pISSN: 1906 - 3296 © 2020 AU-GSB e-Journal.
eISSN: 2773 – 868x © 2021 AU-GSB e-Journal.
http://www.assumptionjournal.au.edu/index.php/AU-GSB/index

Factors Impacting Satisfaction and Loyalty of Students: A Case Study of a Public University in Shanxi, China

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Received: November 29, 2022. Revised: May 6, 2023. Accepted: May 16, 2023.

Abstract

Purpose: This study explores the influencing factors of student satisfaction and loyalty among students majoring in natural science at public universities in Shanxi Province. The framework proposes causal relationships among built environment, teaching care, university image, student trust, academic aspects, student satisfaction, and student loyalty. **Research Design, Data, and Methods**: Researchers used a quantitative method (n=500) to distribute questionnaires to students majoring in science and technology at the Taiyuan Institute of Technology. The researcher used purposive, stratified random and convenience sampling to collect the data. Before data collection, to ensure reliability and validity, the Item Objective Congruence (IOC) and Cronbach's alpha were used. Structural equation modeling (SEM) and confirmatory factor analysis (CFA) were used to analyze the data, including model fit, reliability, and validity tests. **Results**: The campus environment has a significant influence on teaching care. The school environment, teaching care, school image, student trust, and academic aspects significantly affect student satisfaction. **Conclusion**: Seven hypotheses have been proven to meet the research objectives. Therefore, school administrators should maintain a good school environment, improve academic performance, increase teaching care, and establish a good image of the school to enhance students' satisfaction and loyalty.

Keywords: Student Satisfaction, Student Loyalty, University Image, School Environment, Academic Aspects

JEL Classification Code: E44, F31, F37, G15

1. Introduction

Since the founding of New China in 1949, China's higher education has ushered in a new chapter of development and a significant historical turning point. During this period, higher education has made rapid development and great progress, especially in the decades after the reform and opening up. China's higher education has experienced great historical changes of reform, innovation, and development. According to the Ministry of Education data, in the past 20 years, from 1978 to 1998, the enrollment of ordinary colleges and universities in China has increased from 400,000 to 1.08 million, and the total number of students in schools has correspondingly increased from 860,000 to 3.41 million. In 1999, China's CPC Central Committee and State Council focused on the macro development of science and technology and society in the new era. They made a major decision to expand enrollment. Since then, enrollment in colleges and universities has been increasing to more than 400,000 for many years. By 2009, the enrollment of colleges

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and universities in China had exceeded 6 million, and in 2021, it had exceeded 9.1 million, setting a record high (Global Times, 2022).

The theoretical study of higher education satisfaction began in the 1950s in the United States. American scholars used customer satisfaction theory for reference, creatively put forward the concept of college students' Satisfaction, and began to try to construct the higher education customer satisfaction index model. The Student Satisfaction Inventory (SSI) was proposed, and The Noel-Levitz Higher Education Satisfaction Evaluation Company was established to evaluate the Satisfaction of higher education. The research on the satisfaction evaluation of higher education in Britain is later than that in the United States. However, the research methods for improving the quality of education and teaching and the satisfaction evaluation are unique. People's Satisfaction with education is the goal of China's higher education. In the 1990s, Chinese scholars applied this concept to the field of higher education based on foreign scholars' research and began to study the satisfaction of college students (Song, 2022).

This paper analyzes the evaluation systems of college student satisfaction at the country and abroad, draws lessons from the American Customer Satisfaction Index (ACSI), and combines the research results of Chinese and western scholars to construct the China Customer Satisfaction Index (CSSI). This model contains seven potential variables: school environment, teaching care, school image, student trust, student satisfaction, and student loyalty. The first five variables are independent variables of student satisfaction, and the last two are the result variables of student satisfaction. Compared with the American Customer Satisfaction Index (ACSI), this model adds the potential exogenous variable of school image because school image directly impacts student satisfaction. Compared with the models built by some Chinese scholars, this model removes the variable of customer (student) complaints in the American satisfaction evaluation model. In light of China's actual situation, because there is a lack of smooth channels for students to complain about certain services of schools, the complaints of schools to students can attract attention and be dealt with promptly.

2. Literature Review

2.1 Built Environment

Building environment identified the following aspects: appearance, comfort, configuration, function, work type, and personal relationship (Milan et al., 2015). The environment is one of the tangible factors that affect service because it attracts customers and affects their go or stay (Lamprecht, 2017). How do design, construction, use, and operation effects affect user behavior? (Clark et al., 2004). Comfort verifies that thermal, acoustic, light, ergonomics, and ventilation comfort conditions will affect behavior. These aspects alone or together influence users' positive or negative feelings and attitudes. This environment configuration evaluates the existence and quantity of available space. Functional evaluation of the functional performance of space by architectural projects (Pinder et al., 2003). Another dimension of the environment is the place, which is very important to the service organization and related to the university campus's superior location and convenient transportation (Orihuela & Orihuela, 2014).

Given the scale of the built environment that the university may provide, these factors can affect prices. Many universities offer campus tours, infrastructure investments, discounts, and sports investments to recruit the right faculty and staff to compete and create other revenue streams (Mauss & Robinson, 2009). Using these competitive variables can be expensive (Farhan, 2017). Universities should strategically determine tuition fees to balance the income demand of institutions with the increase of public awareness of higher costs (Doyle, 2012).

Students must consider operation, design, facilities, rooms, environment, and appearance to perceive high-quality learning space (Wilson & Cotgrave, 2020). Laurillard (2013) regards teaching as intermediary and situational learning. However, despite creating the learning environment and understanding that students are aware of the social, political, and organizational environment around them, material space teaching is fine. The behavior of customers and employees and other social aspects constitute the service scene's overall service and customer environment. Whether service providers' and other customers' behavior is customer-oriented will affect mood, customer satisfaction, and future behavior. The physical and tangible conditions of the environment can actively improve service performance and customer well-being and promote attachment feelings by combining the customer-centered service environment (Rosenbaum et al., 2020). Therefore, two hypotheses are set:
H1: Built environment has a significant impact on student satisfaction.
H2: Built environment has a significant impact on teaching care.

2.2 Teaching Care

Teaching care, including contact with teachers, private lessons, practice, and placement, affects students' satisfaction (Petruzzellis et al., 2006). The research on college students' satisfaction in this paper is based on the fact that higher education is a service. Many scholars believe that higher education is essentially a kind of service, and its basic output is educational service rather than the "products" (college students) produced in the so-called "workshops"

(colleges and universities). Liu (2003) believes that "education service is the product of education department, the producer of education service (product) is the educator, and its consumer is educated." Higher education service includes two levels: first, indirect service, which refers to the overall service to society. Higher education aims at adapting to and meeting the practical needs of social politics, economy, and science and technology and provides academic and technology-intensive services to society purposefully and in a planned way, based on the training of senior specialized talents and the development of scientific knowledge. The second is direct service, which refers to individual service for college students and postgraduates. Through classroom teaching, scientific research, and social practice activities, all forms of explicit or implicit education under the guidance of teachers or tutors, higher education provides knowledge-based and intelligent development-oriented services to college students and postgraduates in an organized and systematic way. According to Yang et al. (2003), service is the product of education. Accordingly, a hypothesis is indicated:

H3: Teaching Care has a significant impact on Student Satisfaction.

2.3 University Image

According to Alves and Raposo (2010), a university image is a perception of its services, divided into communicative and cognitive perception. A mixture of tangible and intangible factors and values influences it. Image is a complex structure based on various factors (Arpan et al., 2003). Palacio et al. (2002) pointed out that the university image consists of cognitive and emotional components. Huddleston and Karr (1982) pointed out that academic reputation, campus appearance, cost of study, personal concern, school location, distance from home, graduates' employment prospects, and professional development all have an impact. Arpan et al. (2003) acknowledged three stable factors among numerous influencing factors: academic attributes, sports attributes, and news media reports. A good corporate image brings a series of returns to the enterprise, such as increased profits, improved value perception, favorable attitude and behavior of consumers, favorable impression and familiarity of service providers, and improved sales (Alves & Raposo, 2010). Palacio et al. (2002) pointed out that the image of a university is also crucial in influencing consumer behavior.

University Image is an important basis for a university to be different from other universities, and it is a unique organizational culture created by teachers and students in the long-term work of the whole school, such as how the teachers are, how the students are employed, how the leadership level is, and so on. Hou (2016) indicated that the image of a university is the impression left by the public and the minds of teachers and students in terms of its management and social publicity, the brand of the university itself, and the symbol that distinguishes it from other universities. Some scholars also think that the image of colleges and universities cannot be defined only from the outside but also from the impression of teachers and students of colleges and universities. Chen (2010) emphasized that the image of colleges and universities not only refers to the external image but also includes the idea of running a school, practical orientation, etc. It needs the joint efforts of teachers, students, and alums of the whole school, which is the evaluation and association of the school. Image is a personal impression of someone or an organization, but my experience and knowledge influence it. Studied the relationship among university image, service quality, trust cost, and student loyalty, and held that university image should be the impression of all aspects of the university formed in students' minds, including the idea, behavior, and vision of the school. The impression is influenced by students' knowledge (Hanssen & Solvoll, 2015). Thus, a hypothesis is concluded:

H4: University image has a significant impact on student satisfaction.

2.4 Student Trust

The concept of students' trust from the pedagogy perspective is based on self-subjective understanding and with the help of the concept defined by basic disciplines. Student trust is an attitude. They believe that teacher-student trust is the attitude that teachers and students hold confidence or rely on each other in communication (Li & Li, 2010). Student trust is a sense of security. Teacher-student trust is a sense of security that teachers and students can fulfill their responsibilities and be entrusted with their obligations, which is formed based on evaluation by both sides in the process of communication (Sun, 2005). Trust is the psychological expectation that one party in interpersonal communication will give positive and positive feedback to the other party (Hong, 2005).

This study holds that student trust is a series of psychological states and behaviors in which one teacher and student believes that the other teacher and student will act according to their psychological expectations based on limited information in a specific situation of teacher-student education activities so that they are willing to take risks to share their real situation or make commitments between teachers and students. Consequently, a proposed hypothesis is concluded per below:

H5: Student trust has a significant impact on student satisfaction.

2.5 Academic Aspects

In the ISO 9000: 2008 standard, scientific research, design, development, training, and education are all listed in the tertiary industry of service industry. At the same time, UNESCO pointed out in the World Declaration on Higher Education that higher education is regarded as a public service and students are regarded as the main stakeholders in the development of higher education (Ming, 1999). Educational institutions are service organizations and regard education as a service industry. The process and results of educational activities cover all kinds of services provided by educational institutions for students to study and live in school, among which academic aspects are regarded as important. Therefore, the products of educational institutions are educational services, and academic aspects are regarded as an important part of providing various knowledge-based service products (Richard & Adams, 2006).

Researchers have made the following explanations on the concept of academic aspects. Colleges and universities use educational facilities, equipment, and technology to meet the needs of learners, make educational consumers improve or improve their intellectual and ideological quality, and promote the value-added human capital of educational demanders (Ma, 2005). Yu (2009) believed that higher education aspects can be divided into internal and external services according to the different service objects of higher education. The internal service objects of higher education are students, while the external objects include the state, employers, families, etc. As the internal services of higher education, academic services are defined as the services provided by colleges and universities to students in interacting with students, which can improve their intellectual and ideological quality. The activity or process of promoting the value-added of students' human capital.

In addition to the general characteristics of educational services, academics have some characteristics different from other services, such as being highly specialized, long-term, complex, and not completely market-oriented. They believed that academic education services are characterized by heterogeneity, intangibility, the inseparability of the service delivery process, variability, volatility, and student participation in the service process (Shank, 1995). Thereby, the researcher hypothesizes that:

H6: Academic aspects has a significant impact on student satisfaction.

2.6 Student Satisfaction

In the 1960s, student satisfaction was first proposed based on customer satisfaction. Bean and Metzner (1985) indicated that student satisfaction is a kind of "indication" by which students can get an indication of the degree of pleasure they feel about being a student and the degree of interest they have in college courses. Student satisfaction is a pleasurable emotional state derived from one's identification with being a student (Bean & Bradley, 1986). Chadwich and Ward (1987) pointed out that student satisfaction is the degree to which students are willing to recommend a college to prospective students.

Student satisfaction is students' assessment of education, services, and facilities during their studies (Elliott & Shin, 2002). It is a multidimensional feeling influenced by different factors. Scholars from various countries have conducted relevant studies on student satisfaction from different perspectives (Weerasinghe & Dedunu, 2017). Research is carried out according to different majors, such as property education and hotel management, for different countries and a university or specific groups, such as international students (Arambewela & Hall, 2009).

The author posted that college students' satisfaction aims to treat college students as customers enjoying higher education services. Based on the feedback of students' attitudes towards school service experience, the psychological feelings of happiness, pleasure, or disappointment generated by students in the process of comparing the harvest of higher education service with the expected expectations are the feelings obtained by students after comparing the actual perception with the ideal state. It is a comprehensive perception of students' school experience, which comes from students' original expectations, teaching value, employment, and other aspects. After entering the school, students fully consider the actual situation to form a complete satisfaction with the school. Subsequently, a hypothesis is concluded:

H7: Student satisfaction has a significant impact on student loyalty.

2.7 Student Loyalty

The concept of student loyalty is optimized based on the concept of customer loyalty. Oliver will look after Customer loyalty is defined as customers' extreme love for a specific product or service that makes customers face the product and service. Outside the marketing temptation can also be unmoved, still insist on the like of this product or service, to hold.

The research on loyalty is mostly concentrated in the marketing field, while the research on student loyalty in the education field is relatively few. The concept connotation of student loyalty can still judge whether students are loyal to the school from two aspects: attitude and behavior. From the point of view of students' emotional attitude toward school, student loyalty is a psychological commitment based on students' satisfaction (Thomas, 2011). The students' loyalty is the responsibility that students take part in the

development of their alma mater and show as alumni for the development of their alma mater. It embodies the good and stable relationship between students and schools (Ren, 2007). That students' loyalty should not only be reflected in students' attitudes, but also reflect students' dedication to colleges and universities and their strong psychological affiliation, which is embodied in students' willingness to pay to attend schools, return to schools again, and publicize schools (Wang, 2016).

According to Dick and Basu (1994), after considering the factors of attitude towards customers and repeated purchase behavior, combine various attitudes and purchasing behaviors and divide customer loyalty into disloyalty and falsehood. Loyalty, potential loyalty, and continuous loyalty. The purchase rate of disloyal customers is low; Although there are false customers, repeated purchase behavior and vulnerability to the change of external environment led to conversion behavior and potential customers. The restrictions have less buying behavior, but the recognition of enterprises is high, and once the conditions are met, the purchase will occur. Loyal customers not only have high recognition of enterprises but also have repetitive buying behaviors.

3. Research Methods and Materials

3.1 Research Framework

The conceptual framework is developed from studying previous research frameworks. It draws on four theoretical models. The first theoretical framework was conducted by Correa da Silva et al. (2021). Student satisfaction is important in determining course quality (Parahoo et al., 2016). Weerasinghe et al. (2018) conducted the second theoretical framework. "Educational experience, services, and facilities during the study influence student satisfaction." The third theoretical framework was conducted by Chen (2017). "The relationships between brand association, trust, commitment, and satisfaction of higher education institutions." Fourthly, Ali et al. (2016) "Does higher education service quality affect student satisfaction, image, and loyalty? A study of international students in Malaysian public universities".

This study aims to investigate the factors on students' satisfaction and loyalty in public undergraduate colleges in Shanxi Province. The model consists of seven variables: the built environment, teaching care, university image, student trust, academic aspects, student satisfaction, and student loyalty

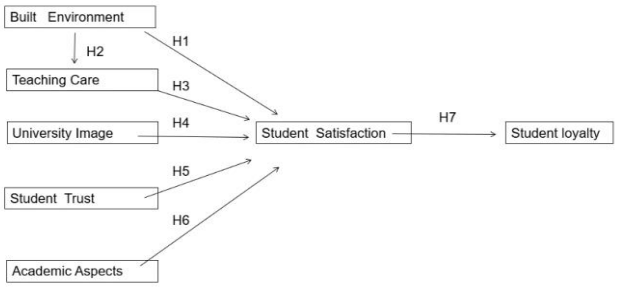

Figure 1: Conceptual Framework

H1: Built environment has a significant impact on student satisfaction.
H2: Built environment has a significant impact on teaching care.
H3: Teaching care has a significant impact on student satisfaction.
H4: University image has a significant impact on student satisfaction.
H5: Student trust has a significant impact on student satisfaction.
H6: Academic aspects has a significant impact on student satisfaction.
H7: Student satisfaction has a significant impact on student loyalty.

3.2 Research Methodology

The research methods outlined by the researcher include the description of the research background, and on this basis, the research hypothesis is put forward. The first-year students to seniors of Taiyuan Institute of Technology in Taiyuan City, Shanxi Province are the target group. This paper explores the factors that affect students' satisfaction in undergraduate colleges. The research tools include selecting the target population, sampling unit, and sample size. In this study, questionnaires were distributed through online and offline channels. Before data collection, the Item Objective Congruence (IOC) was proven by three experts, resulting all scale items were reserved at a score of 0.6 and above. Furthermore, Cronbach's alpha was used to test reliability, resulting with all construct were passed at value greater than 0.70 (Nunnally & Bernstein, 1994). Structural equation modeling (SEM) and confirmatory factor analysis (CFA) were used to analyze the data, including model fit, reliability, and validity tests.

3.3 Population and Sample Size

Saunders et al. (2016) pointed out that the target population is a part of the overall population, representing a

group of related elements which participated in the test and possessed the information designed and collected by researchers. Therefore, the target population of this study is undergraduates in an undergraduate college in Shanxi Province, China. Kline (2011) indicated that the sample size for principles and practices of structural equation modeling should be between 200 to 500. This study distribute questionnaire to 1,000 students. However, the returned questionnaire after the screening was 500 respondents.

3.4 Sampling Technique

The researcher used purposive, stratified random and convenience sampling to collect the data. For purposive sampling, the sampling unit comprises students from year one to four at Taiyuan Institute of Technology in this study. The researcher uses the quantitative research method of multi-step sampling to distribute the questionnaire to students through online and offline channels. As shown in Table 1, number of students majoring in natural science at the Taiyuan University of Technology were calculated per the year of study into subgroup as stratified random sampling. The data collection is between April to August 2022. According to convenience sampling, the questionnaire was distributed through WeChat groups.

Table 1: Sample Units and Sample Size

Grade	Population Size of Natural Science majors	Proportion	Proportional Sample Size
freshman	3727	26.8%	134
sophomore	3797	27.2%	136
Junior Student	3370	24.2%	121
Senior Student	3024	21.8%	109
Total	**13918**	**100%**	**500**

Source: Created by the author

4. Results and Discussion

4.1 Demographic Information

The sample of the target population is 500 participants, whose demographic characteristics are shown in Table 2. 71.4% of the respondents were male, and 28.6% were female. In terms of age, the largest group in the sample is 18 years old or below, accounting for 43.2% of the respondents, followed by 19-21 years old, accounting for 39%, 22-24 years old, accounting for 8.2%, and more than 25 years old accounting for 9.6%.

Table 2: Demographic Profile

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Male	357	71.4%
	Female	143	28.6%
Year of Study	18 years old or below	216	43.2%
	19-21 years old	195	39%
	22-24 years old	41	8.2%
	More than 25 years old	48	9.6%

4.2 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) was used in this study. Each variable's items are significant, representing the factor load to test the convergent validity. Hair et al. (2003) emphasized the importance of factor loading for each project. The factor loading is required to be 0.5, and the coefficient of the P-value is lower than 0.05. In addition, according to Fornell and Larcker (1981), the cut-off points with CR greater than 0.7 and the AVE higher than 0.5. Furthermore, Cronbach's alpha was used to test reliability, resulting with all construct were passed at value greater than 0.70 (Nunnally & Bernstein, 1994). It can be seen from Table 3 that the values of CA are above 0.7, factor loadings are all above 0.5, CR are above 0.7, , and AVE are above 0.5. It shows that the CFA test results are good, and the data analysis results are effective and reliable.

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire	No. of Items	Cronbach's Alpha	Factors Loading	CR	AVE
Built Environment (BE)	Correa da Silva et al. (2021)	6	0.947	0.716-0.842	0.896	0.589
Teaching Care (TC)	Correa da Silva et al. (2021)	6	0.959	0.703-0.812	0.888	0.570
University Image (UI)	Weerasinghe et al. (2018)	3	0.886	0.741-0.916	0.860	0.673
Student Trust (ST)	Chen (2017)	3	0.925	0.883-0.917	0.923	0.801
Academic Aspects (AA)	Zhou et al. (2015)	4	0.949	0.732-0.810	0.847	0.581
Student Satisfaction (SS)	Zhou et al. (2015)	4	0.954	0.650-0.779	0.812	0.521
Student Loyalty (SL)	Zhou et al. (2015)	3	0.907	0.815-0.866	0.882	0.714

CMIN/DF, GFI, AGFI, NFI, CFI, TLI, and RMSEA are used as indicators of model fitting in CFA testing. As shown in Table 4, the value obtained in this study is greater than the acceptable value, which verifies the good-fitting effect of the model. In addition, the measurement results of these models consolidate the effectiveness of discrimination and verify the effectiveness of subsequent structural model estimates.

Table 4: Goodness of Fit for Measurement Model

Index	Acceptable Values	Statistical Values
CMIN/DF	≤ 5.0 (Wheaton et al., 1997)	1.701
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.924
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.908
RMSEA	≤ 0.10 (Hopwood & Donnellan, 2010)	0.037
CFI	≥ 0.80 (Bentler, 1990)	0.967
NFI	≥ 0.80 (Wu & Wang, 2006)	0.925
TLI	≥ 0.80 (Sharma et al., 2005)	0.963
Model Summary		**Acceptable Model Fit**

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = Goodness-of-fit index, AGFI = Adjusted goodness-of-fit index, RMSEA = Root mean square error of approximation, CFI = Comparative fit index, NFI = Normed fit index, and TLI = Tucker-Lewis index

Source: Created by the author

As seen from Table 5 below, the square root of the AVE of each variable is larger than its correlation coefficient with other variables, indicating that the discriminant validity of the model is very good.

Table 5: Discriminant Validity

	BE	AA	UI	ST	SS	SL	TC
BE	**0.767**						
AA	0.558	**0.762**					
UI	0.377	0.346	**0.820**				
ST	0.460	0.497	0.474	**0.895**			
SS	0.515	0.503	0.548	0.554	**0.722**		
SL	0.369	0.394	0.231	0.337	0.308	**0.845**	
TC	0.486	0.499	0.400	0.427	0.476	0.328	**0.755**

Note: The diagonally listed value is the AVE square roots of the variables

Source: Created by the author.

4.3 Structural Equation Model (SEM)

The structural equation model (SEM) is a generalization of the regression model, which has many advantages that the regression model does not have: it can deal with multiple independent variables and dependent variables at the same time, meeting the increasingly complex needs of theoretical models in social science research; It can analyze both explicit and latent variables at the same time, which is consistent with the general implicit characteristics of variables in social science research; The measurement error of independent variables is allowed, and the parameter estimation accuracy is higher; It has rich fitting evaluation indexes to evaluate the model, etc. These advantages make SEM an important statistical method in social science research (Wang et al., 2022).

The goodness of fit indices for the Structural Equation Model (SEM) is measured as demonstrated in Table 6. The calculation in SEMs and adjusting the model by using SPSS AMOS, the results of the fit index were presented as a good fit, which is CMIN/DF = 3.173, GFI = 0.850, AGFI = 0.822, NFI = 0.856, CFI = 0.896, TLI = 0.885 and RMSEA = 0.066, according to the acceptable values are mentioned in Table 6

Table 6: Goodness of Fit for Structural Model

Index	Acceptable Criterion	Statistical Values Before Adjustment	Statistical Values After Adjustment
CMIN/DF	≤ 5.0 (Wheaton et al., 1997)	3.359	3.173
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.840	0.850
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.812	0.822
RMSEA	≤ 0.10 (Hopwood & Donnellan, 2010)	0.069	0.066
CFI	≥ 0.80 (Bentler, 1990)	0.886	0.896
NFI	≥ 0.80 (Wu & Wang, 2006)	0.846	0.856
TLI	≥ 0.80 (Sharma et al., 2005)	0.875	0.885
Model Summary		**Not in harmony with empirical data**	**In harmony with empirical data**

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = Goodness-of-fit index, AGFI = Adjusted goodness-of-fit index, RMSEA = Root mean square error of approximation, CFI = Comparative fit index, NFI = Normed fit index, and TLI = Tucker-Lewis index

Source: Created by the author.

4.4 Research Hypothesis Testing Result

The research model evaluates the significance of the regression path coefficient according to its t-value, and calculates the explanatory ability of the independent variable to the dependent variable according to R2. Table 7 reports that at the level of significance p=0.05, all hypotheses are supported.

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-Value	Result
H1: BE → SS	0.279	4.840*	Supported
H2: BE → TC	0.534	10.431*	Supported
H3: TC → SS	0.169	3.067*	Supported

Hypothesis	(β)	t-Value	Result
H4: UI → SS	0.382	6.795*	Supported
H5: ST → SS	0.343	6.610*	Supported
H6: AA→ SS	0.277	5.610*	Supported
H7: SS→ SL	0.488	5.768*	Supported

Note: * p<0.05
Source: Created by the author

The results in Table 7 are interpreted as follows:

H1 proved that built environments significantly impact student satisfaction, with the standardized coefficient value of its structural path is 0.279.

The result of **H2** proved that built environment significantly impacts teaching care, with the standardized coefficient value of its structural path is 0.534.

H3 proved that teaching care significantly impacts student satisfaction, with the standardized coefficient value of its structural path is 0.169.

The standardized coefficient value of **H4** is 0.382, indicating that university image significantly impacts student satisfaction.

The standardized coefficient value of **H5** is 0.343. That is, student trust has a significant impact on student satisfaction.

The standardized coefficient value of **H6** is 0.277, indicating that academic aspects significantly impact student satisfaction.

Finally, the standardized coefficient value of **H7** is 0.488, reflecting that student satisfaction significantly impacts student loyalty.

5. Conclusion and Discussion

5.1 Conclusion

This study aims to investigate the influencing factors of science majors' satisfaction and loyalty to public universities in Shanxi Province, China. The model consists of seven variables and seven assumptions. The questionnaire subjects were selected from four undergraduate grade science students at Taiyuan Institute of Technology, Taiyuan City, Shanxi Province. The data analysis aims to explore the factors that affect student satisfaction and loyalty. Confirmatory factor analysis (CFA) is used to measure the validity and reliability of conceptual models. A structural equation model (SEM) was used to analyze the influence relationship proposed by the hypothesis.

The results are as follows. First, built environment has a significant impact on teaching care. This means that the built environment has a significant impact on teaching care. At the same time, teaching care significantly impacts student satisfaction. Supported by Wilson and Cotgrave (2020) that students consider operation, design, facilities, rooms, environment, and appearance to perceive high-quality learning space, therefore, the physical and tangible conditions of the environment of school have a great effect on student satisfaction and teach care (Rosenbaum et al., 2020). Secondly, university's image has a significant impact on student satisfaction. It indicates that the better the school's image, the higher the student satisfaction. The impression left by the public and the minds of teachers and students in terms of its management and social publicity, the brand of the university itself, and the symbol that distinguishes it from other universities (Chen, 2010; Hou, 2016).

Third, it is consistent with the expected results that the more satisfied students are, the higher their loyalty will be. In summary, this study determined that built environment, teaching care, university image, and student trust significantly impact student satisfaction. Student trust is a sense of security, which is formed based on evaluation by both sides in the process of communication (Sun, 2005). Moreover, colleges and universities use academic aspects; educational facilities, equipment, and technology to meet the needs of learners to achieve their satisfaction and loyalty (Ma, 2005; Yu, 2009). Student satisfaction is students' assessment of education, services, and facilities during their studies, which determine student loyalty (Arambewela & Hall, 2009; Elliott & Shin, 2002; Weerasinghe & Dedunu, 2017). This study also proved that student satisfaction significantly impacts student loyalty.

5.2 Recommendation

Through a survey of natural science majors at Taiyuan Institute of Technology in Taiyuan City, Shanxi Province, the researchers found that the key factors affecting students' satisfaction and loyalty are the built environment, teaching care, university image, academic aspects, and students' trust, among which, the built environment has a significant impact on teaching care. Therefore, as college staff, it is suggested to improve the building environment, improve the teaching care, and establish good trust between teachers and students, which will help improve students' satisfaction. Student satisfaction is students' assessment of education, services, and facilities during their studies (Elliott & Shin, 2002). At the same time, seeing the significant influence relationship between the built environment and teaching care, through starting from the built environment, improve the teaching care, and then enhance students' satisfaction. Finally, through the research, it is found that satisfaction has a significant impact on loyalty. When students' satisfaction is improved, loyalty will also be improved accordingly.

5.3 Limitation and Further Study

The research on college student satisfaction started early in developed countries such as the United States and Britain, and it has accumulated a deep theoretical foundation today. The investigation and practice activities of college students' satisfaction have formed a certain scale and a relatively complete index system. Based on China's current higher education environment, the research on college students' satisfaction and loyalty still need to mature. There are still many deficiencies in the scale of investigation and the depth of theoretical research. The combination of theory and practice needs to be closer, and the construction of the student satisfaction model is more referential than innovative. Therefore, there is still a lot of research space and value in the research field of college students' satisfaction, which needs further exploration by researchers.

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