Teaching Reform in Database Course for Liberal Arts Majors under the Background of "Internet Plus"

Yunjuan Cai[a,*], Tianpeng Gao[b]

School of Public Affairs and Administration, University of Electronic Science and Technology of China, Chengdu, Sichuan 611731

[a] junecyj@163.com, [b] tpgao_work@163.com

*corresponding author

Keywords: Internet plus, liberal arts students, database course, multi-level, teaching mode

Abstract: Under the background of "Internet plus", the society has higher requirements for the database technology and application ability of college liberal arts students, and at the same time, it changes students' learning styles and learning habits. This paper designs 3-level teaching objectives of knowledge and skills level, data abstraction level and innovative ability level, innovates teaching content system and promotes multi-mixed teaching mode. These teaching reform measures have improved the data thinking ability and innovation ability of liberal arts students and helped them use data to improve work efficiency.

1. Introduction

"Internet plus", based on the infrastructure and tools of Internet, is a new form of economic development formed by the integration of the Internet and traditional industries. Under such a background, information interoperability and personal activities in the real world have been unprecedentedly recorded. This record has provided extremely abundant works and researches for social sciences[1]. For instance, there are more than 300 million photos uploaded to Facebook every day, about 12 billion Google queries per month, and about 2 billion items purchased by Amazon sellers in 2014. This kind of big data not only generate economic value, but also bring new scientific discoveries, which necessarily require liberal arts students to acquire, organize and process these data more professionally[2]. Therefore, under the background of "Internet plus", the society has higher requirements for the data processing ability of liberal arts students. In the era of "big data" with the rapid development of information technology where both databases and data thinking are abundant, learning database is a necessary knowledge structure for students of liberal arts to adapt the development of society and technology, and also a requirement for the basic literacy in this era. After all, therefore, the existence of individuals who can use IT effectively will provide the ability of benefiting from this technology at the highest level[3].

Database courses have been set up in many universities in China for liberal arts majors, but there are still several problems.1) Because of the lack of in-depth understanding of students' basic demand and social needs, teaching objectives and requirements lag behind the requirements of the times, students are not aware of the importance of learning the database; 2) In terms of teaching content, it either emphasizes theory over practice, or only explains the use of ACCESS software without theory, which is outdated; 3) The teaching method is relatively single, and the students have more difficulty in learning database, and have not received good learning results. Under the background of "Internet Plus", teachers should study how to adapt to the needs of the times in teaching design and reform, in order to help students understand this digital era, learn database technology, and adapt to changes in technology and thinking.

2. Research Status

In recent years, the teaching researches on database course in China are not abundant. The

researches mainly focus on the following aspects:1) Research on teaching mode: It mainly puts forward a variety of database teaching modes, such as case-oriented teaching, research-based teaching, task-driven teaching and so on. 2) Ideas of teaching reform based on different teaching objectives: They mainly proposes the practical ideas of teaching reform based on the different goals proposed by "computational thinking", "learning ability training" and "professional application". 3) Research on teaching methods: It mainly analyses the application of teaching methods such as "Relevant Teaching", "Contrastive Teaching", "Case Teaching" and "Thorough Teaching" in database courses. 4) Research on teaching reform in different fields: It mainly concentrates on "computer specialty", "non-computer specialty of science and engineering", "information management and system specialty" and so on, with a small amount of teaching reform researches on "liberal Arts specialty".

According to the teaching research on the database course of liberal Arts specialty, Wang Yiran and Zhu Weijun (2012), combining with the actual teaching experience, proposed the reform plan of the teaching mode from five aspects in view of the current situation and problems of teaching database course of liberal arts specialty in colleges and universities[4].Wang Ruobin et al. (2014) in view of the characteristics of computer learning of liberal arts majors and the current teaching situation of database course, designed a teaching plan of database course for liberal arts majors, which took applied experiment as the carrier, problem solving as the driving force, and embedded computational thinking training module in key links in stages[5].Yu Ning and An Jifang (2015), taking Access database application course as an example and combining with the learning characteristics of liberal arts students, put forward the basic idea of training computational thinking ability through the teaching process from two aspects of classroom teaching and practice, and then put it into practice[6]. Zou Qiong and Cui Hongfang (2017) proposed to redesign the teaching content of database course guided by computational thinking, and to use the abstraction and automation of computational thinking to design highly logical examples on the core content of database teaching, so as to improve the teaching effect and enhance the information literacy of college students.[7]

Based on relevant researches, researchers can design the teaching objectives of the corresponding database course from the characteristics of liberal arts students and the features of database course itself, and explore appropriate teaching programs or teaching modes. However, because there is no external demand arising from the change of "Internet Plus" and the external environment of the big data era, the starting point of research can not keep pace with the times, which may lead to no teaching goal adapted to the demand of external changes, and researches and practice can not break through the old teaching ideas.

3. Design of Multi-level Teaching Objectives

"Internet plus" has brought subversive challenges to traditional industries. It also has had a tremendous impact on the development of traditional humanities and social sciences and personnel training, providing a constructive platform for the development of humanities and social sciences, and expanding the space of practice and research. The practice and research methods, featured by social computing and big data analysis, have been paid more and more attention to. In the fields of census, public service, commercial consumption, urban management, public opinion and social governance, new situations of open data and cooperative innovation are constantly emerging. If the cultivation of liberal arts talents in colleges and universities does not attach importance to such an impact, the needs arising therefrom are not analysed. Thus, it cannot achieve the purpose of personnel training.

Against this background, liberal arts students naturally ask the following question: Why is data so important? How can we organize data better? What is database? How can we use database in study, work or research? How do we use the database? How can we get valuable data in the database? Is the big data often heard about the database taught in the course? Do we need to learn programming?

Therefore, in order to adapt to the needs of the society, we have designed multi-level teaching

objectives:

On the level of knowledge and skills: Students majoring in liberal arts should be able to master the basic concepts, principles and techniques of database, including the concepts of database and database system, structured query language, database protection and other knowledge and skills, as well as some frontier knowledge such as data warehouse and data mining, big data and so on.

On the level of data abstraction: To cultivate students' awareness of learning data and preliminary data thinking, students should be aware that data is at the "heart" of operation and decision support applications. Students should be able to abstract and analyze data needs in real learning, and use correct ideas and methods of database design to abstract and construct organized data from the real world so as to improve the ability of processing and handling data with database technology.

On the level of innovation capability: The ability of data abstraction and computational thinking of liberal arts students need to be strengthened. We need to train these students to solve research and practice problems in their professional field relying on data thinking and computational thinking. Their ability to process, analyze and display the analysis results by using database technology need to be improved as well. At last, students can decide whether to learn programming according to the actual demands of the problem.

4. The Design of Innovative Teaching Content System

Teaching content is the carrier of the achievement of teaching objectives. The selection and arrangement of teaching content are directly related to the realization of teaching objectives. Therefore, we need to select the content around teaching objectives, sort out the logic of knowledge, and reconstruct the knowledge system.

From the level of knowledge and skills, liberal arts students need to master the basic concepts of database and basic application methods. If the theoretical knowledge of database is taught too much, students will feel too far away from reality and lose interest in learning[8]. As a result, we mainly teach the basic theory of database, including basic concepts, E-R model, relational model, SQL language, integrity constraints, typical paradigms and transaction basic concepts, database security and basic principles of data recovery, which can lay the foundation for common database applications. From a technical point of view, you can learn ACCESS. Compared with other database software products, ACCESS is easy to learn and to use. It is a visual operation which is flexible and convenient, can avoid the programming needs of users to the greatest extent, and easily establish the relationship between data. Without writing program code, it can simulate the business logic of real business activities, design well-functioned databases and reports, which can enable students to have a qualitative leap in data analysis and processing ability. However, it should be emphasized that the learning of database should not only be the learning specific DBMS products, but also the assistance of students to understand the basic concepts of database and apply them to any database by learning the basic concepts of database.

At present, the rapid development of big data related NOSQL movement, and the need to store and process big data sets are changing the database world. Therefore, knowledge about big data, data warehouse, database server group, distributed database and business intelligence system should also be introduced.

From level of data abstraction, the teaching goal of database course for liberal arts students focuses on application. Students' understanding of theoretical knowledge can not be superficial. To truly understand the role of database, we must strengthen the understanding of core concepts such as data model, and illustrate the importance of "relational model", and how the objective world is abstracted into data through practical cases and large assignments. Therefore, we should add cases, examples and experimental projects to each teaching content, learn how to use the "abstract" process of computational thinking, and emphasize the descriptive function of modelling for the objective world, thus generating a rational understanding of the "abstract" in the relational model to understand the characteristics and advantages of the two-dimensional model, and then grasp the key points in relational database design, and train students to adopt standard engineering methods to

solve problems.

From the perspective of innovation ability, we should increase students' reading content after the class, including Data Thinking, Big Data Era and extracurricular reading related to "Internet plus", so that students can understand how data become the core of management decision making, the basic role of data in the new concepts of "Internet plus" and AI, and how is the value of data enhanced to inspire students. Adding corresponding cases or assignments requires students to select specific problems in a practical field or research, and to process data on the basis of abstract modelling and organizing database, so as to enhance the value of data and solve practical problems.

5. Diversification of Reform in Mixed Teaching Mode

"Internet Plus" has extremely promoted the use of network in education and teaching which enables the educational informatization to become the most important means and main goal to realize the development and utilization of curriculum resources under the background of globalization of education. The informationization of education promotes the sharing of high-quality curriculum resources, and online courses such as MOOC, micro-course and SPOOC, which are produced by the combination of network interaction and customization, have emerged. This not only expands the existing curriculum resources such as classic courses, and further improves the quality of curriculum resources, but also remoulds the teaching mode of higher education. The innovative ideas brought about by online courses are providing new ideas and methods for the reform in database course teaching mode and the effective improvement of personnel training quality.

In this context, we should integrate classroom teaching and online courses in an all-round and appropriate way, each taking its advantages, and explore a diversified and mixed teaching mode from a single teaching mode to a diversified one, from a "teaching-oriented" to a "learning-oriented", and from a "knowledge-teaching-based" perspective to " training and improvement of innovation ability" one[9]. We should fully mobilize the initiative of the "two subjects" -- the teaching and studying subjects, so as to improve the teaching effect.

5.1. Flipped classroom teaching mode

For some chapters, with strong knowledge independence, which are easy to understand, such as the learning of basic sentences in SQL language, it is advisable to use the flip classroom teaching mode. Before class, according to the general teaching objectives given by teachers, students independently choose the time and way according to their own situation, considering the curriculum resources designated by teachers, to complete the construction of their own knowledge. If there is any doubt in the learning process, students can enhance their learning through repeatedly watching study materials. In addition, students' thinking and autonomous learning ability can be promoted by discussing problems and communicating study in the QQ group and WeChat group built by teachers. In the classroom, teachers first examine students' learning situation by asking questions and checking their progress in online video learning. Then through discussion and answering questions, students' knowledge can be consolidated and their questions can be solved. Thus, the classroom will be changed into a student-oriented flip classroom model. Finally, and most importantly, it combs and integrates students' "fragmentation" knowledge to improve their ability in practice and application.

Under this kind of teaching mode, curriculum learning starts before class and can extend to after class, therefore, there is more time given to teaching, the classroom teaching can deeply integrate application and practice, and students will actively think, discuss and answer in the whole teaching process. By finding, raising, exploring and expanding questions, students can train their thinking formation and application practice, and efficiently transform knowledge into application ability.

5.2. Case-oriented or task-driven teaching mode

Whether it is a flipping classroom or a traditional classroom, it is appropriate to adopt case-oriented or task-driven teaching mode. The content of each chapter connects through a case. In the

citation, the corresponding problems and learning tasks are put forward to help students learn before class and understand the concepts and theories in the class, and initially establish database thinking. After each chapter, through other cases and corresponding tasks, students are guided to complete the tasks by using the theoretical methods they have learned.

Especially the learning goal on the level of the data abstraction, it introduces what a database is, the function of a database, and how to design and standardize a database. The task in the case drives the students to carry out the requirement analysis, conceptual design and logical design of the database, thus completing the abstraction and creation of data step by step.

On the level of innovation ability, it is necessary to train students' ability of the problems analysis, abstract modelling, processing data and displaying results through cases and tasks, so as to enhance the value of data.

5.3. Experimental teaching mode of innovation ability cultivation

For liberal arts students, if they just operate the software Access, because of lack of database design and practical application background, they just blindly learn the operation of software but cannot use it. From the angle of improving students' data-based thinking and innovation ability, this paper takes the software of database management system—Access as the background, and combines all kinds of database cases from all walks of life as the main line, constantly derives the database theory knowledge and the operation method of Access. This paper analyses the overall framework and puts forward some problems in database design. Through the independent learning, from database design to its implementation, management and application, students have a comprehensive understanding of database system, from shallow to deep, step by step. Partial case analysis is carried out from tables, queries and forms in the system. When introducing tables, the concept of relational model is introduced, and then the concept of other data models is extended. When introducing the query, the SQL statement is extracted. When introducing forms, VBA programming is introduced. This not only scatters the knowledge points, but also increases the interest of learning, and emphasizing the practicality and exploratory[10]. In the process of teaching, students should be guided to study independently, analyze problems in society by themselves, and then give solutions and cultivate their innovation ability.

6. Conclusion

The "Internet plus" era has raised higher requirements for students' database learning, and has also provided teachers with more teaching means and ways. In the database course of liberal arts specialty of the School of Public Affairs and Administration of University of Electronic Science and Technology of China, we have tried to carry out teaching reform. First, we design corresponding teaching objectives from three different levels: knowledge and skills, data abstraction and innovation ability, and design teaching content system at these three levels. We have carried out diversified teaching modes, such as flipping classroom, case-oriented teaching and task-oriented teaching. We have completed the student-centered teaching process and achieved good teaching results. In the follow-up research we will conduct a survey of students' learning needs and statistical analysis of existing teaching data, in order to support better teaching practice.

References

[1] Wei Li, Yang Xiaoying, Yang Ruiling. (2017) Discussion on the Cultivation of Innovative Talents in Liberal Arts in the Context of "Internet Plus". College Education,5,125-126.

[2] Hexuan Liu, Guang Guo. (2016) Opportunities and Challenges of Big Data for the Social Sciences: The Case of Genomic Data. Social Science Research,59,13-22.

[3] Fatma Önay Koçoğlu Bakioğlu, Elif Kartal, Zeki Özen, Çiğdem Selçukcan Erol, Sevinç. (2015) Aspects of Students about Information Technology Courses in Social Science. Procedia - Social and Behavioral Sciences,176,148-154.

[4] Wang Yiran, Zhu Weijun. (2012) Reform and Exploration of Teaching Model of Database Course for Liberal Arts Majors in Universities.Popular Science and Technology,11,172-173.

[5] Wang Ruobin, Hu Jian, Du Chuntao, et al. (2014) Teaching Plan Design of Database Course for Liberal Arts Majors --- Concurrently Discussing the Cultivation of Computational Thinking. Computer Education,11,14-17.

[6] Yu Ning, An Jifang. (2015) The Cultivation of Liberal Arts Students' Computational Thinking Ability and Access Database Teaching. Computer Era,11,71-74.

[7] Zou Qiong, Cui Hongfang. (2017)Teaching Design of Liberal Arts Database Based on Computational Thinking. Computer Knowledge and Technology,26,16-21.

[8] Li Jun, Chen Luo, Chen Hongsheng, et al. (2006) Discussion on Teaching Reform in Database Course for Non-computer Majors. Journal of Electrical and Electronic Education,6,94-97.

[9] An Xiangming, Qu Chengliang.(2017) Research and Construction of Hybrid Teaching Mode. Journal of Jilin Institute of Chemical Technology,8,61-64.

[10] Zhai Yingying, Xu Bin, Guo Zhi.(2017) Research on the Experimental Teaching Mode of Liberal Arts Majors. Modernization of Education,19,99-100.