majors in universities are more diversified, covering a wide range of fields like as art, design, science, and technology. Course setting is a crucial component of university design programs, yet several persistent issues remain in current course structures. For instance, some courses are outdated and fail to adapt to contemporary developments, leading to the increasing marginalization of classroom teaching in higher education. Other courses lack systematization and coherence, resulting in incomplete knowledge structures among students and an overemphasis on quantifiable objectives such as knowledge acquisition and skill development. Additionally, while many courses claim to prioritize student-centered approaches, they often overemphasize theoretical instruction while neglecting the importance of practical teaching. This paradox manifests in the disregard for addressing individual student differences during practical training (Han et al., 2020; Y. Han, 2020). It is of great significance to evaluate curriculum settings accurately from the perspective of students.

According to the regulations of the Ministry of Education of China: Visual communication design, product design, fashion and costume design, public art, digital media art, ceramic art design, new media design, packaging design, jewelry design, and art design are among the design majors offered by the Chinese Ministry of Education. Among the 13 design majors, the majors with the highest enrollment are Art and Design, Visual Communication Design, environmental design, and Digital Media Art. According to information retrieved from the official website of the Sichuan University of Media and Communications (SUMC), all four aforementioned programs are offered, and these four majors have the highest enrollment numbers. Large samples can more effectively detect real effects (Cohen, 2013). Under large samples, data distributions approximate normality, facilitating the use of parametric tests and enhancing the reliability of conclusions (Field, 2024). This study will focus on the four most representative programs at the SUMC—Digital Media Art, Environmental Design, Product Design, and Visual Communication Design—to conduct the research.

During the process of course evaluation in Chinese universities, the Academic Affairs Office collaborates with various departments to carry out course evaluation. Through online and offline visits and surveys, researchers have found that universities rarely take into account the opinions of students, who are the objects of course teaching, regarding the courses. This has led to students' lack of understanding, acceptance, and satisfaction with design courses. Moreover, students' evaluations are often easily influenced by non-teaching factors. Therefore, it is necessary to investigate the degree of satisfaction of students majoring in the designing of the course.

Literature Review

Student Satisfaction (SS)

Kotler and Clarke (1986) defined satisfaction as the state that a person feels when their experience, performance, or outcome meets their expectations. Student satisfaction, as viewed through a marketing lens, is the students' emotional reaction to their total purchase and

consumption experience (Spreng & Mackoy, 1996). Student satisfaction, according to Lo (2010), is the individual's judgment of how well the learning environment facilitates their academic performance. Student satisfaction occurs when an individual's subjective assessment of their own experiences and results is positive (Annamdevula & Bellamkonda, 2016). According to Witowski (2008) and Ten Eyck et al. (2009), academic data on student satisfaction helps colleges and universities better tailor their courses to the always shifting demands of the market.

Perceived Value (PV)

Perceived value for students is the assessment of receiving and offering goods and services from two angles; specifically, perceived value is the result of balancing perceived costs and benefits (Dodds & Monroe, 1985; Mornoe & Chapman, 1987; Rys et al., 1987; Teas & Agarwal, 1997; Zeithaml, 1988). The perceived value of students refers to their expectations of the outcomes of purchasing and using educational services that offer both benefits and sacrifices (Spreng et al., 1993). Sheu (2010) argues that when the quality of education significantly exceeds the cost that students sacrifice to enter the university, college students will perceive higher educational value. According to Alves (2011), universities still need to improve their service delivery and institutional image, as these factors have a large impact on the perceived value of their institutions. According to Appuhamilage and Torii (2019) findings, student happiness is positively impacted by perceived value.

H1: Perceived Value has a significant effect on students' satisfaction with professional courses in designing.

Teaching Quality (PV)

Coe et al. (2014) argue that teaching quality encompasses six dimensions: classroom management, cognitive activation, supportive climate, subject knowledge, pedagogical strategies, and assessment literacy. Teaching quality is defined as the equitable provision of instruction that ensures all students—regardless of background—gain learning opportunities through culturally responsive practices, differentiated instruction, and rigorous content (Darling-Hammond, 2017). Additionally, teaching quality refers to the extent to which teachers effectively integrate subject knowledge, pedagogical skills, and assessment strategies to promote measurable student learning outcomes (Stronge, 2018). Kane et al. (2008) pointed out that multi-dimensional assessment (such as mixed methods) can more comprehensively reflect teaching quality. Berk and McKeachie (2013) criticized the limitations of traditional student evaluations of teaching (such as rating biases) and advocated for the combination of peer review and teaching portfolios. Spooren et al. (2013)'s meta-analysis of global student evaluations of teaching revealed a high correlation between teaching quality and student satisfaction.

H2: Teaching Quality has a significant effect on students' satisfaction with professional courses in designing.

Learning Resources (LR)

Learning resources are data or tools that help students find, label, and organize learning materials. Teaching materials and learning resources provided by university courses are considered valuable resources to promote student learning (Jeong & Hmelo-Silver, 2010). Mfon and Ekong (2021) believe that in the field of education, learning resources are the infrastructure built by school management to enhance the teaching of students and teachers. The functions provided by learning resources may vary. Some resources exist as information repositories, such as books, the Internet, and videos; And other resources exist as cognitive tools, which can help learners process information, such as calculators and visualization tools (Kim & Reeves, 2007; Lajoie, 2013). According to a study conducted by Brookshire College in the Philippines, Encabo (2011) discovered that the most significant element affecting student satisfaction is the caliber of learning resources.

H3: Learning Resources has a significant effect on students' satisfaction with professional courses in designing.

Instructors (IN)

Senge (1990) understands the concept of an instructor as a leader or manager in a learning organization, teaching people to view reality correctly and helping everyone in the learning organization gain a deeper understanding of the current reality. Crosby (2000) believes that instructors are both providers of information and facilitators of learning, encouraging students to take responsibility for obtaining their information. Suarman et al. (2013) stated in practical teaching that instructors need guidance, advice, assistance, support, and encouragement from others to establish an effective teaching environment. Rodríguez and Rubio (2016) found that teachers with excellent content knowledge who ask spontaneous and demanding questions from students can affect student satisfaction and may affect their willingness to continue entering higher education institutions.

H4: Instructor has a significant effect on students' satisfaction with professional courses in designing.

Course Content (CC)

Phenix (1962) defined course content as the main teaching content that draws on real-life situations, problems, projects, etc., and uses the knowledge provided by the subject as auxiliary materials required in the basic teaching process. For students to effectively fulfill the course requirements, Siragusa et al. (2007) contend that the course content must have all the knowledge needed, and it must be accurate, relevant, and comprehensive. Feedback from students on their level of satisfaction is crucial for improving the activities of educators, their course content, and the overall quality of educational projects (Bradford & Wyatt, 2010). Farahmandian et al. (2013) found that course factors have a positive and significant impact on student satisfaction. The satisfaction of students is mainly determined by aspects related to the development of the course itself. In other words, for students, the most important aspects are the course plan, content, and evaluation system (Martín-Rodríguez et al., 2015).

H5: Course Content has a significant effect on students' satisfaction with professional courses in designing.

Technology (T)

According to Njoroge et al. (2012), educational technology encompasses a range of teaching tools, including computers, software, multimedia devices, Internet applications, mobile devices, and any other electronic tools that teachers employ to help students learn. It has three uses: technology as a mentor (computers provide guidance and guidance to users), technology as a teaching tool, and technology as a learning tool (Lazar, 2015). The rapid development of emerging technologies provides unprecedented opportunities for educators and scholars around the world to utilize these technologies to improve teaching and learning (Hsu et al., 2013). Multimedia and virtual reality technology applications in the classroom are becoming a given in the evolution of education (Lou, 2017). The adoption of technology in higher education and its impact on student satisfaction have long been issues of concern for both academics and practitioners (Chen et al., 2017). Yuanbo and Pongsatha (2023) have verified that technological factors in education have a significant influence on student satisfaction.

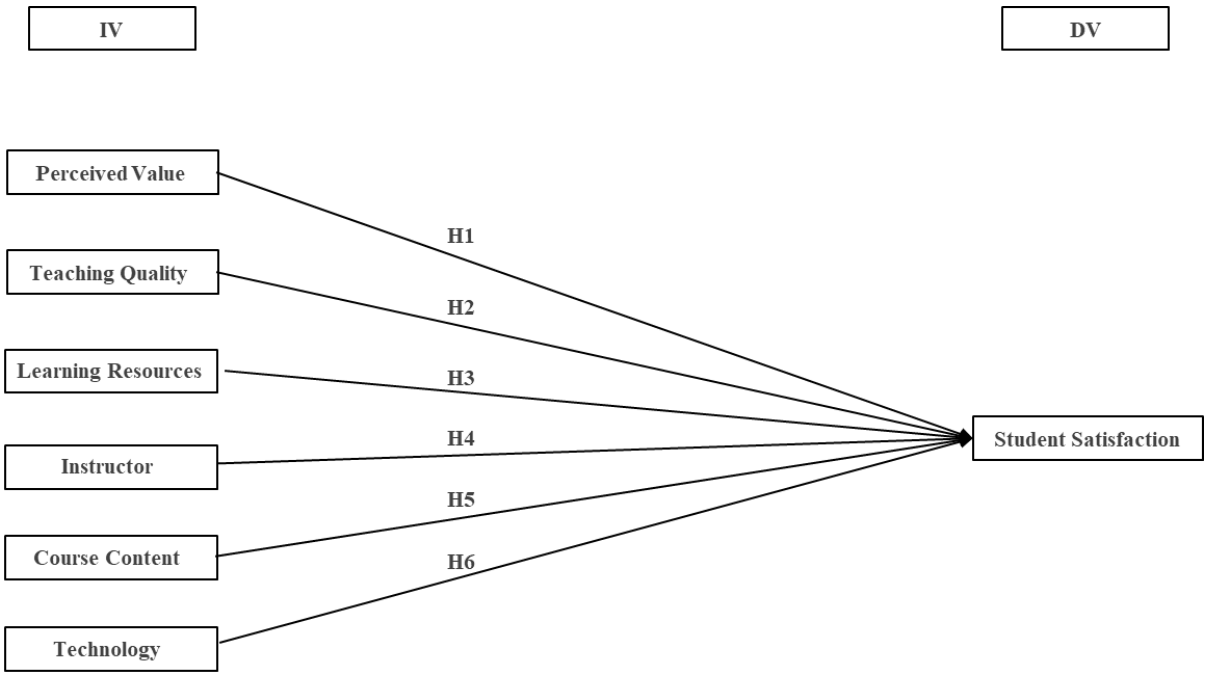
H6: Technology has a significant effect on students' satisfaction with professional courses in designing.

Research Framework

The researchers applied the perceived value theory in Halimatussakdiah et al. (2020) study, and the teaching quality theory in Burgess et al. (2018). Theory of Learning Resources, Instructors, and Course Content in their Research (Zaheer et al., 2015). Study the technology theory in the model (Yuanbo & Pongsatha, 2023). The researchers developed a conceptual framework based on the above 4 frameworks, as shown in the figure 1.

Figure 1

Conceptual Framework)



Source: Created by author

H1: Perceived Value (PV) has a significant effect on students' satisfaction (SS) with professional courses in designing.

H2: Teaching Quality (TQ) has a significant effect on students' satisfaction (SS) with professional courses in designing.

H3: Learning Resources (LR) has a significant effect on students' satisfaction (SS) with professional courses in designing.

H4: Instructors (IN) has a significant effect on students' satisfaction (SS) with professional courses in designing.

H5: Course Content (CC) has no significant effect on students' satisfaction (SS) with professional courses in designing.

H6: Technology (T) has no significant effect on students' satisfaction (SS) with professional courses in designing.

Research Methodology

Research Design

The implementation of the strategic plan aims to assist educational institutions in transforming academic research findings into educational practices. Through data-driven precise interventions, it seeks to enhance student satisfaction and promote the upgrading of

course quality. The detailed design phase of the strategic plan lasts for 16 weeks. The specific implementation steps of the strategic plan are as follows:

1. Lead students to experience the existing design-related professional courses. Researchers will spend three days preparing the courses and then start a nine-week course experience with students, including attending classes, completing in-class assignments, and finishing final projects.

2. Lead students to visit exhibitions. After the course experience concludes, students will be taken to the school's art gallery for a visit, allowing them to closely observe outstanding works by previous students.

3. Organize seminars. Researchers will have face-to-face exchanges with students, collect the questions raised by students, and students can also discuss their previous gains and feelings among themselves.

4. Researchers will answer students' questions, provide comments on students' work, and evaluate students' performance throughout the strategic plan.

Researchers have explained the strategic plan in chronological order, as shown in Table 1.

Table 1

Implementation time and activities as the strategic plan

No.	Time and Duration	Implementation keywords
1	Week 1	Prepare lessons
2	Week 1-10	Experience design course
3	Week 11-12	Visit an exhibition
4	Week 13-14	Organize a seminar
5	Week 15-16	Mentor, summarize and evaluate students

Methodology

There are four separate steps in the research process. To gather information for the suggested conceptual framework, a survey of the complete research population (n=90) was conducted first. In regression analysis, many researchers say that there should be at least 10 observations per variable (Hair et al., 2014). Therefore: The minimum sample size = 7 (number of variables in Proposed Conceptual Framework) x 10 = 70 respondents. Consequently, the selected sample size is 90 respondents. The significance of each hypothesis was then assessed using a stringent multiple linear regression test with a P-value cutoff of less than 0.05. Consequently, hypotheses that are supported are retained, while those that do not meet the criteria are eliminated. The second stage was a pre-SP survey of the remaining 90 students under the supported hypothesis. Subsequently, the third phase introduced the Strategic Plan Implementation (SP), which was implemented exclusively by 30 participants. In the last stage, 30 SP participants filled up a survey that generated the necessary data for a paired sample T-test analysis to compare pre - and post-SP outcomes. This comprehensive process allows for a thorough examination of the objectives and assumptions of the research.

Research Population, Sample Size, and Sampling Procedures

Research Population. The researchers selected 90 design majors at SUMC as the study population for a pre-survey. According to SUMC's student data, there are about 2,000 students in the design class, and the study proportion represents 4.49% of the total student body. Students of different grades, including first grade, second grade, third grade, and fourth grade. A total of 90 SUMC students received paper questionnaires. The researchers then examined all the responses and confirmed that 90 of them were valid.

Sample size. During the testing phase, researchers were uncertain about the feasibility of the questionnaire and the potential need to remove certain variables. Therefore, a reliability test was conducted to validate the viability of all variables. The researchers randomly selected 30 students to participate in this reliability test. After all variables passed the reliability assessment, the researchers separately recruited an additional 90 students (distinct from the initial 30) as study subjects, ultimately obtaining 90 valid questionnaires. A multiple linear regression analysis was then performed to investigate the relationships between independent and dependent variables. Finally, the researchers selected 30 students from the 90 participants who were willing to join the SP phase of the study.

Sampling Procedures. The researcher conducted several sampling and related sampling procedures as follows:

Sampling 1: Pilot Survey and Pilot Test: Researchers randomly asked students to fill out questionnaires and give feedback on the pilot survey and pilot test.

Sampling 2: Pre-survey by distributing questionnaires on an online platform (Questionnaire Star), 90 design majors at SUMC were selected for the pre-survey. The researchers then examined all the responses and confirmed that 90 were valid.

Sampling 3: SP Sampling. To ensure efficient resource utilization and targeted alignment with the professional cohort characteristics, researchers adopted a non-probability sampling method in the design-related academic programs. By combining purposive sampling (to focus on students whose attributes matched the strategic goals) and convenience sampling (to prioritize accessibility and willingness), they recruited 30 students who voluntarily agreed to participate in the strategic plan.

Research Instruments

Design of Questionnaire. The questionnaire was created by the researchers in three stages:

Step 1: Identify questionnaire sources from five published articles (Drago et al., 2002; Hasan et al., 2008; Harsasi & Sutawijaya, 2018; Horsley et al., 2010; Mulyono et al., 2020)

Step 2: Adjust and present the questionnaire about the background of Chinese college students.

Step 3: Implement the IOC.

Components of Questionnaire. The following three components make up the questionnaire item:

Part 1: Screening questions. There are some screening questions to filter out the non-study population.

Part 2: Demographic questions. For certain research objectives, it is essential to collect basic data about the study population, such as gender, age, and academic discipline. For students in educational institutions, their overall evaluation of the school may vary depending on factors like gender, year of study, and academic discipline. To explore these potential inter-group differences, researchers compare response patterns across subgroups (e.g., different genders, age ranges, or academic disciplines). This ensures the questionnaire comprehensively covers the characteristics of diverse groups. Therefore, demographic questions are included in the survey design.

Part 3: Pre-survey Questions. There were questions for pre-survey to find out the current level of IV and DV to a total of 90 SUMC students.

IOC Results. This study selected content validity as the type of validity analysis and adopted the expert evaluation method, namely item-objective congruence (IOC). This method verifies the effectiveness of the tool by collecting expert opinions (Rovinelli & Hambleton, 1976). The researchers invited five independent experts or scholars or doctors to implement IOC, two of whom were teachers of environmental design, two were associate professors of design, and one was a university leader with a doctorate in education. In this process of IOC, independent experts scholars, or doctors marked +1 as consistent, 0 as suspicious, and -1 as inconsistent. Finally, items with a score higher than 0.5 were retained, and those with a score lower than 0.5 needed to be reconsidered (Turner & Carlson, 2003). Every questionnaire item in this study had a value greater than 0.67, so the researchers retained all questionnaire items.

Pilot survey and Pilot test results. The researchers conducted a pilot questionnaire test on 30 randomly selected students and then conducted Cronbach's Alpha internal consistency reliability test on the collected data. Cronbach's alpha coefficient can be used to assess the reliability, stability, and consistency of questionnaires, scales, surveys, and other measurement tools. Therefore, it is recommended to conduct a reliability test using Cronbach's alpha coefficient before formally conducting a questionnaire survey on the target population (Bardhoshi & Erford, 2017). According to Ueno and Sekaran (1992), a Cronbach's alpha coefficient of 0.6 or higher is considered appropriate. The results show that the Cronbach coefficient value of each structure is greater than 0.7, as shown in Table 2.

Table 2

Pilot Test Result

Variables	No. of items	Sources	Cronbach's Alpha	Strength of association
Student Satisfaction (SS)	4	Hasan et al. (2008)	0.819	Good
Perceived Value (PV)	4	Mulyono et al. (2020)	0.891	Good
Teaching Quality (TQ)	4	Harsasi and Sutawijaya (2018)	0.818	Good
Learning Resources (LR)	4	Horsley et al. (2010)	0.798	Acceptable
Instructor (IN)	4	Drago et al. (2002)	0.807	Good
Course Content (CC)	4	Drago et al. (2002)	0.818	Good

Results and Discussion

Results

Demographic Profile. The researcher showed the demographic profile of the whole study population (n = 90), followed by the group of 30 chosen students who took part in SP, as seen in Table 3.

Table 3

Demographic Profile

	Entire Research Population (n=90)		Frequency	Percent
Pre-SP	Gender	Male	37	41.11%
		Female	53	58.89%
	Age	18 years old	30	33.33%
		19-20 years old	28	31.12%
		21-22 years old	30	33.33%
		23 years old and above	2	2.22%
	Grade	First grade	27	30.00%
		Second Grade	21	23.33%
		Third Grade	16	17.78%
		Fourth Grade	26	28.89%
	Major	Digital Media Art	34	37.78%
		Environmental Design	18	20.00%
Pre-SP		Product Design	15	16.67%
		Visual Communication Design	23	25.55%
	Total		**90**	**100%**
Post-SP	Gender	Male	16	53.33%
		Female	14	46.67%
	Age	18 years old	0	0
		19-20 years old	18	60%
		21-22 years old	12	40%
		23 years old and above	0	0
	Grade	First grade	0	0
		Second Grade	15	50%
		Third Grade	15	50%
		Fourth Grade	0	0
	Major	Digital Media Art	4	13.33%
		Environmental Design	8	26.67%
		Product Design	7	23.33%
		Visual Communication Design	11	36.67%
	Total		**30**	**100%**

Results of multiple linear regression. The results of 90 questionnaires were subjected to multiple linear regression (MLR) by the researchers. The connection between six independent variables in the diagnosis stage and the dependent variable, student satisfaction (SS), is displayed in Table 4. The following are the outcomes of the linear regression analysis conducted with Jamovi 2.4.14. On the one hand, from the perspective of variables: First, the P-values of the four independent variables are all less than 0.05, indicating that the independent

variable's Perceived Value (PV), Teaching Quality (TQ), Learning Resources (LR) and Instructors (IN) have a significant impact on the dependent variable Student Satisfaction (SS).

In the multiple linear regression analysis process, this study also carried out a multicollinearity analysis of 6 independent variables. Neter et al. (1983) recommend focusing on maximum VIF values, where values greater than 10 often indicate potential multicollinearity problems. The results show that the variance inflation factor (VIF value) of Perceived Value (PV), Teaching Quality (TQ), Learning Resources (LR), Teachers (IN), Course Content (CC), and Technology (T) are 7.37, 8.70, 6.86, 9.31, 7.66 and 9.12, respectively, all of which are less than 10. The findings indicate that none of the six independent variables have a significant multicollinearity issue.

Table 4

The multiple linear results of the six independent variables on student satisfaction

Variables	Standardized Coefficients Beta	t-value	P-value	VIF	R Square
Perceived Value	0.200	2.272	0.026	7.37	0.913
Teaching Quality	0.230	2.404	0.018	8.70	
Learning Resources	0.188	2.210	0.030	6.86	
Instructor	0.263	2.661	0.009	9.31	0.913
Course Content	0.137	1.529	0.130	7.66	
Technology	-0.019	0.197	0.844	9.12	
Dependent variable: Student Satisfaction					

To sum up, H1, H2, H3 and H4 are respectively supported among the 6 hypotheses, while H5 and H6 are not. Among these unsupported hypotheses, neither course content (CC) nor technology (T) has a significant impact on students' satisfaction (SS). In this case, the researchers removed the two independent variables, course content (CC) and technology (T), and made relevant adjustments. Therefore, based on multiple linear regression analysis findings, we developed the hypothesis in stages. Then, the SP is analyzed according to the following assumptions:

H7: There is a significant difference in Perceived Value (PV) between pre- strategic plan and post-strategic plan.

H8: There is a significant difference in Teaching Quality (TQ) between pre- strategic plan and post-strategic plan.

H9: There is a significant difference in Learning Resources (LR) between pre- strategic plan and post- strategic plan.

H10: There is a significant difference in Instructor (IN) between pre- strategic plan and post- strategic plan.

Results Comparison between Pre-SP and Post-SP

The remaining four variables were analyzed with a paired sample T-test to determine whether there were differences between the pre-SP and post-SP stages, revealing whether the strategic plan was effective in improving student satisfaction. The paired sample T-test analysis of four variables is shown in the following table5:

Table 5

Paired-Sample T-Test Results

Variables	Mean	Std. Deviation	SE	p-value
Perceived Value				
Pre-PV	3.56	0.597	0.1090	<.001
Post-PV	4.56	0.306	0.0558	
Teaching Quality				
Pre-TQ	3.65	0.765	0.1396	<.001
Post-TQ	4.57	0.328	0.0599	
Learning Resources				
Pre-LR	3.60	0.642	0.1172	<.001
Post-LR	4.62	0.339	0.0620	
Instructor				
Pre-IN	3.70	0.699	0.1276	<.001
Post-IN	4.67	0.310	0.0566	

Table 5 displayed the results of the pre-SP and post-SP comparison's paired-sample t-test analysis as follows:

Perceived Value increased significantly between the post-SP (M=4.56, SD=0.306, SE=0.0558) and pre-SP (M=3.56, SD=0.597, SE=0.1090) stages, with a mean value difference of 1.00 at P<0.001. The conclusion that there is a significant mean difference in Perceived Value between pre-SP and post-SP was thus corroborated by H7.

Teaching Quality increased significantly between the post-SP (M=4.57, SD=0.328, SE=0.0599) and pre-SP (M=3.65, SD=0.765, SE=0.1396) stages, with a mean value difference of 0.92 at P<0.001. The conclusion that there is a significant mean difference in Teaching Quality between pre-SP and post-SP was thus corroborated by H8.

Learning Resources increased significantly between the post-SP (M=4.62, SD=0.339, SE=0.0620) and pre-SP (M=3.60, SD=0.642, SE=0.1172) stages, with a mean value difference of 1.02 at P<0.001. The conclusion that there is a significant mean difference in Learning Resources between pre-SP and post-SP was thus corroborated by H9.

Instructor increased significantly between the post-SP (M=4.67, SD=0.310, SE=0.0566) and pre-SP (M=3.70, SD=0.699, SE=0.1276) stages, with a mean value difference of 0.97 at P<0.001. The conclusion that there is a significant mean difference in Instructors between pre-SP and post-SP was thus corroborated by H10.

The researchers came to the following conclusion based on the paired sample t-test results mentioned above. First, there are statistical differences between the pre-SP and post-SP stages for all four independent variables. Second, the researchers discovered that between the pre-SP and post-SP phases, student satisfaction significantly increased.

Conclusions and Recommendations

Conclusions & Discussions

According to the findings, students' satisfaction is significantly impacted by perceived value, instructors, learning materials, and teaching quality, but not by course content or

technology. This research finding is consistent with the results of Appuhamilage and Torii (2019), which indicated that perceived value, image, and service have a direct positive correlation with student satisfaction. They also found that image and financial support have a significant positive direct impact on perceived value. This research finding is also in line with the study by Mfon and Ekong (2021), which determined that instructors, teaching quality, and learning resources have a significant impact on student satisfaction. Additionally, they also believe that teaching methods, student welfare service quality, and the quality of the examination/evaluation system can affect student satisfaction.

The results of the paired-sample t-test indicate that the independent variables—perceived value, teaching quality, learning resources, and instructors—and the dependent variable, student satisfaction, all exhibited statistically significant improvements after the implementation of the strategic plan. The substantial increases in mean values, coupled with a reduction in standard deviation (SD) values, suggest that student evaluations became more consistent post-intervention, underscoring the practical significance of the strategic plan. Before the Strategic Plan, the multiple linear regression analysis identified these four independent variables as significant predictors of student satisfaction. After the strategic plan, not only did these four variables show marked improvement, but student satisfaction also increased accordingly. This outcome thus validates the predictive power of the regression model. Although the magnitude of the mean improvement and the t-value for student satisfaction were relatively lower compared to the independent variables, the results remained statistically significant. This supports the hypothesis that the strategic plan indirectly enhanced satisfaction by improving the four targeted independent variables.

Recommendations

The results of this study indicate that perceived value, teaching quality, learning resources, and instructors all have a positive impact on students' satisfaction with design courses. According to the results of the paired samples T-test, the researchers believe that attention should be focused on the two aspects of perceived value and learning resources. The mean values of these two variables have the largest increase, and the absolute values of the t-values are the highest. It is recommended to regularly showcase application cases of students' works in the industry and establish a regular upgrading mechanism for design software and material libraries. In terms of optimizing teaching quality and the sustainability of instructors, although the effects are weaker than those of the previous two aspects, the improvement is still quite significant. It is recommended to conduct regular professional training for teachers and increase the intensity of school-enterprise cooperation. The increase in satisfaction data is the smallest. The researchers suggest implementing multi-variable collaborative optimization, such as assigning specific classrooms to be responsible for the update of learning resources and answering questions, and embedding perceived quality indicators in teaching quality. The following are detailed suggestions for the four aspects.

To strengthen teacher training, teachers should constantly learn and update their knowledge. By participating in professional training, seminars, industry exchanges and other

activities, I will improve my keen insight into new technologies and new trends, constantly improve my teaching level and scientific research ability, integrate the latest design concepts, technologies and cases into teaching, and be willing to share my design experience and industry insights to ensure that the teaching content is timely and cutting-edge.

Design industry is a constantly developing and changing field, colleges and universities should cultivate students' independent learning ability and lifelong learning consciousness. Through exhibitions and seminars, students can be encouraged to keep abreast of industry trends and cutting-edge technologies, and constantly update their knowledge and skills.

The curriculum is recommended to keep up with industry trends, with regular updates and presentations of the latest design concepts, technical tools and case studies. At the same time, interdisciplinary learning is encouraged, and multi-field knowledge such as art, science, technology and business is integrated into course design to broaden students' horizons and thinking boundaries.

For the necessary professional software design, the complex software operation interface and various functions often make students confused and frustrated. Therefore, software operation training should be strengthened in the teaching process to help students master technical tools and understand the characteristics and applications of emerging software.

Theoretical implications. First of all, this study established a theoretical framework and developed a strategic plan based on the variables of linear programming to explore whether there is a significant difference in the improvement of student satisfaction before and after the strategic plan, providing an improved basis for the higher education industry to improve student satisfaction. Secondly, through the measurement and analysis of student satisfaction, this study can reveal the satisfaction relationship between design professional courses and education service providers and education service consumers (students), providing a new perspective and case for the theory of higher education satisfaction. It provides theoretical support for optimizing curriculum design and improving teaching quality.

Practical implications. First of all, through the investigation and analysis of student satisfaction, researcher can find the problems and deficiencies in the curriculum and teaching. Once these problems are found, we can take targeted measures to improve them, so as to enhance the actual effect of the curriculum and teaching. Secondly, the improvement of student satisfaction is one of the direct goals of this kind of research. The improvement of student satisfaction can also enhance students' sense of belonging and loyalty, help cultivate students' professional quality and innovation ability, and promote the continuous optimization of college education services.

Limitations for Future Research

First, this study has confirmed that perceived value, teaching quality, learning resources and instructors have a positive impact on students' satisfaction with designed courses. Nonetheless, Burgess et al. (2018) study demonstrates that organizational management is another element influencing students' satisfaction. The study of Halimatussakdiah et al. (2020) proves that the image of higher education significantly affects student satisfaction. Therefore,

future studies can use this as a research argument.

Secondly, the samples in this study are all from the School of Art Design and Animation of Sichuan Communication University. Therefore, there may be bias in the selection of samples. In order to overcome this limitation, the sample sources of future researchers should be as diverse as possible.

Third, students' evaluation of design courses is often highly subjective, and different students may have different expectations and standards for the same course, thus affecting their satisfaction evaluation. Therefore, in the future research, researchers can add as many objective conditions as possible, such as student achievement and employment rate.

Finally, the survey tools used to collect student satisfaction (such as questionnaire collection, interviews, etc.) may have limitations. Therefore, in future studies, we hope to use a variety of research investigation tools.

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