Application of Quaternion Instructional Design Mode in Higher Education Based on Personalized Algorithm

Hua Zhong(✉)

Gold Campus, Gannan Medical University, Ganzhou 341000, Jiangxi, China
zhonghua2021111@163.com

Abstract. Based on personalized algorithm, the application of quaternion instructional design mode in higher education is studied, and it is stipulated that teachers should choose the corresponding best teaching method before teaching all the target content. Data mining and personalized recommendation service content. This method is suitable for the tasks with less close relationship between various objectives, but the teaching effect is poor when teaching complex professional tasks that need to integrate knowledge, skills and attitudes and coordinate different skills. For the latter, it is more appropriate to design teaching centered on the overall and practical tasks. This paper introduces the task-based four element teaching design mode, and discusses the problems and future development of the implementation of Task-based education program.

Keywords: Personalized algorithm · Four element teaching design · Integrated learning

1 Introduction

The continuous development and innovation of society and technology put forward high requirements for the field of education. In order to cope with the growing trend of globalization, multidisciplinary and mobility, as well as the complexity of current and future work, we attach great importance to the quality and efficiency of education and training at all levels (European Union, 2009–2018). In order to prepare learners for the growing job market, education programs must provide them with a broad knowledge and skills base, so that they can flexibly use this knowledge and skills when dealing with new tasks in daily practice. More and more people begin to call for the choice of educational content based on ability and result. Since the 1990s, the balance of educational methods has shifted from "goal-based instructional design method" to "Task-based Method", in order to better solve the problem of learning complex cognitive skills and professional ability [1].

In order to solve the problem of fragmentation and segmentation caused by goal-based teaching, the task-based approach focuses on real problems or professional tasks, so as to better connect the learning environment with the work scene and cultivate the

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necessary skills. The educational program advocated by this method includes the learning task sequence based on real professional tasks. The task-based teaching mode includes "cognitive apprenticeship", "fine processing theory", "primary teaching principle" and "Task-based four element teaching design mode". In medical education, communication training, technical training, information solution processing and teacher training, the number of documents related to the application of the 4C/ID model is increasing, which proves that the model has a strong research foundation and popularity. The ten steps of the 4C/ID model provide guidance for analyzing real-life tasks to discover different types of knowledge and skills needed in daily practice (cognitive task analysis). At the same time, the model also has a blueprint for education program design, which consists of learning tasks, related knowledge, support procedures, and special exercises.

Since the release of the national vocational education reform implementation plan (20 articles on Vocational Education) in 2019, the country has raised the vocational education teaching reform to an unprecedented height from the central to local levels. At the beginning of this year, Shandong Province and the Ministry of Education jointly issued the opinions on the construction of a highland for the innovative development of Vocational Education jointly built by ministries and provinces, vigorously developing the reform of vocational education, innovating the development plan of vocational education, deepening the integration of production and education, improving the closeness between students' professional learning and industry development, and vigorously cultivating skilled, professional and compound talents required by the new era and new economic transformation.

In the new era, new demands have been raised. In particular, the impact of the epidemic on education at all levels in the country in the first half of 2020 has increased the panoramic online teaching function and strengthened the development needs of the new model hybrid teaching. At present, various online cloud teaching data collection mechanisms and platforms are used, and various online classes and conference software are prepared for online live teaching, The academic ideas and viewpoints of the online online and offline two-way teaching theory have played a certain enlightening role. Innovating online teaching methods and building a "four element" mixed teaching model are conducive to the practical ability of higher vocational college students, bringing the new online and offline teaching model closer to learning practice, and improving the weight of online teaching in mixed teaching, Strengthen the review of offline courses and look forward to the learning results of online teaching, which can better improve the teaching research for the purpose of mixed teaching goals. The contents of "four elements" are as follows:

(1) Highlight unitary timeliness
As artificial intelligence and global networking become more and more mature, more and more network interactions become indispensable. Their immediacy, simplification and convenience can solve many problems existing in offline real-life teaching. Especially in the epidemic period, timely and effective teaching contact has made irreplaceable contributions to not delaying teaching because the network has become real and reliable. It is hard to imagine that without the network, What will happen to students at home without online teaching during the epidemic.

(2) Strengthening unitary practicality
Classroom teaching is limited by space and time. Teachers should have the concept of paying equal attention to time and efficiency. To a large extent, teachers' teaching preparation (writing teaching plans, teaching plans and other teaching arrangements), implementation of classroom teaching, after-school evaluation strategies and so on. Changing the effectiveness of teaching implementation methods and using limited time and space to carry out efficient online teaching undoubtedly play an important role in improving the efficiency of offline classroom teaching, Of course, online teaching students' study seriousness and self-discipline ability have certain management defects due to network reasons. Paying attention to practical operation and making good use of online detection are conducive to the practical operation level of students in higher vocational colleges.
(3) Strengthen the unitary pertinence
Strengthen online teaching to make up for the new advantages of traditional classroom teaching, comprehensively analyze the shortcomings of online teaching, especially the research on the integration of the two, improve the collaborative development of online and offline teaching, and enhance the learning awareness, reflection awareness and research awareness of teachers and students, so as to improve the quality of school education and teaching, and make a breakthrough in teaching methods.
(4) Focus on unitary effectiveness
In order to develop the advantages of mixed teaching in long-term education and teaching, the extreme whole line teaching during the epidemic period is taken as a research model, and a set of long-term effective and effective mixed teaching achievements are formed through personal experience and extensive research, which can be more purposefully applied to the improvement of teaching quality.

Based on the experience gained from online teaching during the epidemic period, combined with personal teaching summary and the opinions of other teachers, and according to the characteristics of Higher Vocational Majors, the "four element" new hybrid teaching mode can effectively integrate online teaching into hybrid teaching, focusing on cultivating students to use online teaching platforms, flexibly manipulate learning software, and be flexible, convenient, entertaining, powerful Many advantages of online teaching with a strong sense of picture further strengthen students' autonomous learning and understanding ability, strengthen the response and digestion steps of online learning and problem-solving in offline teaching, take online learning as the guidance of offline teaching content, and offline classroom has become an auxiliary scene for face-to-face communication between teachers and students in Online learning.

2 Quaternion Teaching Based on a Personalized Recommendation Algorithm

Highlight the advantages of hybrid teaching combining online and offline teaching, especially the use of various excellent online learning and communication platforms, carriers and software used during the epidemic, which has been recognized by many teachers.

According to the author's collection and summary, there are mainly the following online video software that can meet the application of the "quaternion" mixed teaching mode at present. They are:

(1) Tencent classroom
The professional online education platform launched by Tencent has gathered a large number of high-quality educational institutions and famous teachers, and set up many excellent online learning courses, such as vocational training, TOEFL IELTS, oral English, primary and secondary education, to create a classroom for teachers' online teaching and students' timely interactive learning.
Operating steps: first, the teacher must install Tencent classroom express version on the computer, and students install Tencent classroom on the computer or mobile phone (students can click the link sent by the teacher to listen to the class, but the function is less than the installed client). Secondly, the teacher runs Tencent class on the computer, shares the QR code or a link to the students, and the students scan the code or click the link to enter the class and listen to the class.
Software features: 1. The teacher can switch the shared desktop window, the open PPT, the video to be played and the camera in the computer. The camera can be embedded in the PPT image or the corner of the shared desktop to form a picture in picture. 2. The teacher can control the students' hand raising and voice connection. 3. There is an answer board on the teacher's side. When there are questions such as selection and judgment in the courseware, students can interact with each other through the answer board sent by the teacher. The current version can generate playback video (downloadable).
(2) Tencent Conference
It is an audio and video conference product under Tencent cloud. It has the functions of 300 people online conference, one key access of the whole platform, intelligent audio and video noise reduction, beauty, background virtualization, locking conference, screen watermark, etc. The software provides real-time shared screens and supports online document collaboration. From January 24, the conference coordination capability of 300 people will be open to users free of charge until the end of the epidemic. At present, the international version application has been developed and launched.
Operating steps: teachers and students must install Tencent Conference on computer or mobile phone, book the conference, set the conference code, and students can enter the conference through the conference code to participate in learning.
Software features: 1. Teachers' computers and mobile phones can initiate meetings. 2. Teachers and students can open video and voice communication, and anyone can share their own desktop. 3. Teachers can switch between running various teaching software on the computer, and can also switch to the open video and music window at any time, so that video and music will not be subject to any restrictions on inserting courseware to play, and the sound transmission is clear and smooth without delay. 4. Teachers and students can open the text exchange area for text exchange. 5. In case of any interference during the live broadcast, the meeting initiator can set all staff to mute.

2.1 Data Mining

Data mining refers to the process of extracting valuable information and knowledge from numerous, incomplete, unclear and real-time generated four element teaching data, which is contained in the middle, unknown in advance, but related to each other. It is the core of knowledge discovery in database. Specifically to this paper, we mainly use the log mining in Web usage mining technology to provide personalized services, so as to complete the design of four element teaching method.

2.2 Personalized Teaching System

Personalized recommendation service refers to recommending information that users are interested in according to the characteristics of users' interests. After entering the personalized network teaching system constructed in this study, students input their basic information and learning information into the learning platform. Each student browses different pages in the process of learning. The generated browsing sequences can reflect the progress, levels and interests of students, and these browsing sequences are transferred to the personalized recommendation module. The learning platform stores all the access history of students in the user log of the server, because the web log mining module is embedded in the system, all the user log data is preprocessed in the module, and then the web access transaction database is obtained. Then, the personalized recommendation algorithm is used to mine the web access transaction database, and the frequent itemsets are generated and stored in the learning resource knowledge base built by the system. Next, the browsing sequence of students is extracted by the personalized recommendation module. Through the analysis of the confidence and support of association rules, the matching frequent patterns are found in the learning resource knowledge base. Finally, we recommend the last item of the association rules to the students. Figure 1 shows the implementation process of the improved Apriori like algorithm.

After preprocessing the data in the system, we can analyze the personalized recommendation algorithm of the obtained data. Here, we mainly use the improved Apriori algorithm to get the frequent item set and association rule pattern. If there is some regularity between the values of two or more data items, it is called Association. Association rules of these data items can be established. Generally, the two thresholds of "support" and "confidence" are used to eliminate the useless association rules. Among them, for the four element teaching method has recommended the appropriate education program [2].

The four element instructional design model aims to help instructional designers develop educational programs for teaching comprehensive or professional abilities. It describes the four elements of various educational programs: learning tasks, relevant knowledge and abilities, support procedures and special exercises (see Fig. 2).

In the teaching system based on personalized algorithm, firstly, the registration information, access content, path and other data of students are collected from the web log document on the server side to get the transaction database. Using the improved Apriori algorithm, using the intermediate results of frequent itemsets counting process, the invalid transactions are deleted continuously in each scan to complete the filtering of

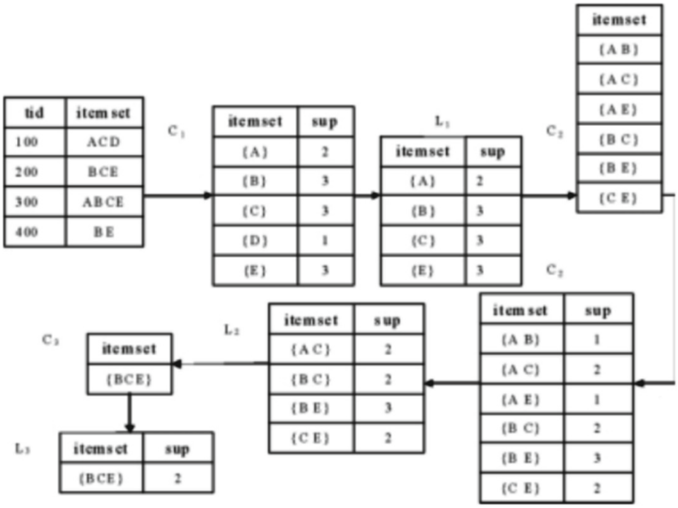

Fig. 1. Implementation process of improved Apriori like algorithm

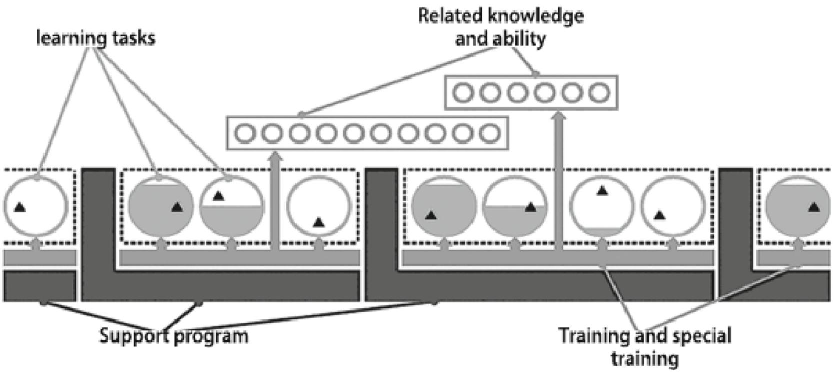

Fig. 2. Four elements

transaction database, and the frequent itemsets and association rules accessed by users are obtained, which corresponds to the quaternion teaching method.

The blended learning module introduces the learning tasks proposed in the course and the learning tasks to be completed in the workplace during the internship. Students usually go to the discussion area to communicate with other students or teachers before they submit their homework. This is a group of frequently visited pages. The designer of the website should mark the links of the above two pages with distinguishable colors in the eye-catching part of the submitted page, so as to speed up the query.

Most of the students will browse the related content of slide making while learning the operation of document typesetting. In the original website, there is no link between the two pages. After browsing the first page of association rules, students must go back to the course selection page to browse the second page of association rules, which causes unnecessary delay in time. So website designers should add hyperlinks between the two pages to improve learning efficiency.

3 The Application of Four Element Instructional Design in Higher Education

When designing educational programs with four elements, activities can be divided into five categories [3]. Four element instructional design has formed many design principles based on evidence for each activity. These activities are as shown in Fig. 3:

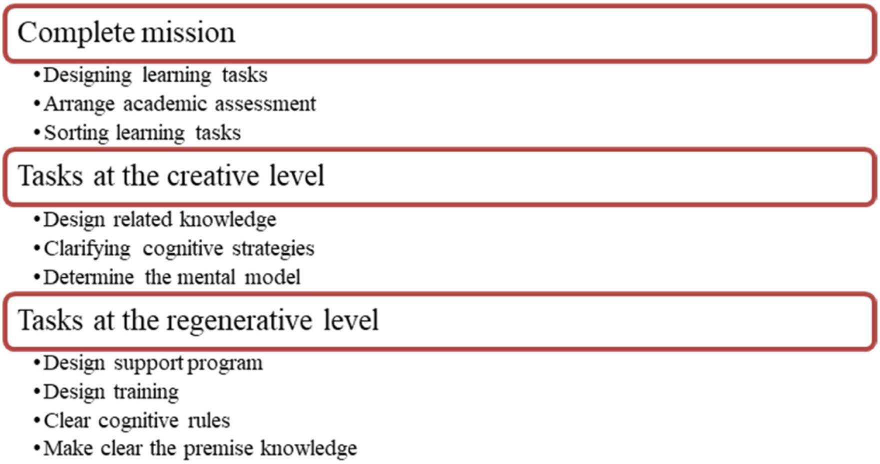

Fig. 3. Five groups of activities in four element instructional design

1. Design learning tasks. Learning tasks are usually based on real tasks in professional or daily life. Design principles involve realistic level fidelity, variability, support and guidance. The types of learning tasks include common learning tasks (i.e. independent learning tasks, learners must find solutions), complete learning tasks (learners must supplement some of the given solutions) and sample learning tasks (learners must learn the given solutions).
2. Arrange academic assessment. Learners need to get feedback when they complete the learning task, that is, the evaluation of their academic performance. Academic goals are based on skill levels, and describe the standards (requirements, values and attitudes) learners must meet for different aspects of their studies. The assessment tool contains a scoring rubric for all of these criteria.
3. Sorting learning tasks. Learning tasks are gradually changing from simple to complex, which can be sorted by either complete task or partial task. If teachers can evaluate the progress of learners, they can establish personalized learning trajectory or provide learners with the best choice of learning tasks.

4. Design related knowledge. Relevant knowledge and ability can help learners to complete the creative level of learning tasks, and provide them with domain model (for the development of psychological schema), systematic problem-solving methods (for the development of cognitive strategies) and cognitive feedback. Sometimes, teachers need to deeply analyze the psychological schema and cognitive strategies they want to obtain.
5. Design support procedures and special exercises. The support program tells learners how to complete the learning task at the regenerative level, and provides them with "instructions for use" (for the development of cognitive rules) and corrective feedback. Sometimes, teachers need to deeply analyze the cognitive rules and prerequisite knowledge they want to acquire. When the selected regenerative level tasks need to reach a full proficiency level, special drills can be designed.

4 Teaching Tasks

Colleges and universities should list the main principles of designing learning tasks. First of all, professional or daily tasks should be the starting point of learning task design. This kind of real-life task is usually composed of knowledge, skills and attitudes to help learners develop comprehensive or professional abilities.

Secondly, learning tasks are usually completed by learners in simulated task environment or real task environment. In order to provide a safe learning environment and prevent novice learners from dealing with too many irrelevant details, learners can first try in a low fidelity (such as written cases, role play) environment, then transition to a high fidelity (computer simulation, high fidelity simulation) environment, and finally provide practical tasks in the workplace.

Thirdly, it is essential that learning tasks in education programs should be different in all dimensions, because real-life tasks are also different, and learning tasks must represent the tasks that professionals encounter in the real world. The surface features that do not affect the way to complete the task and the structural features that affect the way to complete the task should reflect a certain degree of variation [4].

Fourthly, learners should be fully supported and guided at the beginning of learning tasks. Support should be embedded in the task and related to the use of "example learning task" or "case learning task", "completion learning task", "free goal problem", "reverse learning task" and "imitation learning task". Guidance should be "added" to the task and related to the guidance provided by the teacher or the guidance questions in the worksheet. Following the systematic problem-solving approach, guidance can help learners use effective cognitive strategies.

Finally, each complexity of the learning task should have a "scaffolding" process, which means that as learners acquire more professional knowledge, support and guidance will gradually reduce until they can complete the learning task independently without any support and guidance. Then, learners may complete the task with a higher level of complexity, and the scaffolding process starts from scratch, thus forming serrated support and guidance in the whole education program.

5 Conclusion

In a word, the current and future development of the job market requires that education programs can cultivate lifelong learners, who must have the knowledge, skills and attitudes to cope with the complex tasks familiar and unfamiliar in their fields.

The formation of a new quaternion hybrid teaching mode can more effectively integrate online teaching into hybrid teaching, maximize the effectiveness of online teaching, form an online teaching as the main force, cultivate students' online use of teaching platforms and flexible control of learning software, and further strengthen students' autonomous learning and understanding ability through flexible, convenient, entertaining, powerful and powerful online teaching advantages, Strengthen the response and digestion steps of online learning and problem-solving in offline teaching, take online learning as the guidance of offline teaching content, and make offline classroom an auxiliary scene for face-to-face communication between teachers and students in online learning. In words, it must be called network content and practical operation process, and take offline classroom teaching as an auxiliary field for improving learning and exchanging experiences in higher vocational colleges, Form truly practical and effective mixed teaching achievements.

The "four element" hybrid teaching is very suitable for the training needs of innovative, practical and applied talents in higher vocational colleges. Under the classroom teaching mode of the mixed teaching concept, teaching activities extend from 45 min in the classroom to form an integrated learning process of "pre class, in class and after class". By using the methods of course playback and online live communication, students' learning, thinking, communication and practical operation can be greatly improved.

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