Research on the Relationship Between the Characteristics of Distance Open Teaching and the Needs of Adult Learners Based on Quality Functional Development

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Abstract. The analysis process is carried out according to the quality function, adheres to the "learner-centered" quality concept, and takes the subjective needs of adult learners as the logical starting point. The research framework includes three main links: acquisition of the subjective needs of adult learners, analysis of the characteristics of distance open teaching, and construction of the relationship between the subjective needs of adult learners and the characteristics of distance open teaching. The research results show that learner-centered and in line with scholar level are the focus of teaching goal design, rich teaching experience and teaching content system are the focus of teaching resource construction, support for online and offline interaction is the focus of teaching implementation, support for teacher-student mutual evaluation is the focus of teaching evaluation, and platform function perfection is the focus of platform and support system design.

CCS CONCEPTS: Social and professional topics,Professional topics,Computing education

Keywords: adult learner; distance open teaching; quality functional development

1. Introduction

As the composition of higher education students becomes more and more complex, their learning purpose, learning ability and learning needs are showing a diversified development trend. One of the problems caused by this trend is that traditional teaching methods are no longer suitable. This reality requires us to adopt new teaching modes and methods. Most distance open teaching usually uses video and reading materials as knowledge carriers, static tests and examinations, with limited peer interaction and limited teacher-student interaction. Many studies have shown that learners are the important subjects of distance open education, and distance open education should pay more attention to the needs of learners. Digitization has gradually upended our traditional learning and work roles, and the needs of learners will continue to change in the future. Therefore, in order to remove learning barriers and expand learning opportunities, it is important to emphasize the idea that learners are at the center of the

open learning ecosystem. In the "learner-centered" education ecology, more attention should be paid to the micro-individual level.

Adult learners are the main body of non-traditional learners, and also the main consumer group of distance open education. As non-traditional learners, adult education learners have significant characteristics different from traditional learners: first, adults tend to be more self-directed, have stronger drive and are more willing to learn; Secondly, in the new stage of social development, adult learners' learning needs cover many aspects such as career, life and self-development. In the new era of "paying more attention to everyone and paying more attention to lifelong learning", in the education blueprint of building a lifelong learning system serving the whole people, we must increase the in-depth description of the needs and characteristics of adult learners, and do more in-depth research on distance open education in colleges and universities with the support of data.

The existing researches on the theory of distance open teaching, learner subject and Quality Functional Development (QFD) technology application provide the research framework and theoretical model support for this research. However, among the existing relevant research results, the research on the characteristics of distance open teaching based on adult learners still lacks sufficient attention, and the research results on the design of distance open teaching based on the survey data of adult learners' needs are rarely seen. Therefore, It is necessary to study the characteristics of distance open teaching based on the data requirements of each link of QFD and the characteristics of adult learners' needs for data, so as to carry out targeted teaching and help to improve the effectiveness of adult learners.

2. Literature Review

2.1 Historical evolution of theoretical research on distance open education

Among the theories of distance open education that have emerged since the 1960s, several theories have greatly promoted the understanding and development of distance open education, and they are regarded as the basic theories of distance open education. They are autonomy and independence theory [1], guided instructional conversation theory [2], and interactive distance theory [3]. Since the 1990s, in the learning environment based on innovative network technology, several new theories of distance open education have emerged: The inquiry community model [4], pedagogy of self-determined learning [5], Connectionism [6], rhizome learning theory [7].

2.2 Research focus on the learner subject

Foreign literature research shows that about 50% of distance and open education research focuses on learner-related topics, such as Lee,J.X.et al. This paper studies the relationship between the teaching characteristics, teaching quality and students' learning experience in distance education[8]. Jaekel, A. K., et al studied the impact of digital learning use on the learning motivation of medical students in Universiti Nasional Malaysia before and during the COVID-19 pandemic[9]. Domestic literature research shows that learner-related topics are also hot topics in distance and open education, mainly in the aspects of learner characteristics, learner modeling, learner needs and so on. There are few articles that further focus on the topic of adult

learners. For example, Zhu Yanfei et al used typological research methods to divide adult learners into four types: alienated, idealistic, developmental and lazy, and further tested their learning effectiveness[10]. Qi Yin conducted research on adult learners' knowledge view and learning behavior [11].

2.3 Research on the application of QFD technology in education field

Quality Functional development (QFD) was proposed by two Japanese professors, Yoji Akao and Shigori Mizuno, in the 1960s as a quality management system, with the purpose of designing and producing products and services that fully meet customer needs. In the process of product or service development, companies should listen to the "voice of customers" [12]. At present, quality function development technology has been applied in many fields of education. Macro-level research involves education quality management [13], teaching resource guarantee [14], talent training [15], and micro-level research involves curriculum development [16], curriculum setting [17], curriculum improvement [18], etc.

3. Research Methodology and Data Analysis

Firstly, according to the analysis process of QFD, and focusing on the main needs of adult learners, the theoretical research framework of the characteristics of distance open teaching is established. The framework focuses on the acquisition of adult learners' subjective needs, characteristic analysis of distance open teaching' quality, and the correlation construction between adult learners' subjective needs and distance open teaching quality characteristics. In the process of specific research development, the first stage is to obtain adult learners' subject needs and determine the weight of these needs. In the second stage, the characteristics of distance open teaching are analyzed. Finally, the construction of the House of quality generates the utility relationship between the characteristics of distance open teaching and the needs of adult learners.

3.1 The element system and weight determination of adult learners' subject needs

3.1.1 Identification and refinement of adult learners' subjective needs

In order to ensure the needs of adult learning learners in distance open education, data collection and acquisition adopt various approaches: firstly, through combing and analyzing the relevant research literature on the needs of adult learning learners in distance open education; Secondly, the network questionnaire survey was carried out, and in-depth interviews were conducted according to the survey situation; Finally, several open online courses are selected on the MOOC platform of Chinese universities according to the number of students selected, the number of user posts, the type of subjects and other factors, and the text mining and analysis are carried out on the content of user comments. Through the above three data acquisition channels, the initial data of the main needs of adult learners are obtained. On the basis of the initial data acquisition, through the extraction of keywords, clustering and grouping, extraction and summary, and detailed classification of the initial data, the elements of adult learning subject demand in college distance open teaching are obtained, as shown in Table 1.

3.1.2 Determine the weight of adult learners' main demand elements

The analytic hierarchy process (AHP) is used to determine the index weight of adult learners' subjective demand element system. In this study, the hierarchical analysis software Excel2021 and Yaahp were used to carry out statistical analysis on the weight rating table of the recovered index system. The rating table mainly consists of "first-level index weight rating table" and "second-level index weight rating table". The scoring scale adopts the Satty1-9 scale method to calculate the weight in pairwise comparison. In this paper, the specific steps to determine the weight of indicators are as follows:

(1)On the basis of the previously established demand element system, we use expert survey, focus group discussion and other methods to determine the correlation between the evaluation indicators;

(2)Establish a two-level index judgment matrix, compare the indicators pairwise, usually use the expert survey method to determine the relative importance of the indicators;

(3)Significance test is carried out on each judgment matrix. When the result of average random consistency test is less than 0.1, the result can be considered acceptable. In this study, the consistency automatic correction algorithm of Yaahp hierarchical analysis software is adopted to modify the judgment matrix on the premise of retaining expert decision data to the maximum extent, so that the judgment matrix can pass the consistency test. Demand factor weights are reshown in Table 1.

Table 1. Main demand factors and weights of adult learners.

First-level Indicators	Secondary-level indicators	Weights
Knowledge requirements	Content resources	0.25
	Teaching process	0.15
	Assessment method	0.1
Ability Needs	Professional competence	0.08
	Practical ability	0.08
	Ability to expand	0.04
Service demand	Service system	0.15
	Online course platform	0.15

3.2 Characteristics analysis of distance open teaching

This paper analyzes the characteristics of adult distance open teaching in colleges and universities from two aspects: teaching process and supporting conditions. First, from the perspective of the basic elements of the teaching process, fully explore the process teaching characteristics of the adult distance open teaching process; Then, give full consideration to the hardware teaching characteristics reflected by the operation of the distance open teaching platform; Thirdly, considering the characteristics of process teaching and hardware teaching, the paper puts forward an analysis framework which includes five basic dimensions, including

teaching objectives, teaching resources, teaching implementation, teaching evaluation and learning platform. Finally, the Delphi method is used for two rounds of adjustment and improvement, and a list of characteristic elements of distance open teaching including 5 dimensions and 16 index items is obtained, as shown in Table 2.

Table 2. List of characteristic elements of distance open teaching.

Dimensions	Elements
Teaching objective	Learner-centered
	Appropriate professional training requirements
	Suitable for learners' level
Teaching resources	Teachers have rich teaching experience and high teaching level
	The teaching content is systematic and the learning resources are abundant
	Diverse presentation methods, suitable for online learning, blended teaching and other applications
	Update teaching content and learning resources in a timely manner
Teaching implementation	The technology environment effectively supports online teaching activities
	Support online and offline interactive activities between teachers, students and students
	Provide personalized support services for academic, emotional, management, etc.
Teaching evaluation	Support a process assessment approach
	Support the final evaluation method
	Support mutual evaluation of teachers and students
Learning platforms and support systems	The course platform has perfect functions, convenient navigation and good operation
	It has a background system to support student status management
	Service staff working attitude is good

3.3 Analysis of the utility relationship between the characteristics of distance open teaching and the needs of adult learners

According to the mathematical operation rules of the House of Quality, the utility relationship between the characteristics of distance open teaching in colleges and universities and the needs of adult learners is generated. Firstly, the left wall of the house of quality is established according to the demand index in the hierarchy model of adult learners' needs. The characteristics of distance open teaching are taken as the ceiling of the house of quality. Then the correlation between the two is analyzed, that is, the mapping relationship, and 0,1,3,5 is used to carry out the correlation score (0 is very weak, 1 is weak, 3 is neutral, 5 is strong), and then the correlation matrix is obtained. According to formula (1), the absolute weight of the characteristics of distance open teaching is calculated. The relative weights of distance open teaching characteristics are calculated according to formula (2).

$$K_i = \sum_{i=1}^{n} A_i R \qquad (1)$$

Where, K_i is the absolute weight of the characteristics of distance open teaching; A_i is the

weight of adult learners' needs $\times 100$; R is the correlation coefficient.

$$K_i' = \frac{K_i}{\sum\limits_{i=1}^{n} K_i} \tag{2}$$

Where, K_i' is the relative weight of the characteristics of distance open teaching.

This calculation process is the transformation process from the requirement factor to the quality characteristic factor, from the hidden layer to the operable solid layer. The quality house of distance open teaching is shown in Figure 1. As can be seen from Figure 1, learner-centered and suitable for learner level are the focus of teaching goal design, rich teaching experience and teaching content system are the focus of teaching resources, support for online and offline interaction is the focus of teaching implementation, support for teacher-student mutual evaluation is the focus of teaching evaluation, and platform function perfection is the focus of platform and support system design. The characteristic design of adult distance open teaching should focus on the above.
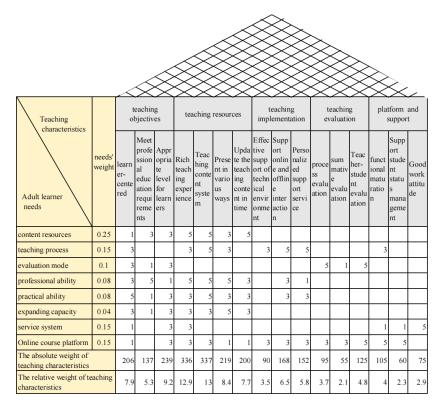
Teaching characteristics / Adult learner needs	needs' weight	teaching objectives			teaching resources				teaching implementation			teaching evaluation			platform and support		
		learner-centered	Meet professional education requirements	Appropriate level for learners	Rich teaching experience	Teaching content system	Present in various ways	Update the teaching content in time	Effective support of ical environment	Support online and offline interaction	Personalized support service	process evaluation	summative evaluation	Teacher-student evaluation	functional maturi ratio n	Support student status management	Good work attitude
content resources	0.25	1	3	3	5	5	3	5									
teaching process	0.15	3			3	5	3		3	5	5				3		
evaluation mode	0.1	3	1	3								5	1	5			
professional ability	0.08	3	5	1	5	5	5	3		3	1						
practical ability	0.08	5	1	3	3	5	3	3		3	3						
expanding capacity	0.04	3	1	3	3	3	5	3									
service system	0.15	1		3	3										1	1	5
Online course platform	0.15	1		3	3	3	1	1	3	3	3	3	3	5	5	5	
The absolute weight of teaching characteristics		206	137	239	336	337	219	200	90	168	152	95	55	125	105	60	75
The relative weight of teaching characteristics		7.9	5.3	9.2	12.9	13	8.4	7.7	3.5	6.5	5.8	3.7	2.1	4.8	4	2.3	2.9

Fig.1. House of Quality of distance open teaching features.

4. Conclusion

This study adheres to the quality concept of "user needs", takes meeting the needs of adult learners as the logical starting point, and follows the idea of "learner needs - characteristics of distance open teaching in colleges and universities" to obtain the characteristics of distance open teaching in colleges and universities. The research process and results can guide the reform of education supply. Research on the characteristics of distance open teaching based on the needs of adult learners is conducive to improving the matching degree of supply and demand in higher education and improving the effectiveness of adult learners. In the final analysis, all reforms in the field of education are aimed at promoting students' learning.

The innovation of this paper is reflected in the following aspects:

(1) From the perspective of research, this research upholds the quality concept of "user needs", takes meeting the needs of value subjects as the logical starting point, and obtains the characteristics of adult distance open teaching.

(2) In terms of research methods, previous studies mostly used literature research or logical deduction methods, but this study uses the quality function development method in the field of quality management science to realize the transformation from the needs of value subjects to the characteristics of teaching.

(3) In terms of the research results, the characteristics of adult distance open teaching obtained in this study fully reflect the needs of adult learners' value subjects, and reflect the distinct characteristics of "bottom-up" and "reverse innovation".

The problem of the research is that the end point of the research stays on the characteristics of distance open teaching, and the further use and discussion of the research results are lacking. The future research can further add the identification subject, evaluation activities, personalized requirements and other constraints, in order to obtain the quality of adult distance open teaching identification standards.

References

[1]   C.A. Wedemeyer. 1971.Independent study[J]. The encyclopedia of education,548-557

[2]   B. Holmberg.1983. Guided didactic conversation [J]. Distance education: International perspective,114-122

[3]   M.G. Moore. 1973.Towards a theory of independent learning and teaching[J]. Journal of Higher Education,44(9),661-679

[4]   D.R. Garrison, T. Anderson, W. Archer. 2000.Critical inquiry in a text-based environment: Computer conferencing in higher education[J]. The Internet and Higher Education,2: 87- 105

[5]   S. Hase, C. Kenyon. 2000.From andragogy to heutagogy[J].The philosophy of open education,2-9

[6]   G. Siemens. 2005.Connectivism -A learning theory for the digital age[J]. International Journal of Instructional Technology and Distance Learning, 2(1):3-10

[7]   D. Cormier. 2018.A model for e-education: Extended teaching spaces and extended learning spaces[J]. British Journal of Educational and Technology, 1,6-18

[8]   Lee, J. X., Ahmad Azman, A. H., Ng, J. Y., & Ismail, N. A. S. (2023). Open Distance Learning

in Medical Education: Does It Improve Students' Motivation?. SAGE Open, 13(1), 21582440231157687.

[9]   Jaekel, A. K., Fütterer, T., & Göllner, R. (2023). Teaching characteristics in distance education—associations with teaching quality and students' learning experiences. Teaching and Teacher Education, 132, 104174.

[10]   Y.F. Zhu, H. Ji. 2020.Types and learning outcomes of adult learners: An inquiry based on learning motivation and learning disabilities [J]. China Distance Education, 12,18-27+92.

[11]   Qi Y.(2022) Research on Knowledge View and Learning Behavior of adult distance learners [J]. Continuing Education Research,(11):18-22.

[12]   W. Xiong. 2012.Quality Function Development: Theory and Method [M]. Beijing: Science Press,65-76

[13]   Mou X.W., Li Y., Tang Y.B.2021 Secondary vocational teaching quality improvement based on QFD study [J]. Journal of contemporary vocational education, (6) : 73-81. The DOI: 10.16851 / j.carol carroll nki/g4.2021.06.013. 51-1728

[14]   Zhang Z., Chen B.2018 Based on QFD model of cultivating applied talents of teaching resources protection [J]. Journal of education modernization, 5 (32) : 17-18. DOI: 10.16541 / j.carol carroll nki. 2095-8420.2018.32.008

[15]   Yang L.,Zhang J.J. 2018.Research on the Difference between Enterprise Demand and University Talent Training Quality based on QFD theory [J]. Journal of shenyang institute of engineering (social sciences edition), 14 (01) : 63-67. The DOI: 10.13888 / j.carol carroll nki jsie (ss). 2018.01.008

[16]   Fan L.H.2021. QFD theory for the application of innovative entrepreneurship education in colleges and universities curriculum design [J]. Journal of contemporary education theory and practice,13 (01) : 79-86. The DOI: 10.13582 / j.carol carroll nki. 1674-5884.2021.01.014

[17]   Liu S.X. 2020.Research on curriculum Optimization of Computer Application major in C secondary vocational schools based on QFD [D]. Light chemical engineering in sichuan university. DOI: 10.27703 /, dc nki. GSCLG. 2020.000088

[18]   Li Y.F., Zhou X.Z.2022. Yang Xiaohong. Optimization design of open online courses for subject needs [J]. Modern Educational Technology,32(01):104-110.