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Construction of OBE Concept Autonomous Learning Mode in University Teaching Based on the Internet

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ABSTRACT

In order to meet the needs of life-long learning of the internet of things and the economic and social development of digital learning countries, we must actively explore the teaching mode of digital self-learning courses for college students. This article aims to explore the construction of an autonomous learning model based on the OBE concept of university teaching based on the internet of things technology. Through self-study of college students in the environment of internet of things and information technology, as well as the micro-course self-directed learning that carries the OBE concept, the results show that most students hold a positive attitude towards the autonomous learning model in the information environment. A survey that carries the OBE concept shows that the scoring dimensions of the content of the students' autonomous learning attitude survey before class are both 4.11. It can be considered that the micro-curriculum resources that carry the OBE concept can effectively help students to conduct autonomous learning.

KEYWORDS

Autonomous Learning Model, Internet of Things Technology, Micro Course, OBE Philosophy

1. INTRODUCTION

The rise of technologies such as big data, cloud computing, and smart campuses has taken a big step forward in the establishment of a digital, networked, and personalized learning society. The real needs of deep integration and education of Internet technology has become the only way education information. With the rapid development of information technology including the Internet, Internet technology has entered people's life, work, education and other fields. The Internet of Things is the "Internet between things", which establishes connections between things through Internet information technology, and the form of the Internet of Things technology has cognitive functions that can realize "dialogue and communication" between things (Ivan, 2021). The OBE concept is integrated with the Internet of Things technology to guide the design of online open curriculum resources supporting university courses. The retrospective design method makes the developed curriculum resources more reasonable and adapts to the development and changes of the social industry.

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Learners can also directly study independently through the Internet, without being restricted by time and space, and obtain more learning information and resources. It is not only conducive to mobilizing and enhancing learners' enthusiasm for learning activities and the development of self-study ability, but also can help promote learners to further improve their learning efficiency in future learning. That is considered to be the most effective means for us to implement lifelong education.

Combined with domestic and foreign research, different scholars have put forward different views on the OBE concept and the autonomous learning model under the Internet of Things environment. Kennedy M studied the impact of Outcomes-Based Education (OBE) on students pursuing a degree in human services, especially those in police programs. This work tested the validity of the following view: OBE is a progressive teaching method that can improve the quality of education and subsequent professional practice (Kennedy, 2020). Mohieldein A H believes that OBE is a holistic approach that provides a powerful and attractive way to reform and manage medical education to master learning and meet the prerequisites for local and international certification (Mohieldein, 2017). Business environments such as information technology (IT) are constantly changing, and organizations are constantly trying to change themselves to survive and succeed in the ever-changing environment. The purpose of Bae S J's research is to investigate the impact of organizational members' psychological factors on new IT performance, which is one of the most important organizational changes (Bae, 2016). Nakonechna has studied the characteristics of the self-learning organization of translators in American universities in the future. Various studies on this issue have proved that the underestimation of self-learning leads to the lack of professional ability of translators in the future (Nakonechna, 2017). Pradhan D mentioned in the article that Outcome-Based Education (OBE) is a prominent trend in today's education field, allowing manual students to gain more information and creativity in their careers. Then, they discussed the importance of sports and proposed engineering colleges. The framework and strategy of college students performance appraisal and evaluation, combined with the discussion of the four operating concepts of OBE (Pradhan, 2021). Sisavath C takes "Internet of Things close to life, easy to use" as the design concept, and builds a smart home system based on the Internet of Things, including modules including escape board module, node module and APP module (Sisavath, 2021). Lv Z explored the stability of the mobile network system in the next-generation Internet of Things applications, introduced the computing migration framework of the next-generation network, and summarized the concept and content of mobile edge computing using SDN and NFV (Lv, 2020). Baronio G proposed an interactive self-study tool called Technical Drawing Learning Tool-Level 2 (TDLT-L2), which is used to teach engineering students about manufacturing dimensions. Statistical considerations on the results obtained confirm that the tool is the effectiveness of self-study tools increased by about 8.8% on average (Baronio, 2016). These studies did not analyze the self-learning model of OBE concept through specific survey examples, and they were not empirical.

The innovations of this article are mainly reflected in:(1) The basic concepts and implementation points of the OBE educational philosophy are given, and combined with the Internet of Things information technology, to explore its development effects in the autonomous learning mode. (2) Several different modes of autonomous learning were explored, and finally, a self-learning course carrying the OBE concept can provide effective help for students' autonomous learning.

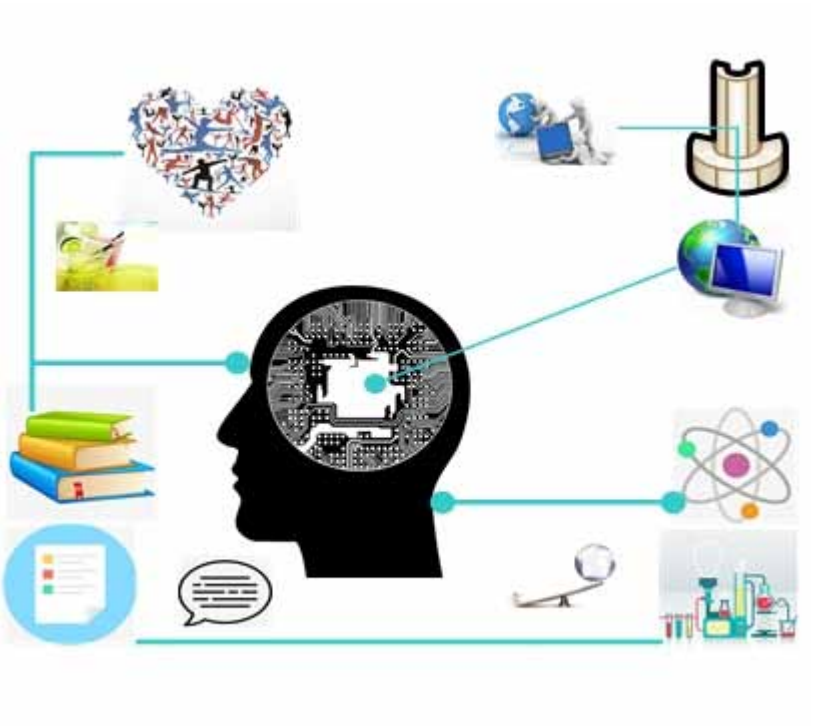
2. CONSTRUCTION METHOD OF OBE CONCEPT AUTONOMOUS LEARNING MODEL

2.1 OBE Education Philosophy

OBE education concept is also called achievement oriented education, ability oriented education, goal oriented education or demand oriented education. OBE education concept is a kind of construction concept of curriculum system with achievement as the goal orientation, student-oriented and reverse thinking. It is an advanced education concept. The OBE concept should emphasize the spirit of

innovation, as shown in Figure 1. The concept of combined learning and entertainment education should also clarify the core qualities that learners should have when they graduate. On this basis, the appropriate educational structure should be designed back to ensure that the expected objectives are achieved. In this process, the corresponding courses and resources are indispensable (Jin, 2018).

Figure 1. OBE innovation



2.2 Key Points for the Implementation of OBE Educational Philosophy

First, determine your own learning results. The final learning result (peak learning result) even if it is the end of OBE, it is also its starting point. The learning result itself should be able to be clearly expressed and directly or indirectly measured, so it is often necessary to convert them into a performance indicator (Cui, 2018). In determining their own learning outcomes, need to fully consider the various education stakeholders' needs and expectations. These stakeholders include not only local governments, schools, and employers, but also students, teachers, and parents of students.

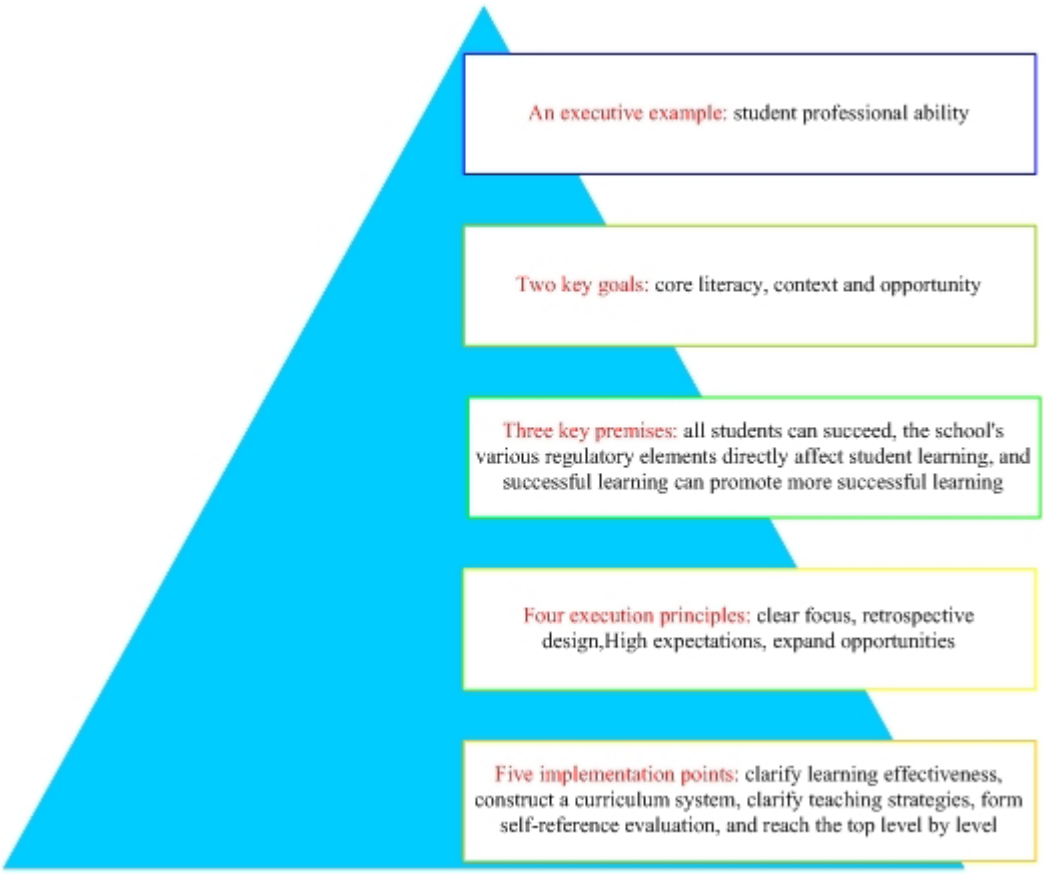
Second, build a curriculum system. Learning achievement is a kind of ability structure, which is mainly realized through course teaching. Therefore, the construction of a learning system is particularly important for the realization of learning outcomes. There should be a clear mapping relationship between the ability structure and the curriculum system structure, and each capability in the capacity structure should have a clear course support. In other words, each course in the curriculum system should make a certain contribution to the realization of the ability structure. This mapping relationship between the curriculum system and the ability structure requires students to have the expected ability structure after completing the curriculum system (Huo, 2017).

Third, determine the teaching strategy. OBE especially emphasizes what students learn rather than what teachers teach, emphasizes the output rather than input of the teaching process, emphasizes research teaching mode rather than indoctrination teaching mode, and emphasizes individualized teaching rather than "carriage-style" teaching. Individualized teaching requires teachers to accurately understand each student's learning trajectory, and to understand each person's goals, basis and process in time. According to different requirements, develop different training plans and provide different training opportunities (Dastjerdi, 2016).

Fourth, self-reference evaluation. OBE teaching evaluation focuses on learning results, rather than teaching content, learning time and learning methods. Adopt multi-level evaluation standards. The evaluation emphasizes the connotation of academic performance and personal learning progress, and does not emphasize the comparison between students. According to the level of each student to meet the educational requirements, different levels of assessment from unskilled to excellent are given for targeted assessment. Through a clear understanding of the learning situation of students, it provides references for schools and teachers to improve teaching (Rubaai, 2016).

Fifth, reach the peak level by level. Divide the learning process of students into different stages, and determine the learning objectives of each stage. These learning goals range from elementary to advanced, and ultimately achieve the best results. This means that students with different learning abilities will use different time and achieve the same goal in different ways and methods (Dhara, 2017). Figure 2 shows the element structure pyramid system under the OBE concept.

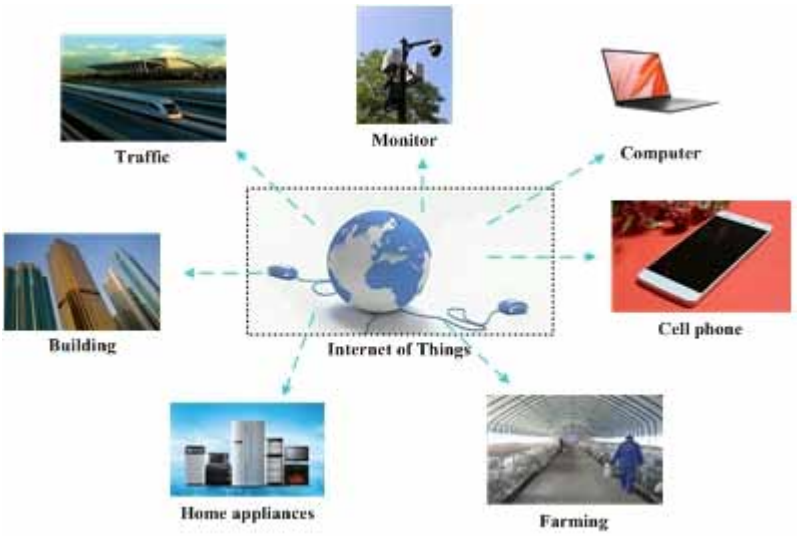
Figure 2. The element structure pyramid system under the OBE concept



2.3 Internet of Things Information Technology

The most important thing in the technology system of the Internet of Things is information, and information resources, like matter and energy, have important practical significance and value (Qi, 2021). At the level of information exchange, people gradually realize that information is an important strategic resource. Therefore, it will cause a series of competition and conflicts and encounter the distribution of information resources-the possession and utilization of high-quality information resources (Hou, 2016).With the rapid development of current information technology, terminal electronic devices are emerging one after another, such as mobile terminals, tablet computers, PCs, etc., as shown in Figure 3, everyone can be a producer, disseminator, processor, and consumer of information, together with traditional products and services, information resources also have important value. However, certain characteristics of information will also produce new changes that will have a certain impact on the development of human society, such as the mobility, virtual sex, and security of information resources, which will have a significant impact on the interaction between people (Liu, 2016; Ying, 2021).

Figure 3. Internet of Things and life



Data communication methods mainly include (1) wireless public network (such as: GPRS network communication) method; (2) wired network method.

Using the GPRS public network to transmit the data collected by the terminal is one of the most common connection methods in the Internet of Things industry. It has the advantages of wide coverage, strong real-time performance, and low construction cost.

The wired gateway system transmits data, and the technology is mature and easy to operate. Since it is a self-built network, there is generally no traffic charge.

The Internet of Things has three main parts: sensor networks, Internet-side applications, and the connection path between the two networks. Figure 4 and Figure 5 describe the two main schemes of connection technology. Among them, the public network is mainly a wireless network, with simple transmission and low construction cost. The network protocol has also been integrated into the GPRS module. The network part of the development only has a small amount of work such as configuring IP parameters. User only needs to transmit the data to be transmitted to the GPRS module, without

Figure 4. Data transmission system architecture based on GPRS public network

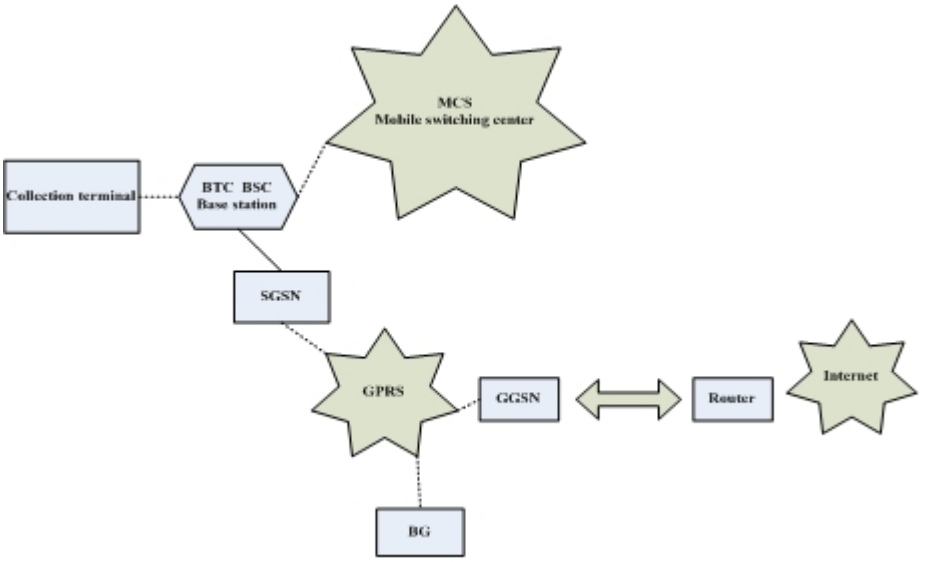
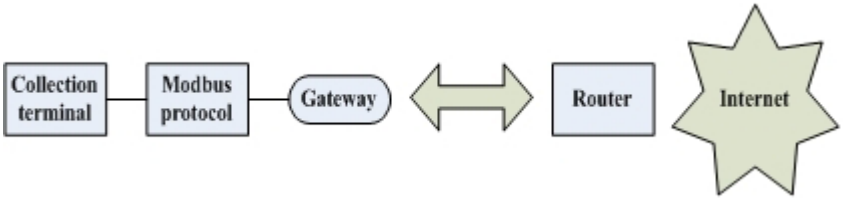


Figure 5. Data transmission system architecture based on wired gateway



having to consider too much about the transmission channel and connection. The wired connection method requires users to lay their own channels to connect the sensor network and the Internet, and integrate the network protocol into the entire system (Ehsan, 2017; Sun, 2016; Stephen, 2017).

2.4 QOS Parameter Evaluation of BQC-AOMDV in the Internet of Things

In the design of the BQC-AOMDV protocol, the QoS requirements of the service are summarized in four aspects: delay, reliability, available bandwidth and energy. The packet delay D is characterized by the time difference between two nodes in each path, the reliability N is characterized by the average connection degree, the available bandwidth X is characterized by the minimum bandwidth of each path, and the energy Y is characterized by the path node. Finally, the overall quality of service K of the path is defined to represent the QoS requirements of a specific service (Ye, 2021).

(1) Packet delay D

Each node records its time stamp in the Time Stamps field, and then calculates the time interval from the previous node, and at the same time, the cumulative delay obtained by formula (1) is recorded in the delay field of the RREQ packet and forwarded to the next neighbor node (Geng, 2020). Until in the end, the destination node uniformly uses formula (2) to calculate the average delay of the link

as the final packet delay of the link. Among them, RREQ Size represents the total amount of data involved in the transmission, and Size Data represents the size of a single data volume.

$$Delay_{RREQ} = \sum_{i=1}^{N} \left(Y_i - Y_{i-1} \right) \tag{1}$$

$$D = {}^{Delay_{RREQ}}_{Size_{RREQ}} Size_{Data} \tag{2}$$

(2) Reliability N

The connection degree of each node on the path can be used as the characteristic value of path reliability. The connection degree of each node recorded by RREQ, the connection degree of the path is calculated by formula (3), which is finally used as a QoS parameter to measure the reliability of the path (José, 2016). In the formula, N represents the number of nodes on the path, and Bi represents the number of neighbor nodes of the node i.

$$N = (\sum_{i=1}^{N} B)_i \ / \ N \tag{3}$$

(3) Available bandwidth X

In an AD hoc network, the minimum bandwidth of all nodes on the link determines the available bandwidth of the path. Take the minimum bandwidth of all nodes on the path as the characteristic value of the path available bandwidth X, as shown in equation (4). Among them, Rmax is the maximum length of the packet queue that the node on the path can send, which is determined by the physical bandwidth of the node; the length of the packet queue waiting to be sent by the node i in the Ri path (Ai, 2016).

$$X = min\{Rmax \text{ -Ri}\} \tag{4}$$

(4) Energy Y

Obtain the remaining energy of the current node as the node energy value. Record the path RREP remaining energy value of each node, and then calculate the minimum energy value of the path through the source node according to the formula (5). The node failure caused by energy exhaustion will lead to the failure of the entire path or even re-search, which will greatly increase the network overhead and transmission delay (Apiletti, 2017). Therefore, an energy threshold Yf needs to be set. When it is lower than this threshold, the source node does not maintain its path.

$$Y = min\left\{ Y_i \right\} \tag{5}$$

(5) Overall path service quality K

The overall service quality of the path is the carrier of the user's demand. The specific operation is to actively adjust the weight of each parameter in the service quality according to the characteristics of different services, which ultimately leads to the selection of the optimal route for the service. The mathematical expression of K is shown in formula (6):

$$K = \frac{bN + cX}{aD} \tag{6}$$

Among them, a, b, and c are the weights of delay, connectivity, and available bandwidth, and the sum of the three is 1. The user can adjust it adaptively according to the type of service and network model, and add it to the data packet header structure through software control in.

Since the communication between ad hoc nodes is achieved through wireless propagation, the entire system can be simplified into a sending module and a receiving module. Among them, the transmitting part consumes energy in the process of the transmitting circuit and the amplifying circuit, while in the receiving part, only the receiving circuit consumes energy. Therefore, the first-order mathematical model of energy consumption can be expressed as:

$$E_A = hE_B + hE_f x^2 \tag{7}$$

$$E_M\left(h\right) = hE_B \tag{8}$$

Among them, EA represents the energy consumed by sending data, EM represents the energy consumed by receiving data, EB represents the energy consumption of the sending circuit and the receiving circuit, h represents the number of bits contained in the sent data packet, x represents the transmission distance, and Ef is a constant. Among:

$$E_B = 50nJ \,/\, bit \tag{9}$$

$$E_f = 10pJ \,/\, bit \,/\, m^2 \tag{10}$$

2.5 Reliability and Validity Test of the Questionnaire

(1) The meaning of reliability

Test reliability, also known as test reliability, refers to the consistency of the results obtained by the same group of subjects in the same test twice or more. In measurement theory, reliability is defined as the ratio of the true variance of the test score to the total variance (ie, the measurement score):

$$R_{xx} = \frac{ST2}{Sx2} \tag{11}$$

In the formula, Rxx represents the reliability of the measurement, and ST2 represents the variance of the true score. Sx2 represents the variance of the real score.

As can be seen from the above formula, reliability refers to the difference between the measured value and the true value. The measured value refers to the value obtained when actually measuring something, also called the measurement score (x); the true value refers to the true scale value of the measured object, also called the true score (T). For various reasons, the actual score is usually not equal to the true score, and the difference between the two is measurement error or error score (E). In theory, the actual score includes the true score and the error score, that is, x=t+E. RXX is the best estimate of the difference between the measured score and the true score of a set of test data.

(2) Reliability estimation method

In actual measurement, usually only the actual score (x) and actual variance (SX2) can be obtained, while the true score (T) and true variance (ST2) are unknown. Therefore, the reliability factor cannot be calculated according to the above formula. The correlation analysis method is mainly used in statistics, that is, a computer is used to calculate the correlation coefficient of two columns of variables, and the size of the correlation coefficient is used to indicate the reliability. The test-retest method is mainly used to calculate the reliability, that is, the same subject performs two tests before and after the same test, and calculates the correlation coefficient based on the scores of the two tests, that is, the test-retest reliability. Reliability reflects the stability of the test, so it is also called the stability coefficient, which is calculated by the PEARSON product moment correlation formula:

$$R_{xx} = \frac{\sum X_1 X_2 / N - M_1 M_2}{S_1 * S_2} \tag{12}$$

Where X1 and X2 are the two test scores of the same subject, M1 and M2 are the average scores of the two tests, S1 and S2 are the standard deviations of the two tests, and N is the number of subjects.

Splitting method: when there is no repeated test and the test is only applicable to one test, the halving method can be used to estimate the reliability, that is, the test questions are divided into two equal parts, and the correlation coefficient is calculated according to the scores of each person in the two parts of the test. Through the reliability factor, it will test the reliability of the entire test of the entire test. Therefore, the test coefficient needs to be corrected, and the correction formula is the Spearman-Brown formula:

$$R_{xx} = \frac{2Rhh}{1 + Rhh} \tag{13}$$

Rxx is the reliability estimation coefficient of the entire test, and Rhh is the correlation coefficient of the two and a half tests. The premise of the above formula is that the variability of the two and a half test scores is equal, but if the test data does not satisfy this assumption, the reliability can be obtained by the following Fronner formula:

$$R_{xx} = 2^* \left(1 - \frac{Sa2 + Sb2}{Sx2}\right) \tag{14}$$

Sa2 and Sb2 respectively represent the variance of the scores of the two subtests, and Sx2 represents the variance of the entire test.

For a test composed of objective questions, the internal consistency of the test can be estimated using the Kudd-Richardson formula:

$$Rkk = \left(\frac{k}{k-1}\right)(1 - \frac{\sum\left(pq\right)}{Sx2} \tag{15}$$

K is the total number of questions in the test, P is the rate of correct answers or the proportion of people who pass the test, q is the proportion of people who fail the test, P=1-q, and Sx2 is the variance of the total test score.

For a test composed of objective and subjective questions, when certain questions are scored multiple times, the coefficient calculated by the Kronbach formula should be used to estimate the internal consistency of the test:

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum Si2}{Sx2}\right) \tag{16}$$

K is the total number of test questions, Si2 is the variance of a certain question score, and Sx2 is the variance of the entire test score.

(3) Validity

Validity refers to the validity or correctness of the measurement, that is, the degree to which the test can measure the characteristic to be measured. The validity of the test is relative, not absolute.

In measurement theory, validity is defined as the ratio of the true variance related to the measurement purpose to the total variance in a series of measurements:

$$rxy2 = \frac{Sy2}{Sx2} \tag{17}$$

rxy represents the effective coefficient of the measurement, sy2 represents the effective variance, and Sx2 represents the total variance. According to the above formula, we can see the relationship between validity and reliability:

$$Sx2 = Sy2 + SI2 + SE2 \tag{18}$$

$$ST2 = Sy2 + SI2 \tag{19}$$

$$rxy2 = \frac{Sy2}{Sx2} = \frac{ST2 - SI2}{Sx2} = \frac{SI2}{Sy2} \tag{20}$$

$$\therefore rxy2 \leq rxx \tag{21}$$

SI2 stands for systematic error variance, which is combined steadily with effective variance and has no effect on reliability, but has an effect on validity. From the above evidence, the validity of the test is limited by the reliability of the test, and the validity coefficient is not greater than the reliability coefficient. Efficient tests must have high reliability, but high-reliability tests are not necessarily efficient.

3. EXPERIMENTAL RESULTS OF OBE CONCEPT AUTONOMOUS LEARNING MODEL

3.1 Questionnaire Survey on Autonomous Learning Status of College Students

Through preliminary investigations, it is learned that most students are interested in autonomous learning and possess certain autonomous learning capabilities, but they perform relatively poorly in self-will, self-monitoring and evaluation of learning, as shown in Table 1.

Table 1. Autonomous learning status of college students

	Learning results			Learning motivation	Time management	Learning environment
	Self-evaluation summary	Self-will	Self-monitoring			
Highest score	3.741	3.689	3.521	3.598	4.198	4.589
Lowest score	1.493	1.493	1.399	2.201	1.987	2.198
Average score	2.598	2.584	2.801	2.989	3.112	3.287

Note: (5 points out of perfect score, 0-1 points are very poor, 1-2 points are relatively poor, 2-3 points are basically qualified, 3-4 points are good, 4-5 points are excellent)

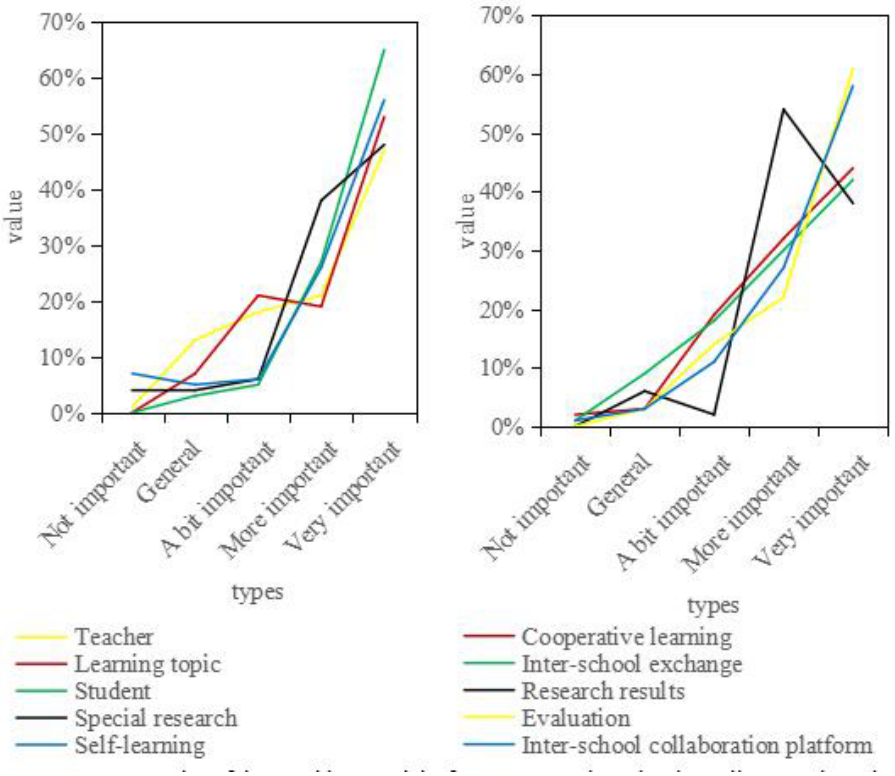
The above data is the performance of college students in six aspects: self-summarization and evaluation, self-will, self-monitoring, learning motivation, time management and learning environment. From the statistical results, it can be seen that: (1) The scores of most students are maintained at about 3, indicating that college students have the conditions for autonomous learning and have preliminary autonomous learning capabilities. (2) From the average score, college students' "self-summarization and evaluation", "self-will" and "self-monitoring" abilities are weak and need to be strengthened. (3) the performance of "learning motivation" is not very good, and needs to be further improved. (4) There is also much room for improvement in performance in terms of time management and learning environment.

In addition, we also found that only a very small number of students perform well in certain aspects of autonomous learning, and most students' autonomous learning ability is still relatively low and needs to be further improved under the guidance of teachers.

3.2 Autonomous Learning of College Students under the Internet of Things Information Environment

In order to maximize the quality of the questionnaire survey, we conducted a questionnaire survey on teachers and students participating in inter-school collaboration, including teachers, tutors, and students in each school. The results of the survey are shown in Figure 6. The survey results show that it is very important to take students as the main body for autonomous learning in an information environment. Of course, teachers also play an auxiliary role in the autonomous learning of students.

Figure 6. Survey results of the teaching model of autonomous learning by college students in an information environment



With the advent of the Internet of Things information era, educational information has become an inevitable trend in the development of education. There are a growing number of online courses, and autonomous learning models are becoming more and more common. CNKI uses "online course resources" and "autonomous learning models" as the subject of the search, of which there are 157 documents related to "online course resources" and 139 documents related to "self-learning mode". See Figure 7 in terms of the number of documents. According to the year, the number of published documents is increasing.

The source of the thesis includes degree, conferences, and journals, and the distribution of disciplines includes economics and management sciences, information technology, and social sciences as shown in Figure 8. It can be analyzed from the figure that the literature on the study of autonomous learning mode and the construction of online courses is dominated by journals, most of which are concentrated in the field of social sciences, and there are relatively few research papers.

Figure 7. Annual distribution of online course resource construction literature publication

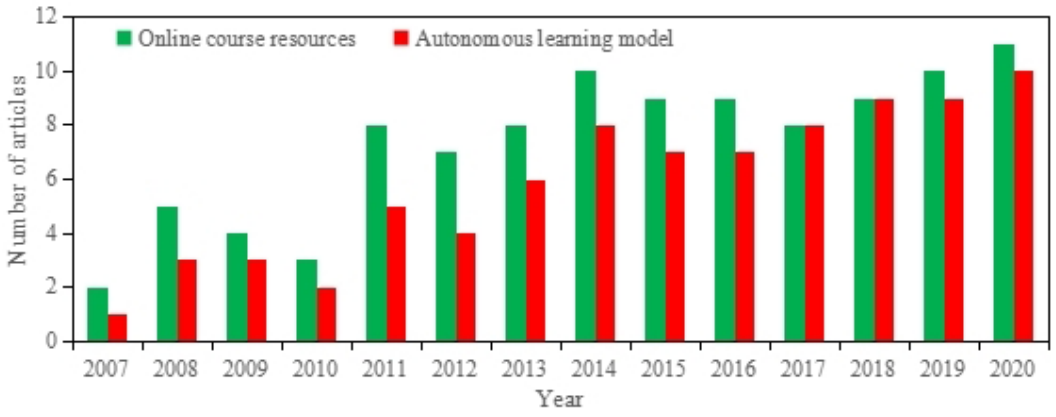
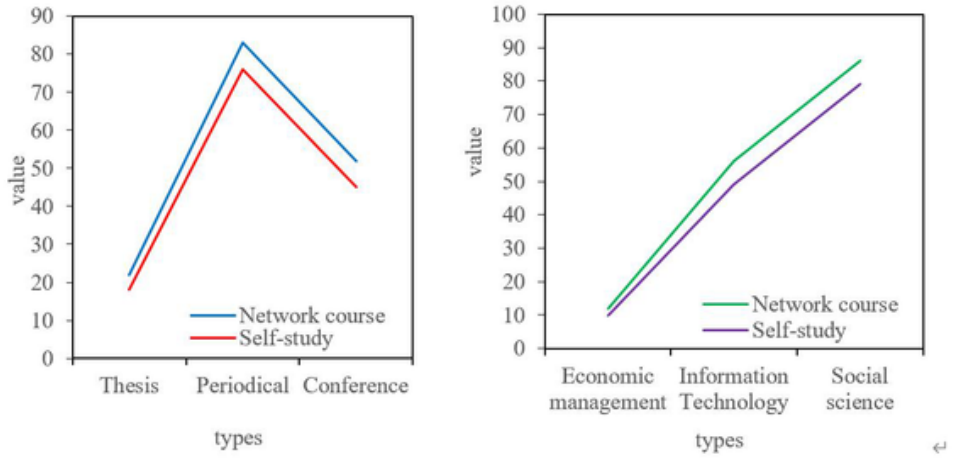


Figure 8. Data source and subject distribution



From the above data, we can see that the Internet of Things education will become the mainstream. To this end, we launched an inter-school collaboration survey. In the initial stage of the inter-school collaboration, we conducted an online survey of students from various schools participating in the

Table 2. Survey results of autonomous learning ability of college students (pre-test)

	Self-evaluation summary	Self-will	Self-monitoring	Learning motivation	Time management	Learning environment
Highest score	3.651	3.656	3.437	3.812	4.269	4.599
Lowest score	1.876	1.711	1.634	2.438	2.099	2.219
Average score	2.822	2.921	2.978	3.217	3.329	3.501

inter-school collaboration, and learned that most students have relatively low autonomous learning capabilities. See Table 2 for details.

When the inter-school collaboration is in the mid-term, another online survey of the students participating in the inter-school collaboration is carried out. The results of the survey are shown in Table 3.

Table 3. Survey results of autonomous learning ability of college students (post-test)

	Self-evaluation summary	*Self-will*	*Self-monitoring*	*Learning motivation*	*Time management*	*Learning environment*
Highest score	3.661	3.723	3.514	3.931	4.509	4.678
Lowest score	2.511	2.712	2.433	2.839	3.092	3.221
Average score	3.012	3.412	3.211	3.652	3.919	3.741

It can be seen from the survey results that most students have made significant progress in "self-summarization and evaluation", "self-will", "self-monitoring" and "learning motivation". It is particularly worth noting that the minimum scores of each item have increased a lot, which is enough to prove that the implementation effect of the autonomous learning teaching model for college students in the information environment is ideal. In addition, most students have also made some progress in the "time management" and "learning environment" of autonomous learning.

It can be concluded from the evaluation and analysis of college students' autonomous learning ability before and after that, the scores of the post-test are higher than the scores of the pre-test. The results show that most students agree with the autonomous learning model under the information environment.

3.3 Effect of OBE Concept Autonomous Learning

Course resources are the basis and guarantee for the development of teaching practice. The self-learning stage starts with the upload of course resources. Teachers upload the course resources carrying the OBE concept to the Internet in advance and publish them as online open course resources. Curriculum resources mainly include micro-video teaching resources, related teaching courseware, task guides, basic course information, teaching periodic tests, and expansion resources. Then conduct a questionnaire survey of OBE concept autonomous learning for students. The survey content of this questionnaire is divided into several aspects such as the analysis of the effect of students' autonomous learning before class, the analysis of the use effect of micro-course resources, and the analysis of the teaching effect of other curriculum resources.

According to the grading dimension of the Likert scale, the grading dimension of the content of the students' self-learning attitude survey before class is averagely divided into 4.04 (average score for each question = weight * frequency / number of items included in the question, average dimensionality = average score for each dimension addition/number of dimensions), exceeding the average score of 3 points, it can indicate that the learner's acceptance of the course meets the requirements and can carry out learning well. As shown in Table 4.

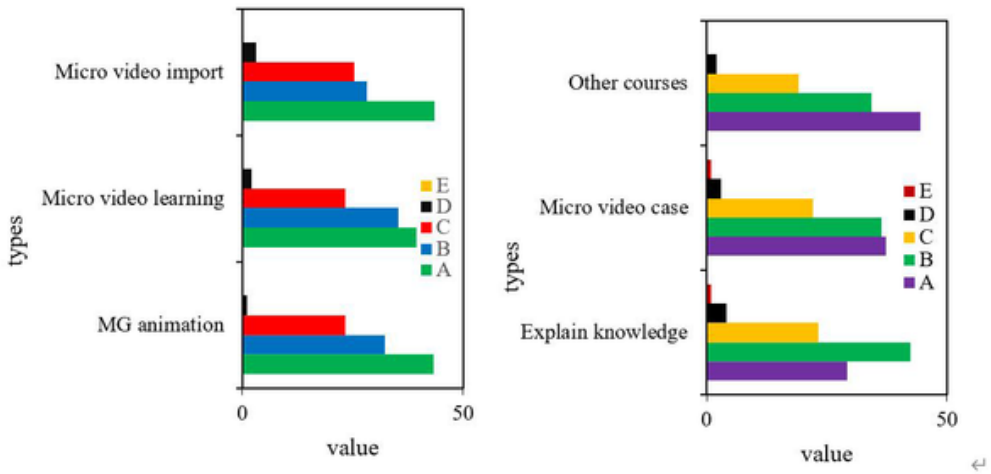
(1) Analysis of the use effect of OBE concept micro-course resources

Table 4. Analysis of the effect of autonomous learning

Student Evaluation Index	A	B	C	D	E	Evenly split
Self-study is necessary before class	39.65%	31.82%	22.73%	4.80%	1.01%	4.34
Tend to use micro-videos for autonomous learning	35.35%	37.37%	20.20%	7.07%	0%	4.01
You have mastered all the knowledge points in the micro course	25.25%	35.35%	31.31%	5.05%	3.03%	3.75
Using the micro-course resources to improve the quality and efficiency of learning	40.40%	36.36%	20.20%	3.03%	0%	4.07

As shown in Figure 9, it shows the proportion of the use effect data of micro course resources. The feedback of learners is investigated in terms of the stimulation of learning interest in the form of MG animation, the clarity of learning objectives, the way of classroom introduction, the explanation degree of theoretical knowledge, the explanation degree of case operation, and the promotion of micro video in the form of MG animation.

Figure 9. Analysis of the use effect of micro-course resources



1) It is believed that the MG animation form can stimulate the interest of learning accounted for 75.75%, there are 75 students. 23.23% hold a general attitude, and there are 23 students. 1.01% of those who were opposed, there was 1 student, Likert is divided into 4.19. It can be seen that the vast majority of students agree that micro-course learning in the form of MG animation can stimulate interest in learning.
2) 74.74% of students who think the learning goals in micro videos are very clear. 23.23% hold a general attitude, and there are 23 students. The disapproval accounted for 2.02%, and there were 2 students. The Likert score is averagely 4.12. It shows that the micro-course resources designed by this institute can achieve clear learning goals.
3) The proportion of students who think they like the classroom introduction of micro video is 71.71%, with 71 students. The general attitude accounted for 25.25%, with 25 students. 3.03%

of the students were opposed, and there were 3 students. Likert's average score was 4.12. It can be seen that the classroom introduction method designed by this research is deeply loved by students.

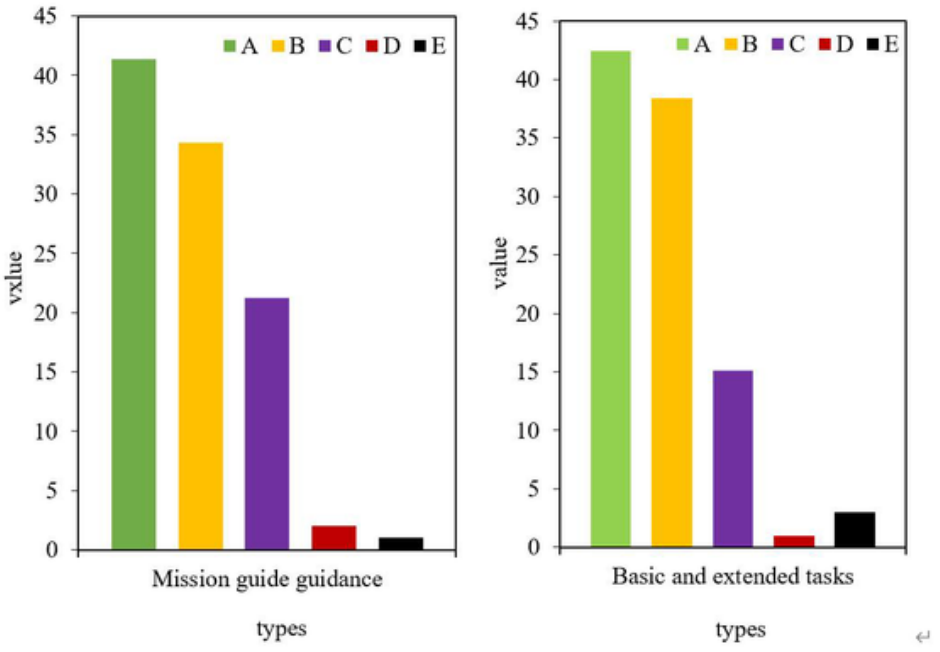
4) 71.71% of students think that micro-video can explain the theoretical knowledge points clearly. 23.23% hold a general attitude, and there are 23 students. There are 5.05% of the dissenting opinions, and there are 5 students. The Likert score is averagely 3.95. Data show that students generally agreed that this study designed micro video can clearly explain the theory of knowledge.
5) 73.73% of students think that the micro-video case operation explanation is complete and clear. Those with a general attitude accounted for 22.22%, with 22 students. The disapproval accounted for 4.04%, and there were 4 students. The Likert score averaged 4.06. It can be seen that students generally believe that the practical explanation of the case is more clear and complete.
6) 78.78% of students who think that the animation micro-video format can be borrowed from other courses. 19.19% hold a general attitude, and there are 19 students. The disapproval accounted for 2.02%, and there were 2 students. The Likert score averaged 4.21. It can be seen that students generally believe that the practical explanation of the case is more clear and complete.

Based on Likert's dimensional average calculation, the result is 4.11. It can be considered that the micro-course resources carrying the OBE concept can effectively help students to learn independently.

(2) Analysis of the teaching effect of other course resources

Figure 10 shows the experience effect of students on other related course resources, including the teaching effect of auxiliary course resources such as the task guide, the arrangement of activity resources, and whether the setting of evaluation resources is effective and reasonable.

Figure 10. Analysis of the teaching effect of other course resources



1) 75.75% of the affirmative votes that the task guidance has effectively guided self-directed learning. Those with a general attitude accounted for 21.23%. 1.01% of those who hold an objection, there are 1 person. The Likert score is averagely 4.15. It can be seen that most students think that task guidance can effectively guide autonomous learning.
2) 80.8% think that basic tasks and extended tasks deepen their understanding of knowledge. Those with a general attitude accounted for 15.15%. The disapproval accounted for 4.04%, with 4 people. The Likert score is averagely 4.16. This shows that basic tasks and extended tasks can effectively promote learners to deepen learning and understanding of knowledge.

Based on Likert's dimensional average calculation, the result is 4.14. Therefore, the quality of other curriculum resources has also been generally recognized by students and can be used as an effective tool for their knowledge internalization and skill acquisition.

4. DISCUSS

The increasingly advanced development and popularization of information technology is opening up broad space and prospects for learners' lifelong learning, and autonomous learning under the background of the information age is becoming more and more obvious. Under the background of the information age, autonomous learning has gradually developed into an excellent classroom teaching environment, which is also a new development trend of lifelong learning.

Generally speaking, different learners construct their own knowledge system in different learning methods. Therefore, external teaching and learning methods will greatly affect the construction of students' knowledge system. Autonomous learning under the information environment enables learners to gain with more autonomy, students can learn in the way they like to maximize their learning potential and meet their learning needs.

In the process of self-learning through the Internet, learners change from passive to active, which requires them to boldly innovate in the way of receiving knowledge and seek scientific proof. At every step of learning, learners have to face some network information, some of which are true, and some require further demonstration. The information selection process must be careful and rigorous. Through this process, they have cultivated their attitude towards science, and the most important thing is that they can have their own opinions on certain issues, and cultivate innovative thinking.

Most learners hold a positive attitude towards the autonomous learning model in the information environment. They believe that they have the ability to determine learning goals, formulate learning plans, select learning content and learning methods, and conduct self-monitoring and self-assessment. They will do better if they also adopt this teaching method. This shows that most students are very interested in the self-directed learning teaching model, and are willing to carry out self-directed learning, and are responsible for their own learning. However, there are also unoptimistic phenomena. A few students think that in team learning, they play a very small role, the team leader's organizational ability is not strong, and the team members' enthusiasm cannot be mobilized well. Many tasks are under the supervision and supervision of the team leader. It is completed passively, lack of communication and communication between team members, and low team collaboration efficiency. There is also an unreasonable division of labor among individual teams, resulting in tasks that cannot be completed on time with quality and quantity. Therefore, while seeing the results, we must also pay attention to the existing problems.

5. CONCLUSION

This study is based on the content of the information environment, combined with the OBE concept to carry out design exploration, and analyzes that in the era of Internet of Things information, educational information will become an inevitable trend in the development of education. The self-study resources, mainly based on the micro-courses carrying the OBE concept, have greatly stimulated the interest of learners with its rich expression forms, and are more inclined to active learning, which inspires learners' initiative. The important and difficult points in the teaching process are prominent, complete and good teaching design, and rich expression forms. As a product of education information, the typical characteristics of micro-courses can better adapt to the needs of learners and meet the needs of teaching. At the same time, the flexibility of online self-learning resources can support learners to learn anytime and anywhere, and complete the internalization and transfer of knowledge more efficiently. Online open curriculum resources can try to add interactive functions through technical means to more stimulate students' initiative in learning, to achieve interaction, so that students can integrate into the teaching context, and reflect the dynamic and interactive nature of learning. At the same time, in the process of designing curriculum resources, try to leave a certain amount of space so that students can also participate in the process of curriculum resource construction, reflecting the individualized construction of curriculum resources.

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