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Design of Learning Structure of Digital Online Gaming Art Based on Task Mode

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Abstract. The contemporary education community has been trying to use video games or game elements in teaching in recent years. The pioneers in this field have tried to improve the quality of education by means of educational games or gamified teaching, but it has been difficult to be widely promoted for various reasons. In recent years, attempts have found that although there are certain advantages over educational video games and gamified teaching, like the former, there are still considerable difficulties in popularizing them in practice. Therefore, this paper proposes a learning structure design based on the big data video game task mode, hoping to make the learning process really arouse the learners' interest in learning, achieve good learning results in a relaxed and focused learning atmosphere, and achieve unsupervised high efficiency. Self-learning. Finally, the F1 value of simple teaching resources is increased by 8.6% on average compared with the other four algorithms, and it can reach 0.888 when the test set is 10%; when recommending complex teaching resources, the F1 value is increased by an average of 5.6% compared with the other four algorithms. It can reach 0.958 at 10% of the test set. The above data show that the CUPMF method can effectively improve the recommendation accuracy and improve the recommendation effect.

Keywords: Big data; video game task model; learning structure; teaching
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1 INTRODUCTION

In the early stage of childhood growth, "play" has a positive impact on children's psychological, social and intellectual growth, and "play" as a way of learning is gradually recognized[18]. With the growth of information technology, video games have become one of the main ways of "playing" the current public[11]. Some studies have found that video games can affect individual cognitive function and motivation, video games can make learning more interesting and can promote learning[5]. The contemporary video game industry has surpassed other traditional media in terms of audience size

and economic scale, and still has huge growth potential in the future. Video games have a special attraction and influence on student groups, and the educational community has gradually realized and must consider how to adapt rather than limit the existence of video games[14]. After years of attempts and explorations, video games for educational purposes can become an effective educational tool, which has become the consensus of the educational technology community. But attempts to use video games in education faced difficulties from the start. The main obstacle is not from the technical link, but from the social psychology. Although video games were born in scientific research places, they can be promoted because of their high commercial value. Therefore, for a long time, video games have been a commercialized entertainment product, which has given video games a "non-existent". education" stereotype[7]. This stereotype is reflected in the attitude of public opinion, which is the general belief that students should be restricted from using video games so as not to adversely affect their studies. As a result, early video game researchers focused on the negative effects of video games. Therefore, in order to reflect its positive impact, it enables the task mode to promote students' learning.

At the beginning of their appearance, they were just another new electronic representation form in diversified modern entertainment[6]. Unexpectedly, however, since the day of its birth, video games have become more attractive to young people than imagined, especially a large number of primary and secondary school students who have joined them and become so-called "game enthusiasts". The media also reported some problems that may be caused by video games - such as unintentional schoolwork, wasted energy, moral and personality problems, violent behavior caused by games, etc. - calling it "gaming disorder", and even more. The game is regarded as "electronic heroin"[20]. The problems caused by video games are not only actively exaggerated by the media, but are also criticized by parents and teachers almost unanimously. Therefore, this paper makes use of the advantages of big data algorithms, analyzes and mines the teaching resource library, and conducts research on the task model combined with video games, so as to obtain a reasonable learning structure to promote children's learning. this research aims to contribute to the development of an innovative learning structure for video game task mode by leveraging online gaming and big data analytics. By providing insights into the benefits and challenges of using these elements, this study offers a foundation for enhancing the learning experience and performance outcomes of learners engaged in video game task mode.

The application of early educational games in the classroom was not smooth. Due to the limitations of hardware conditions and game types, most of the teaching attempts using computer games were not effective. Therefore, for a long time, the application of educational games has been used for vocational skills training, especially training new employees to adapt to corporate culture. Moreover, there are some special education uses[19]. These applications do not have many requirements for the actual teaching effect, and few people evaluate them in detail[12]. The specific purpose of teaching is transformed into a teaching mode that is organically combined with the teaching system and simultaneously achieves a variety of teaching goals[8]. Educational resources are course materials that are designed and developed to achieve certain teaching purposes, support teaching activities, and are stored in digital form. However, digital education resource services still have problems such as mismatch with demand and lack of dynamic adaptability. Therefore, this paper discusses the impact of big data on educational resource services, analyzes the connotation, characteristics and service modes of digital educational resource services under the background of big data, and explores new paths for improving the quality of digital educational resource services. Based on the learning structure of the big data video game task model, this paper will use the digital technology under the big data to combine it with the video game teaching, break through the teaching innovation, and create a new teaching and learning model. Its innovations are:

1. This paper uses the method of big data analysis to analyze the teaching of video game task mode, in order to analyze the structure of initial learning and promote the learning effect of students.

2. This paper designs a system for the task mode of video games, and also adopts the cognitive diagnosis theory to optimize students' learning efficiency and teaching methods.

This paper studies the problem of learning structure design based on the task model of big data video games. The structure is as follows:

The first chapter is the introduction part. This part mainly expounds the research background and research significance of the learning structure based on the big data video game task model, and proposes the research purpose, method and innovation of this paper. The second chapter mainly summarizes the relevant literature, summarizes the advantages and disadvantages, and puts forward the research ideas of this paper. The third chapter is the method part, which focuses on the system design combined with the characteristics of video games. The fourth chapter is the experimental analysis part. This part is experimentally verified on the dataset to analyze the performance of the model. Chapter five, conclusion and outlook. This part mainly reviews the main content and results of this research, summarizes the research conclusions and points out the direction of further research.

2 RELATEDWORK

The so-called video game teaching resources are teaching resources that integrate game resources into teaching activities. Its main components are educational game resources, but educational games mainly refer to some computer game software, and some non-computer game resources are also included in game resources. resource.

When Zhang Z J inspected the main existing forms of teaching resources, he divided game teaching resources into two parts: "official" and "civilian". Generally, game teaching resources refer to "civilian" teaching resources[21]. When Sugaya studied the application of folk games in kindergarten teaching, they believed that the scientific, ideological and educational nature of games should be paid attention to when choosing game teaching resources[17]. Wang Rimler M S conducted a survey on the growth and utilization of sports game resources in colleges and universities and found that in college physical education, the proportion of games as a teaching method is not high, and the sources of game resources are generally obtained through collection, transformation, editing, etc. Physical education teachers will also create and edit according to their own life experience and professional characteristics[15]. Ioannou O believes that the introduction of computer games into online education will increase the interest and effectiveness[13]. In his research on the value and utilization of game resources in ideological and moral courses, Seiko believes that the selection of game teaching resources should be carried out through teaching links and teaching tasks[16]. Taking art class as an example, Chu X J integrates many game elements into teaching through flash and Authorware 7.0 software tools, which increases the interest and effectiveness of classroom teaching[16]. Bowman N D believes that games create a safe "trial and error" learning environment for children, and learning efficiency can be improved through the fun and process experience of games[2]. When Bastos F H studied the influence of sensorimotor exercises and symbols on children's activities, he believed that games assimilated reality into children's activities, provided necessary food for activities, and changed reality according to the various needs of the self[1]. Garris R believes that the role of games in humans can at least reduce the pressure from impulse and stimulation, thereby making it possible to start internal learning[10]. Bowman N D is a master of research on the social and cultural impact of games. He expounded the core concept of the impact of games on human society and culture, and integrated game research into many levels of society[3]. He believes that if the game element in a society gradually declines in the social culture, then the survival of the whole society is at stake.

Most of the descriptions are about the impact of games on teaching, through the application of a certain game in subject teaching to analyze the impact of students' thinking and knowledge

mastery. But there are relatively few studies on how to make choices and the considerations in the selection process. In addition, there is a lack of systematic understanding of game teaching resources, and there are relatively few studies on the classification, value and characteristics of game teaching resources. Before teaching the video game task mode, we need to choose what kind of video game teaching resources are appropriate, what kind of teaching resources and learning structure are effective for learning the content of a certain class hour, and think about such problems and Further research is the premise of applying video game resources to teaching. Our ultimate goal is to improve the classroom efficiency of classroom teaching and students' classroom participation through the establishment of the database of game teaching resources and the research on the application of game-based teaching, so as to help achieve the goal of core literacy.

3 METHODOLOGY

3.1 The Connotation and Characteristics of Digital Education Resource Services Under the Background of Big Data

In the context of big data, the types of data that can be collected in the process of digital education resource services are diverse, multi-level, and rich in structure. Digital educational resource services are based on data, and the mining and utilization of these data will improve digital educational resource services to a certain extent[4]. Therefore, it is necessary to further explore the connotation and characteristics of digital educational resource services, so as to construct a new model of digital educational resource services.

The connotation of digital education resource service in the context of big data In Cihai, "service" is defined as: not aiming at material things, but satisfying the needs of others by providing living labor. In this sense, "service" includes two levels: first, the service object is to provide labor for the service object, not material. Therefore, the labor form and content of the service object and the service object's experience in the service process It determines the quality of the service; the second is to meet the needs of the served object, which is determined before being served, which can be proposed by the served person, or discovered and notified by the served person, and served by the served person. of people admit that when the service is completed, the requirements are met. "National Economic Industry Classification" defines digital teaching resources as a digital content service, which is defined as "digital teaching resources". For various digital education resource providers, including various education resource suppliers, digital education resource libraries at all levels of educational institutions and institutions, and non-profit digital education resource sharing platforms. The service target includes teachers, students, parents and related personnel in the education industry. Digital educational resource service refers to providing resource retrieval, download, subscription, upload and other functions for different types of users to realize resource search, arrangement, application and other functions.

Characteristics of digital educational resource services in the context of big data In the context of big data, through the collection, statistics and analysis of various data in the process of digital educational resource services, and their effective use, digital educational resource services are dynamic, accuracy, relevance and real-time characteristics.

1. Dynamic

The dynamic nature of digital teaching resources is mainly manifested as: first, according to the needs of learners and the level of knowledge of learners, dynamically adjust and combine learning resources to provide learners with information services; second, use modern technologies such as the Internet of Things, etc. technology, obtain dynamic educational materials from the real world; use the Internet of Things technology to realize remote control of sensor nodes, and feedback the

test results to students, which reduces costs, reduces the contradiction between extracurricular practice and internal school, and also facilitates It facilitates students' organizational observation, reduces the risk of activities, is conducive to long-term observation, and is also conducive to cross-study.

2. Accuracy

In the past, using artificial intelligence technology, it was possible to provide students with certain personalized services. However, due to the small amount of data and the collection and mining of users' personal data, it is difficult to truly meet the user's requirements. With the support of big data technology, data collection can be carried out according to a large amount of data to make it more in line with existing users, and real-time data can be carried out according to physiological monitoring data, dynamic environment monitoring data, learning process data, learning process data and other data. Analysis, find the needs of users more accurately, and provide them with accurate data services. The accuracy of digital teaching resources includes two aspects: one is to accurately describe the needs of users, and to find out the interests and behaviors of users through the user's previous query records; second, the provision of resources must be accurate.

3. Relevance

With the rapid growth of Internet technology, network and virtual organization have become a new type of cooperation. In the big data environment, in the service process of digital teaching resources, students have created a good environment for students to build an interpersonal network. Learners have strong autonomy and can spontaneously establish connections, communicate and collaborate according to the content of learning and personal interests, that is, self-organization, real, non-real-time discussions, virtual communities, etc. On the national public service platform for educational resources, students, teachers, and parents can include their offline schools and classes, and all registered students have personal web pages where they can upload learning resources, personal articles, etc. In the process of learning, self-organization and other-organization are a dynamic alliance, and thus constitute a knowledge network.

4. Real-time

In the era of big data, the real-time nature of educational information services is mainly manifested in two aspects: one is the real-time nature of educational information services; the other is the real-time nature of educational information services; Users provide educational information, such as educational news, special reports, live broadcasts, etc. The second is the real-time nature of classroom teaching activities. In some remote and poor places, teachers are lacking in resources. Using Internet technology, real-time live broadcasts can be realized in one school and multiple schools, a good teacher can give lectures for his own class, and can also allow students from different schools to participate in different teaching, so that not only can we share excellent teachers, but also help teachers in poor and remote areas.

3.2 Overview of Video Game Teaching Resources

The core of the video game teaching resource library is actually an automatic collection system for video game resources, which includes two parts: the foreground and the background. The front-end part facilitates interaction with users, and supports the functions of users inquiring about video games and uploading games. At the same time, the design is compatible with other modules independently developed by the project team - an interface module for a scale test and a multi-intelligence labeling system, to provide users with related game push services. The background part consists of a web crawler module and a game theme information extraction module. The web crawler module downloads web pages related to video games, saves them in the primary database, and allows the game theme information extraction module to extract sensitive information, mainly

including the game name, game introduction, game source, etc., and stores it in the secondary database(DB2), and then The multi-intelligence tagging system for video games independently developed by our project team will tag each game with multi-intelligence tags, and push related games to players who have deficiencies in a certain intelligence, as shown in Figure 1.

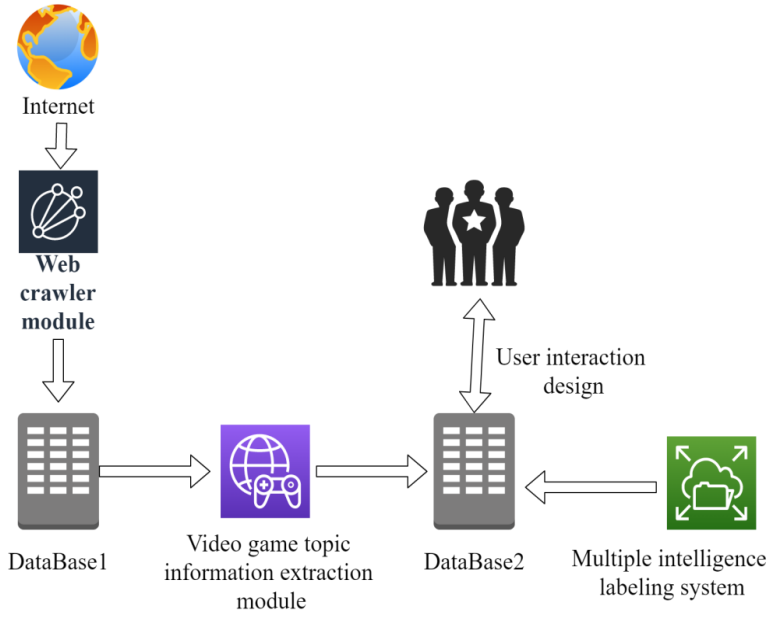

Figure 1: Content Architecture.

The core elements of video games are shown in the table below.

Element	*Feature*	*Format*
Title	*Game title in large, bold or with title number*	*Txt*
Introduce	*Text description, including game introduction, gameplay, etc.*	*Txt*
Multimedia	*Game screenshots or the game itself*	*Jpg/gif/swf/exe/...*

Table 1: Composition of core elements of video games.

Thematic crawler is a research hotspot that has emerged in recent years. The original design idea is to consider the filtering of pages, unlike ordinary crawlers, which process links to all pages. It first analyzes the subject relevance of the page to the restricted domain, and only when the subject relevance of a page meets the requirements, the links in the page will be processed. This is based on the idea that if the page is more relevant to the field, the links it contains are more likely to be relevant to the field. Compared with a comprehensive crawler, this improves the crawling accuracy. Although some pages will be missed, the overall effect is satisfactory. A well-designed theme crawler should include several modules such as theme establishment, seed bank, and correlation analysis. As shown in Figure 2.

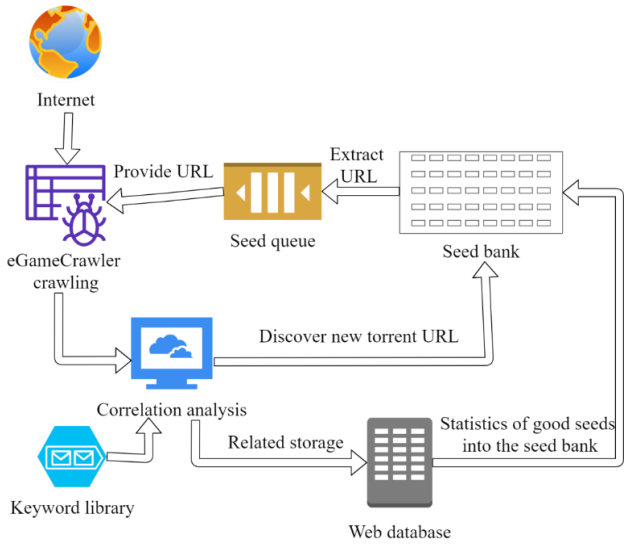

Figure 2: The theme crawler structure diagram.

3.3 Gamified Teaching System Design

1. Integrate games into various teaching sessions

At present, there are two types of popular online games in China. One is small web games, which can only be played by one or two people. Game programs are often written in FLASH or HTML5 to provide a relaxed and casual form of entertainment. The other category is multiplayer online games, which provide multiplayer interactive entertainment experiences. There are two types of popular multiplayer online games: one is a weak traffic online game (similar to QQ chess and card games), in which several players are divided into groups and usually operate in turn according to the rules. The amount of data that needs to be processed on the server side is relatively small: the other is a high-traffic online game (similar to "Honor of Kings", and the classic "World of Warcraft" and other online role-playing games), in such games, thousands of Thousands of players gather together, they communicate with each other and complete game tasks together, and the game server needs to process a large amount of data and information. In this system, games will be an important supplement to the teaching process, integrated with all aspects of teaching, and run through the teaching process from beginning to end. Different forms of online games are suitable to be integrated into different teaching links: small web games can be used to package assignments, exercises and pre-class previews by gamification in the form of "answer the answer", "whack the hamster", "answer the question and pass the test", etc. Theoretical knowledge is integrated into the happy game process: low-traffic online games allow students to gather together, freely choose study groups, and conduct unit review: high-traffic online games can be integrated into more teaching activities. In addition, the virtual reality(VR) technology is integrated into the game to form a VR game, which can provide virtual simulation experiments and exhibition halls.

2. Recommend the most suitable game format

In the teaching system proposed in this paper, various forms of games will be provided. For example, various forms of games such as "answering the answer", "whack-a-mole", "answering the question and passing the level" can be provided in the web page mini-game module. Different students are interested in different forms of games. For example, some girls prefer casual games, while some

boys prefer fighting games. The background service system is based on campus big data and adopts the user-based collaborative filtering method to recommend the most suitable game form for each student. Before recommending a game form, the system first finds a set of other students with similar interests to the target student. The following formula can be used to calculate the similarity of students' interests.

$$S_{ab} = \{N(a) n N(b)\} \tag{1}$$

In the formula, the S_{ab} representation a, b the similarity between the two students, $N(a)$ and the set of game forms $N(b)$ that represent the student a and the students b who have had positive feedback respectively.

After obtaining the similarity of students' interests, the following formula can be used to calculate the students' interest in a certain game form.

$$X(a,i) = \{ \underset{be S(a,m) n N(i)}{} S_{ab} R_{bi} \} \tag{2}$$

In the formula, $X(a,i)$ it represents the students ' interest a in the game form i, $S(a,m)$ including students a whose interests are close to the students' interests, is the $N(i)$ set of student users who have acted S_{ab} on the resource form, and is i the interest similarity between R_{bi} students a and students, b which indicates the student b 's interest in the resource form. i.

Using the above method, the system can understand students' interest in a certain game form. The system can then try to recommend an appropriate game form for the student and package the knowledge content through this game form.

3. Screen out targeted exercises

The gamified teaching background service system adopts the method of item-based collaborative filtering, and selects and recommends targeted gamified-packaged exercises for each student. These selected exercises can help students improve their grades quickly. In the question bank of the complete course, many exercises are related to a certain extent. For example, if a classmate wrongly answers exercise U, and he is also very easy to incorrectly answer exercise V, then exercise U and exercise V are related. The correlation between the exercises can be calculated by the following formula:

$$Q_{uv} = |F(u) n F(v)| \tag{3}$$

$$T_{au} = V^{|F(u)\| F(v)|} \tag{4}$$

In the formula, the relationship between the Q_{uv} representative u and the v two exercises indicates $|F(u) n F(v)|$ the number of students who did both the exercises u and the exercises incorrectly at the same time. After obtaining the similarity of the exercises v, the error rate

parameters of the students in solving the exercises v can be predicted by the calculation formula as shown below a .

$$Y(a,v) = \underset{ueF(u)nQ(y,K)}{\{} Q_{uv} T_{au} \} \tag{5}$$

In the formula, $Q(a,v)$ is V the set of exercises with the Q_{uv} greatest degree K of relevance to the exercise, is the degree of relevancy between T_{au} the exercise u and the exercise, and v is the parameter of the student a 's error rate on the exercise u .

Using the above method, the system can understand the importance of a problem to a student. The system can then attempt to recommend targeted exercises for that student. Of course, in order to avoid lowering students' self-confidence, the system can also appropriately provide some exercises that students can easily answer correctly.

4. Develop a review plan that strengthens your memory

German psychologist H. Ebbinghaus found that forgetting begins immediately after learning, and the process of forgetting is not uniform. The speed of forgetting is fast at first, and then gradually slows down.

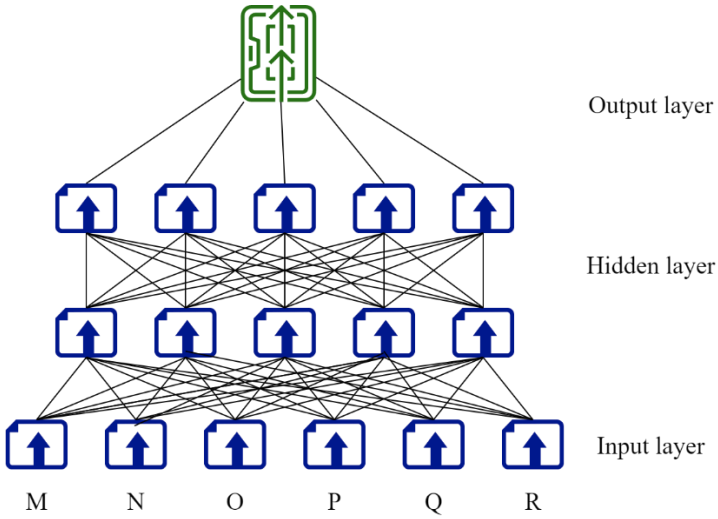

Figure 3: Learning Structure Neural Network.

The input information becomes the short-term memory of people after learning through the process of human attention, but if it is not reviewed in time, these memorized things will be forgotten, and after timely review, these short-term memories will be forgotten. The memory of time will become a kind of long-term memory of a person.

Moreover, the article also points out that each student's memory is different. The result of the review depends on the student's memory, the number of times of review, the time interval of the review, and the difficulty of the review. Since students' memory is difficult to describe with numbers, indicators such as IQ, historical average scores, and online learning activities can be used instead.

The following formula can be used to calculate how many days a student can remember after each review.

$$T = a M^2 + b N^2 + c O^2 + d P^2 + e Q^2 + f R^2 \quad (6)$$

In the above formula, it T represents the number of days to keep memory. After T days have passed, the system will schedule students for the next review. M Indicates the number of times that have been reviewed: N Indicates the time interval between this review and the last review; Indicates the O student's IQ value: P Indicates the student's average score in the past; Q Indicates the student's online learning activity; R Indicates the difficulty level of the knowledge point. They a, b, c, d, e, f are the weights of each parameter, and their initial values can be set to 2, 1.5, 0.05, 0.05, 0.05, and 0.05, respectively. These weights can be continuously revised through the analysis of campus big data.

During each review, the system will quiz the students and adjust the weights according to the quiz results. If the student's test result is satisfactory, the network adopts the following formula as the objective function. where p the initial value is 0.2.

$$E_d = (p+2)^2 \quad (7)$$

If the student's test result is not good, the network adopts the following formula as the objective function. where the $\min$ function obtains the minimum value.

$$E_d = -\min(T - (pT+2)^2) \quad (8)$$

3.4 Theories Related to Cognitive Diagnosis

In recent decades, the rapid growth of educational data mining (EDM) has promoted the advancement of teaching resource recommendation. The purpose of EDM is to automatically extract information from a large amount of data information generated or related to people's learning behaviors in educational and teaching environments. Valuable information, and teaching resource recommendation is to combine data mining, artificial intelligence, Internet, recommendation system and other technologies to actively recommend these valuable information to users according to the individual needs of learners.

Cognitive diagnosis is a modern educational psychometric theory that combines educational psychometrics and cognitive psychology. student-users) and, such as the level of cognitive ability of a skill, to describe the subject. Cognitive diagnosis is a science based on modern computer technology and statistical analysis, which can diagnose the cognitive structure and behavior of subjects. At present, in the actual education and teaching practice, people generally adopt the method of cognitive diagnosis, which makes the traditional online classroom teaching develop towards a more personalized direction. According to incomplete statistics, there are currently more than 80 related cognitive diagnostic models. Some models assume the continuity of attributes, and some models assume the discreteness of attributes. Among them, the most commonly used are item response theory(IRT) and potential classification.

IRT is used to describe the relationship between subjects' abilities and item characteristics. It breaks through the limitations of traditional classical measurement theories and is a new and modern

educational psychometric theory. Item Response Theory will test users. The potential cognitive ability level (such as student users) is parameterized and modeled by combining the user's behavioral performance on test items (such as test questions, knowledge points, learning videos, etc.). The item response theory model holds that there is a functional relationship between students' cognitive ability level and their performance in teaching resources, and is defined as item response function. The basic models of item response theory mainly include one-parameter, two-parameter and three-parameter logistic models, as shown in formulas (9), (10) and (11), respectively.

$$P(u_{ij}=1|\theta_i)=\frac{e^{(\theta_i-d_j)}}{1+e^{(\theta_i-d_j)}} \tag{9}$$

$$P(u_{ij}=1|\theta_i)=\frac{1}{1+e^{-da_j\theta_i-d_j}} \tag{10}$$

$$P(u_{ij}=1|\theta_i)=g_j+\frac{1-g_j}{1+e^{-Ca_j(\theta_i-d_j)}} \tag{11}$$

Parameter	*Definition*	*Brief introduction*
a_j	*Test item discrimination coefficient*	*Indicates the degree of discrimination of test items or questions, and determines the slope of the middle of the curve in the curve. The smaller the value is, the harder it is to distinguish the test scores of the tested users.*
d_j	*Difficulty factor of test items*	*Indicates the difficulty of the tested item or question, and the displacement in the direction of the horizontal axis of the curve is represented in the curve. The greater the difficulty coefficient, the higher the ability is required for the subject to obtain a higher score.*
g_j	*Test item guess factor*	*Indicates the probability that the tested user will answer the test question without prior knowledge of the test item, such as a multiple-choice question with a certain probability of being right.*
θ_i	*The potential ability value of the testee*	*Indicates the subject's mastery of the knowledge points or abilities to be assessed by the project or topic.*
C	*Constant 1.702*	*Ordinary constants.*

Table 2: IRT model formula parameter correspondence table.

Use the maximum likelihood to estimate the capability parameters of the IRT model and the project parameters, generally assuming that the current project parameters are known to perform the maximum likelihood estimation of the capability parameters, or assuming that the current capability parameters are known to perform the maximum likelihood estimation of the project parameters. If both the capability parameters and the project parameters are unknown, the alternating estimation method is used to estimate the IRT model parameters. The general steps are as follows:

Obtain the score matrix of the tested users and items;

Parameter estimation:

If the difficulty coefficient, guessing coefficient, and discrimination coefficient of the current item are all known, the answer result data in the score matrix and the known difficulty coefficient, guessing coefficient, and discrimination coefficient are substituted into the IRT model, and the maximum likelihood function of the ability parameter is established. As shown in formula (12).

$$L=\prod_{i=1}^{m} p_i^{y_i}(1-p_i)^{1-y_i} \tag{12}$$

Among them, is the correct answer probability obtained by the IRT model function, which is the real answer situation of the tested user in the score matrix. Taking the logarithm of both sides of formula (13), we get:

$$\ln(L)=\sum_{i=1}^{m} y_i \ln(p_i)+(1-y_i)\ln(1-p_i) \tag{13}$$

Deterministic input and noise gate model (DINA) is a typical representative model i n latent classification models, and it is also one of the most widely used cognitive diagnostic models. The DINA model is a simple random connection model. Compared with other models, the model only involves two parameters, the error factor and the guess factor. Compared with other models, it is more flexible, concise and easy to interpret. Therefore, it has been widely used and studied by related researchers. The mathematical expression of the DINA model is formula (14).

$$P(u_{ij}=1|\alpha_i)=(1-s_j)^{\xi_{ij}} g_j^{1-\xi_{ij}} \tag{14}$$

Left side of $P(u_{ij}=1|\alpha_i)$ formula (14) is the probability that subjects $g_j=P(u_{ij}=1|\xi_{ij}=0)$ with knowledge mastery level α_i can correctly answer the item. j Indicates the probability of guessing that students do a certain test question, that is, the probability that students can correctly answer the item when they do i not fully grasp j all the knowledge points examined by the test question. $s_j=P(u_{ij}=0|\xi_{ij}=1)$ Indicates the probability of a student's error in doing a certain test question, that is, when the student i has mastered j all the knowledge points examined by the test question, but the probability of answering the item incorrectly. Among them, ξ_{ij} indicates whether students i fully master j all the knowledge points (attributes) examined by the test questions, ξ_{ij} mathematical expression is shown in formula (15).

$$\xi_{ij}=\prod_{k=1}^{l} \alpha_{ik}^{q_{jk}} \tag{15}$$

Among them, it $\xi_{ij}=1$ indicates that the tested user (student user) has i mastered j all the knowledge points (skill attributes) examined by the project; otherwise, $\xi_{ij}=0$ it indicates that the tested user (student user) has i not fully mastered all the knowledge points (attribute skills) examined by the project.

4 RESULT ANALYSIS AND DISCUSSION

The traditional concept that "video games will have a bad impact on students' learning" has made more front-line teachers willing to use video games in classroom teaching, and has also implemented more extensive and in-depth teaching reform experiments for educational researchers to explore more effective classrooms. Teaching strategies provide a solid foundation. Therefore, for the analysis method based on big data, two visual literature data statistical analysis softwares, HistCite and CiteSpace, are used. The result obtained is as follows:

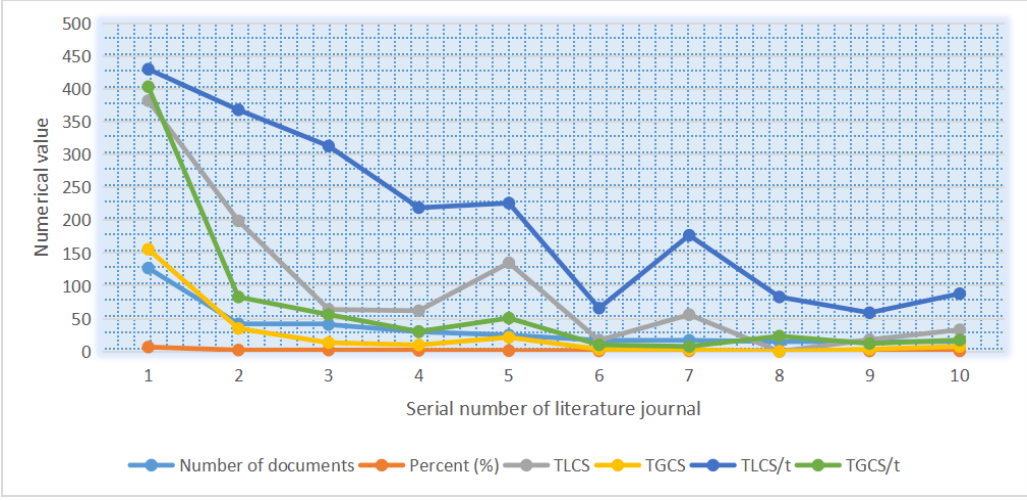

Figure 4: Top 10 journals by number of articles.

Serial number	*Name*
1	*Computers & Education*
2	*British Journal of Educational Technology*
3	*Computers in Human Behavior*
4	*Educational Technology & Society*
5	*Etr&D - Educational Technology Research and Development*
6	*Journal of Educational Computing Research*
7	*Simulation & Gaming*
8	*Frontiers in Psychology*
9	*Games and Culture*
10	*Journal of Science Education and Technology*

Table 3: Correspondence table of the top 10 journals.

A total of 884 journals have published research literature on video games and education, and the top 10 academic journals with the number of publications are shown in Figure 1 and Table 1 above. Among them, Computers & Education published the largest number of papers, with 127 papers, accounting for 6.7% of the total number of papers, almost equal to the total number of the next nine journals. Among the 10 journals, seven are from the field of education, and the other three journals Computers in Human Behavior, Frontiers in Psychology and Games and Culture are mainly from psychology and other sociological fields. This further shows that most of the current research on video games and education is to solve practical education and teaching problems as the main goal, although other fields are involved but on a smaller scale.

In addition, among all the extracted keywords, the keywords "computer game", "video game", "education", "learn", etc. used for literature retrieval are canceled, and the resulting keyword co-occurrence knowledge map is shown in the figure. 2, and ranked the top 10 keywords in the size of centrality as shown in Figure 5. It can be seen that the current research hotspots in this field mainly focus on gamified learning environment, gamified teaching strategies, brain plasticity, selective attention and so on.

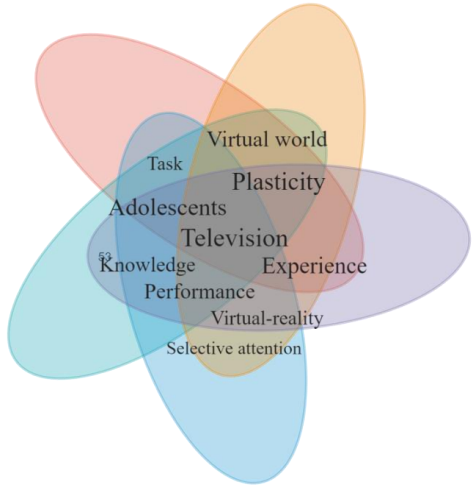

Figure 5: Keyword co-occurrence knowledge map of video games and education research.

In the experiment process, in order to observe different data sparse degrees of applying different algorithms and observe their effects, this paper selects 70%, 50%, 30% and 10% from all data sets as test data sets, and the rest are used as training data sets. That is, when 70% of the data is randomly selected as the test data, it means that the remaining 30% is used as the training set to predict the test set data, and the same is true for 50%, 30% and 10%. Moreover, within the range of the difficulty value of 0.6, the teaching resources are divided into simple teaching resources and compound teaching resources, and a comparative study is carried out on the recommendation effects of teaching resources with different difficulties. materials, while other video teaching resources and text teaching resources are manually annotated by domain experts or teachers who generate the resources.

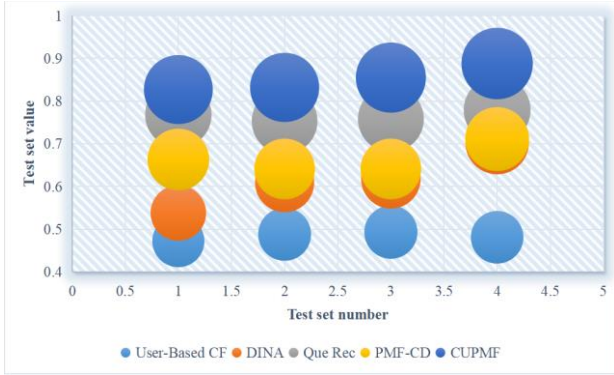

Figure 6: F1 value table of prediction results of simple teaching resources.

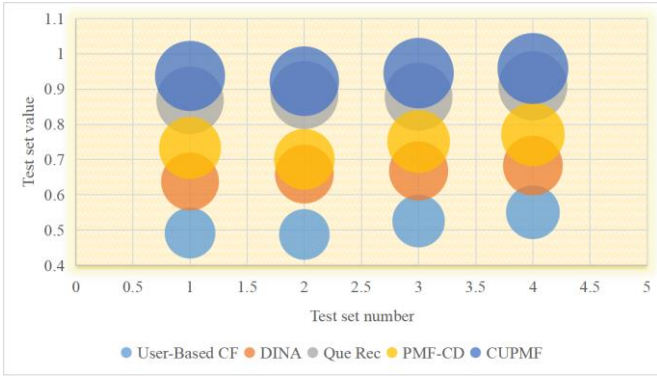

Figure 7: F1 value table of prediction results of complex teaching resources.

It can be seen from Figure 6 and Figure 7 that with the continuous reduction of the test set ratio, that is, the continuous increase of the training set ratio, the CUPMF model is generally better than the other four algorithms in the recommendation accuracy of simple teaching resources and complex teaching resources. Specifically, when recommending simple teaching resources, the F1 value is 8.6% higher than the other four algorithms on average, and it can reach 0.888 when the test set is 10%; when recommending complex teaching resources, the F1 value is higher than the other four algorithms. %, up to 0.958 when the test set is 10%. The above results show that the CUPMF algorithm is effective in improving the recommendation accuracy and improving the recommendation results. Among them, the combination of the CUPMF model and the TDINA model can provide a personalized cognitive diagnostic model for student users, resulting in higher diagnostic accuracy; while the CUPMF model is based on a joint probability model, combining deep learning technology and algorithms. , which can guarantee a high recommendation accuracy even when the number of student users is sparse.

The following is an example analysis of the video game task -based teaching mode based on big data. The research group has established a traditional online open course platform for the B course and a video game teaching platform for the A course. The research group organized students into two groups I and II: group I had a total of 717 students who assisted their learning through the gamified teaching platform and group II had a total of 734 students who assisted their learning

through a traditional online open course platform. 36 students were randomly selected to test the learning effects of courses A and B.

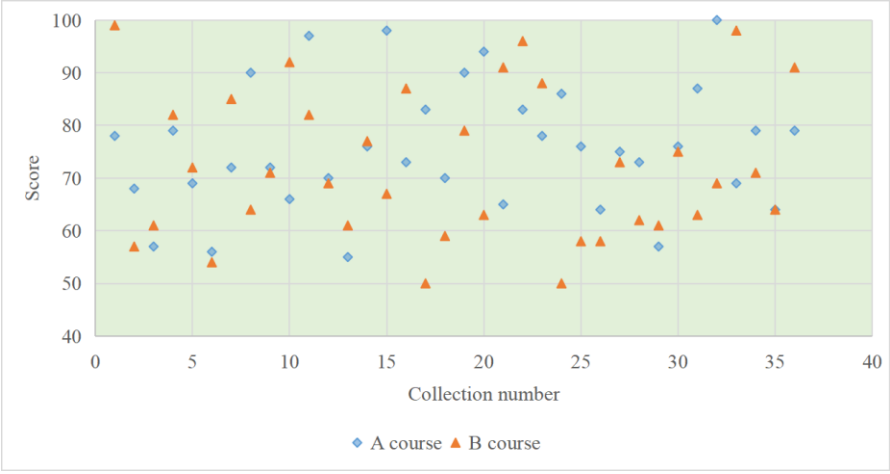

Figure 8: Comparison of grades for courses A and B.

As can be seen from the above figure, the average trend of students' average scores in the two courses is similar, both within 50-100 points. However, there is still a certain difference in the scores of the students' A and B courses. Most students' grades in A courses are higher than those in B courses, up to 36 points higher, and most are more than 10 points higher. There are also students who do it the other way around, with grades B higher than grades A, up to 29 points higher. Due to the randomness of randomly selected students, they will be divided into A and B classes for investigation.

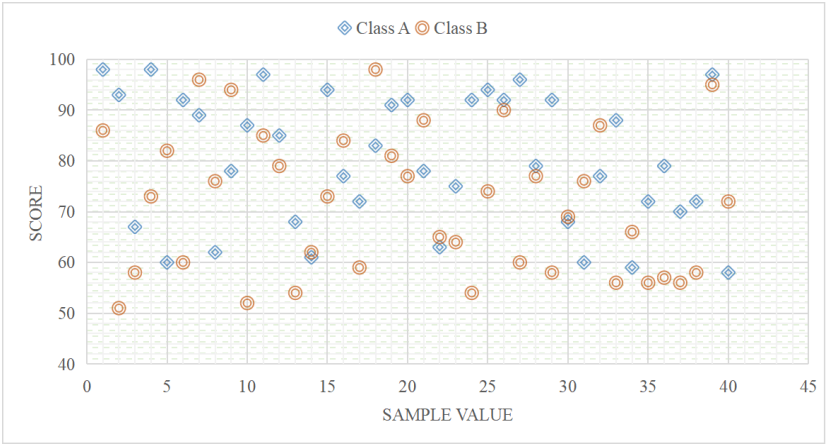

Figure 9: Course grades of Class A and Class B.

As can be seen from the above figure, the overall trend of the average grades of the students in the two classes is quite different. The grades of the students in class A are obviously better than those of the students in class B. Of course, there are individual students in class B who are more outstanding, but in class B There are more students in the class with a score of 50-60, while the

students in class A have more students in the score of 90-100. The contrast is large. The average score of class A students is 80.125, and the average score of class B students is 71.45. The highest score for A can be as high as 98, the lowest score is 58, and the lowest score in Class B is 51. It can be seen that the reasonable and appropriate use of the video game task mode teaching mode is an important manifestation.

5 CONCLUSIONS

This paper proposes the learning structure design of video game task mode teaching based on big data, aiming to cultivate learners' autonomous learning interest and ability, so that learners can achieve better learning effects in a relaxed and focused environment. The system uses computer-assisted teaching, combined with new networking technologies, to help learners strengthen their daily online learning, and integrate all the boring and complicated knowledge into an engaging virtual game learning environment. And record each person's learning situation during the learning process of the learner's game, help the learner to grasp the key points while learning easily, check the gaps and fill in the gaps, create a good learning and competition environment among the learners, and fully stimulate the learners' initiative sex. To sum up, this topic has the following three important significances:

- Changed the traditional education model, saving some manpower and material resources;
- Stimulate learners' interest in an all-round way and enhance learners' initiative in learning;
- Provide guidance for each learner in order to obtain a more efficient learning effect.

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