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An Empirical Analysis of Student Satisfaction in the Modern Educational Technology Program Based on Structural Equation Modeling: A Case Study of City

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Abstract: As AI technology becomes deeply integrated into the digital transformation of education, the Modern Educational Technology program, as one of the core vehicles for cultivating educational informatization talents, has seen its student satisfaction become an important indicator for measuring program quality. However, existing research mostly focuses on single influencing factors and lacks exploration of the complex mechanisms among multidimensional variables, leading to insufficient precision in program optimization. This study incorporates the CCSI model to construct a program satisfaction index model with 6 latent variables and 20 observed variables. It surveys current students and recent graduates of this program in universities in City C, and employs structural equation modeling and path analysis to reveal the causal relationships among influencing factors. Empirical results show that four latent variables—input-output ratio perception, quality of training expectations, perceived curriculum quality, and school/program image—have significant positive effects on program satisfaction. The findings provide theoretical evidence for optimizing curriculum systems, strengthening technical resource allocation, and improving industry-education integration practice platforms.

Keywords: Modern Educational Technology; Program satisfaction; Structural equation model

1. Introduction

The rapid development of AI technology is reshaping the global educational landscape, driving the transformation of teaching from a “teacher-centered” model toward “human-machine collaboration”. China’s Education Informatization 2.0 Action Plan explicitly calls for building an “artificial intelligence + teacher education” innovation system [1]; meanwhile, with the progressive implementation of the “construction of a high-quality education system,” program development in higher education institutions is also advancing vigorously [2]. Against this dual background, the Modern Educational Technology program, as an interdisciplinary field that cultivates “AI developers who understand education” and “educational designers skilled in technology,” has a direct impact on the quality of the digital transformation of education. By integrating education and computer science, it has become a major channel for training educational technology talents adapted to the intelligent era [3], and therefore the cultivation of this program in universities must be taken seriously.

Currently, more than 200 universities nationwide offer this program. To improve training quality, this study takes current students and recent graduates of the program in City C as the research subjects, constructs a program satisfaction index model, conducts a questionnaire survey, uses AMOS to build a structural equation model, and systematically analyzes the key factors affecting student satisfaction, with the aim of providing empirical evidence and directions for program improvement.

2. Theoretical Foundations of Student Satisfaction Research in the Modern Educational Technology Program

(1) China Customer Satisfaction Index

The China Customer Satisfaction Index (CCSI) was jointly proposed by the China National Institute of Standardization and Tsinghua University in 2002.It is China's first full-category customer satisfaction evaluation model [4]. The CCSI model is based on the American and European customer satisfaction index models and incorporates China's basic national conditions as well as relevant consumer and psychological theories, ultimately producing a satisfaction survey model suitable for China. It includes six structural variables.

(2) Structural Equation Model

Structural equation modeling is a multivariate statistical technique consisting of a measurement model and a structural model. It assumes causal relationships among a set of latent variables,which can each be represented by a group of observed variables as linear combinations of those observed variables [5]. It is commonly used to analyze causal relationships among multiple latent variables, which are measured through a set of observable indicators. It effectively handles variables that are difficult to measure directly in social science research. By verifying the covariance among observed variables, the model can estimate regression coefficients and thus test the plausibility of the hypothesized model. Since satisfaction can be evaluated from multiple dimensions and individual variables are difficult to observe directly, structural equation modeling is chosen for multidimensional research and analysis.

3. Model Construction for Student Satisfaction Research in the Modern Educational Technology Program

(1) Program Satisfaction Model

Drawing on the application studies of program satisfaction in references [6-8], this paper transforms the CCSI model variables into satisfaction evaluation variables suitable for the Modern Educational Technology program. The model retains the causal chain framework of CCSI but converts the commercial "product transaction" logic into the educational "talent cultivation" logic. The specific conversions include: perceived quality transformed into perceived curriculum quality, expectation quality transformed into quality of training expectations, brand image transformed into school/program image, perceived value transformed into input-output ratio perception, customer satisfaction transformed into program satisfaction, and customer loyalty transformed into program loyalty, resulting in six structural variables. The transformed structural variables are shown in Table 1.

Table1: Structural variables of the program satisfaction index model.

Original variable (CCSI)	Transformed variable (Program Satisfaction Index)
Perceived Quality	Perceived Curriculum Quality
Expectation Quality	Quality of Training Expectations
Brand Image	School/Program Image
Perceived Value	Input-Output Ratio Perception
Customer Satisfaction	Program Satisfaction
Customer Loyalty	Program Loyalty

(2) Questionnaire Design

Since all variables in the program satisfaction index model are structural variables and cannot be directly observed, it is necessary to derive the next-level observed variables. Therefore, the questionnaire items were designed with reference to literature [9-11] and comprehensive design methods, resulting in the "Modern Educational Technology Program Satisfaction" questionnaire.

The questionnaire was distributed by the research team via "Wenjuanxing" to current students and recent graduates of the Modern Educational Technology program in City C universities. The questionnaire operationalizes the 6 structural variables into 20 observed variables, covering five major sections: curriculum and teaching, learning experience, internship and employment, etc. Items use a Likert scale with five response levels: "strongly disagree, disagree, neutral, agree, strongly agree," scored from 1 to 5. Participants were asked to answer based on their learning and employment experiences. Higher scores indicate higher satisfaction with the Modern Educational Technology program. Reliability and validity tests show that the questionnaire has good reliability (Cronbach's α = 0.963) and structural validity (KMO > 0.9, P < 0.001). The specific measurement items are shown in Table 2.

Table2: Measurement Items for Program Satisfaction.

Variable type	Latent variable	Code	Observed variable
Exogenous latent variable	Perceived Curriculum Quality	C1	Course content will change with the development of artificial intelligence technology.
		C2	Teachers use blended teaching models, combining technical practice tasks to promote the transformation of theoretical knowledge into practical knowledge.
		C3	The proportion of theoretical learning and practical tasks in the curriculum is reasonable.
		C4	Teachers use intelligent teaching tools in class (e.g., AI classroom).
	School/Program Image	S1	I have a good overall impression of this program/school.
		S2	The school has good intelligent learning resources and faculty strength.
		S3	The school has good cooperative relationships with enterprises related to the program, which can provide help in future employment.
	Quality of Training Expectations	P1	After studying the program, I believe I can master practical skills related to educational technology such as artificial intelligence and big data.
		P2	The learning experience in the program can help me find a job in related industries.
		P3	The program learning can promote my personalized development.
		P4	The abilities cultivated by the program can enable me to adapt to technological changes in the future education industry.
Endogenous latent variable	Input-Output Ratio Perception	T1	I think the more time and effort I spend on studying this program, the more abilities I will master.
		T2	I think the tuition/learning fees are reasonable compared to the learning resources obtained.
		T3	I believe that through studying this program, I will be able to find a job in the future whose salary and development prospects match my investment.
	Program Satisfaction	M1	I am satisfied with the theoretical courses in educational technology.
		M2	I am satisfied with the practical courses in educational technology.
		M3	I am satisfied with the program-related competitions/activities arranged by the school.
	Program Loyalty	Z1	I am willing to recommend this program to others in the future.
		Z2	I will be engaged in work related to modern educational technology in the long term in the future.
		Z3	I will pay long-term attention to issues related to modern educational technology in the future.

(3) Research Hypotheses

This study constructs a structural model comprising six latent variables: Perceived curriculum quality: students' comprehensive evaluation of course content, relevance, and teaching resources; Quality of training expectations: students' expectations regarding skill acquisition, personalized development, and career goal achievement; School/program image: students' overall perception of program reputation and resources, which significantly influences initial satisfaction; Input-output ratio perception: students' assessment of the match between input and returns, which continuously affects satisfaction formation; Program satisfaction: overall comprehensive satisfaction with educational quality; Program loyalty: influenced by high satisfaction, enhancing students' willingness to continue learning and recommend the program. These variables form the driving mechanism of program satisfaction through direct and indirect paths.

Based on these six structural variables, this paper proposes the following hypotheses:

H1: Perceived curriculum quality has a positive effect on perceived learning benefits.

H2: Perceived curriculum quality has a positive effect on overall program satisfaction.

H3: Perceived curriculum quality has a positive effect on quality of training expectations.

H4: Program reputation/image has a positive effect on overall program satisfaction.

H5: Program reputation/image has a positive effect on quality of training expectations.

H6: Perceived learning benefits have a positive effect on overall program satisfaction.

H7: Quality of training expectations has a negative effect on overall program satisfaction.

The hypothesized paths are shown in Figure 1.

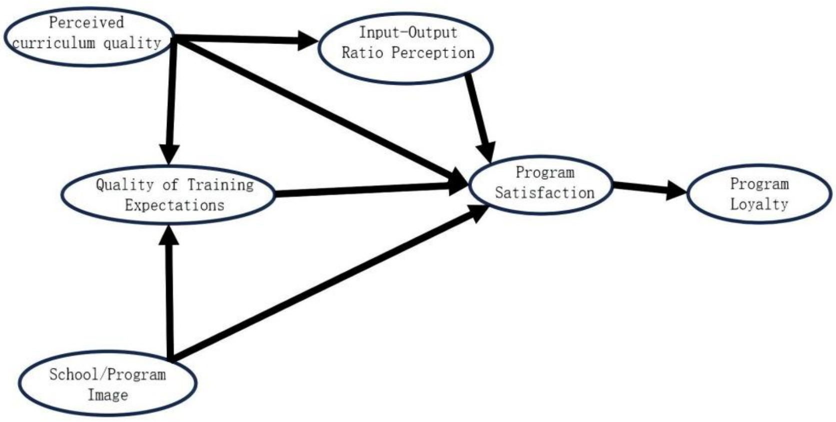

Figure 1: Research Hypothesis Paths.

4. Empirical Analysis of Student Satisfaction Research in the Modern Educational Technology Program

(1) Questionnaire Collection

The questionnaire targeted current students and recent graduates of the Modern Educational Technology program in City C. A total of 220 questionnaires were collected, of which 211 were valid and 9 invalid. All survey data have been anonymized. The number of valid questionnaires exceeds ten times the number of items, meeting the basic sample size requirement [12] for data analysis.

(2) Reliability and Validity Analysis

This study uses Cronbach's α coefficient to assess scale reliability. The unstandardized estimates of all parameters are statistically significant, indicating that the hypothesized relationships among latent variables are supported by the data and that the model can be used for relevant analysis. In terms of item reliability (SMC) and composite reliability (CR), convergent validity meets the standards, and the internal consistency of latent variables is high. Most item reliability values are above 0.55; most composite reliability values are above 0.8; and the convergent validity of each latent variable is above 0.5, indicating that the convergent validity of each latent variable is acceptable [13]. In summary, the questionnaire meets measurement requirements in terms of internal consistency, convergent validity, and discriminant validity, with good overall reliability and validity, and the measurement part of the constructed model is reliable (Table 3).

Table 3: Composite Reliability Analysis of Scales.

Code	FL	SMC	CR	AVE
C1	0.773	0.597		
C2	0.781	0.610	0.864	0.614
C3	0.815	0.664		
C4	0.764	0.584		
S1	0.807	0.651		
S2	0.783	0.613	0.825	0.611
S3	0.755	0.570		
P1	0.796	0.634		
P2	0.794	0.630	0.868	0.622
P3	0.781	0.610		
P4	0.782	0.612		
T1	0.774	0.599		
T2	0.723	0.523	0.802	0.575
T3	0.776	0.602		
M1	0.690	0.476		
M2	0.746	0.557	0.770	0.528
M3	0.743	0.552		
Z1	0.747	0.558		
Z2	0.802	0.643	0.816	0.596
Z3	0.767	0.588		

(3) Path Analysis

Path analysis results show that among the four latent variables affecting program satisfaction, input-output ratio perception (path coefficient = 0.297) has the strongest direct effect on program satisfaction. Among its observed variables, “I believe that through studying this program, I will find a job with salary and development prospects that match my investment” (Table 3) has the highest factor loading (0.776), while “I think the time and effort spent studying this program is proportional to the competencies acquired” (Table 1) has a loading of 0.774. This indicates that both Table 1 and Table 3 contribute significantly to input-output ratio perception. The direct effect coefficients of other latent variables on program satisfaction are: quality of training expectations (0.259), school/program image (0.252), and perceived curriculum quality (0.197). Among the indicators of quality of training expectations, “After studying the program, I believe I can master practical skills related to educational technology such as AI and big data” (Figure 1) has a factor loading of 0.796, making it the primary influencing factor, followed by "The learning experience in the program can help me find a job in related industries" (Figure 2) with a loading of 0.794. The high loadings of Figure1 and Figure 2 reflect that master's students pay more attention to skill acquisition and employment prospects, which are directly related to program satisfaction evaluation. Although perceived curriculum quality has no significant direct effect on program satisfaction, it still exerts a significant indirect effect through input-output perception and quality of training expectations. Its key observed variable "The ratio of theoretical learning to practical tasks in the curriculum is reasonable" (C3) has a factor loading of 0.815, indicating that curriculum design needs to balance theory and practice. Among the observed variables for program satisfaction, "I am satisfied with the practical courses in educational technology" (M2) has the strongest effect, with a loading of 0.746, confirming that professional master's students place greater value on practical course value.

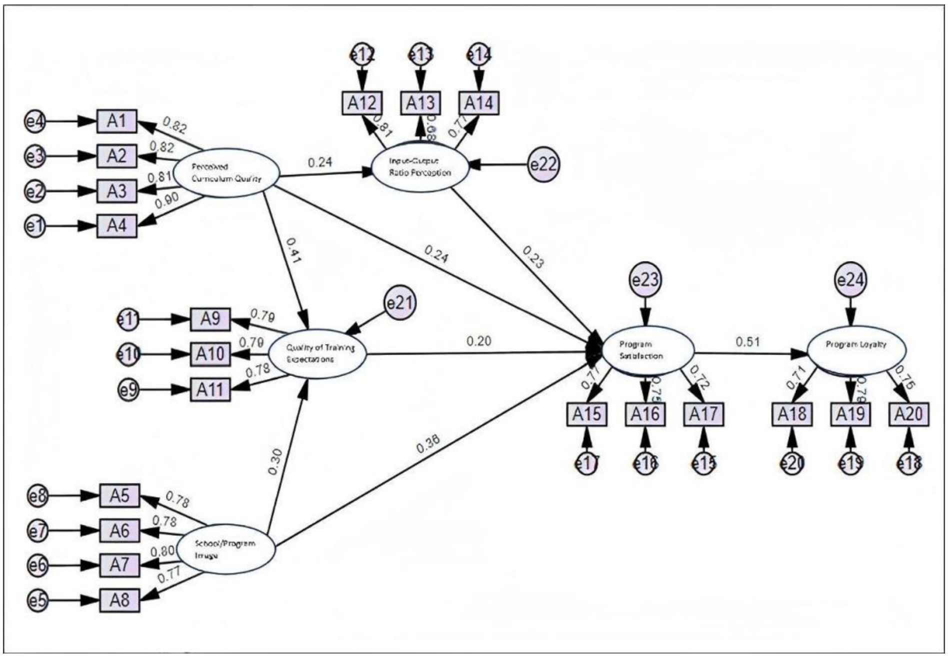

Figure 2: Standardized Paths of the Structural Equation Model.

5. Conclusions and Recommendations

Based on the above data analysis, for this master's program, students are more concerned with whether they can acquire relevant knowledge and employment opportunities after learning, while also expecting a balanced development between theoretical and practical courses. In light of these findings, the following recommendations are proposed.

(1) Establish a Dynamic Updating Mechanism for Program Learning

To cope with the profound reshaping of education by AI technology, universities should establish a dynamic curriculum updating mechanism that closely follows trends in AI education. It is recommended that each academic year, based on ministry or industry demands, new courses reflecting cutting-edge technologies be added and outdated theoretical courses be replaced, ensuring that students master the most advanced knowledge and skills, facilitating the effective transformation from technical knowledge to educational innovation.

(2) Precisely Align with Job Market Demands to Enhance Employment Competitiveness

When designing training programs, universities should invite industry-university cooperative partners to participate in curriculum outline design and course planning, ensuring that teaching content closely aligns with real industry needs and effectively avoids a disconnect between learning and application. At the same time, universities should collect recruitment information from relevant enterprises and offer courses targeting frequently appearing core competencies, which can both enhance students' professional abilities and strengthen their employment competitiveness.

(3) Build a Progressive Practical Curriculum System

Universities should focus on constructing a stepwise progressive practical curriculum system, guiding students from "beginners" mastering basic tool applications to "advanced practitioners" capable of innovatively using tools to solve practical educational problems. At the same time, the proportion of practical courses in total class hours should be increased, providing students with more opportunities to participate in real projects and accumulate practical experience.

In summary, the empirical analysis shows that perceived learning benefits, achievement of training expectations, program reputation/image, and curriculum content quality are the four core factors influencing satisfaction. The survey reveals that current student satisfaction is at a basic level of satisfaction, but there is still considerable room for improvement in terms of innovative practice support, curriculum relevance, and employment connection. Based on the above driving mechanisms and the diagnosis of the current situation, it is recommended to advance program construction from the following aspects: strengthen program development, deepen innovative practical teaching, establish a dynamic mechanism for updating curriculum content, and expand the depth of industry-university collaboration. These measures will collectively act on the key drivers of satisfaction, systematically improve educational quality, and promote the sustainable development of the program.

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