Exploration of Teaching Model of the Database Course Based on Constructivism Learning Theory

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Abstract—**Applying constructivism learning theory, this article puts forward the constructive teaching model of the database course through analyzing the existing problems in the traditional teaching method of database. This constructive teaching model elaborates a process in which the contents in the textbooks including relationship normalization requirement analysis, conceptual design, logical design, and physical design are integrated in teaching skillfully through a concrete database application system project. This model advocates learner centered learning under teachers' guidance and emphasizes that the students should explore and find the knowledge, and construct the meaning of the learned knowledge initiatively and learn to cooperate and communicate with others. It has been found in practice that this model has aroused the enthusiasm of the students and improved student's ability of analyzing problems and solving problems.**

Keywords- Constructivism; Project, Database, Teaching model

I. INTRODUCTION

Along with the consistent development of computer techniques, database becomes more and more important. To store and manage a good deal of data, database is required. The database course is one of the core curriculums for computer major, which is highly comprehensive, involves much theoretical knowledge, at the same time, involves professional knowledge of relative industries, and is highly practically. Understanding of relevant concepts, theories, and rules and skilled operational capability stem from practice. Handling management and operation of database deftly is one of the necessary skills for students major in computer.

In the traditional teaching of database, firstly, what the teachers do is inculcating the knowledge to the students. The teachers require the students to learn the same content with the same learning method in the same time, regard the students as machines of accepting and copying knowledge, and ignore students' individual differences and psychological needs. In the teaching and learning process, the teacher has the power of making decision, and the student is controlled. The student is depressive because they are passive, and they become passive and evasive because they are depressive, while the teacher become tired because of the student's passiveness. Gradually, the total effect is easily to go out of control. For the database course which is highly practical, this development trajectory is especially obvious. There are students who escape and give up in different stages of this course. At the same time, this growing trend has negative influences on both the total teaching effect and the teacher's enthusiasm. At the same time, because of the ignorance of the students' individual differences and psychological needs, the teacher's ability of solving practical problems deftly is smothered. Under this learning model which is under the authority of the teacher, the student's enthusiasm for study will be suppressed, and the teacher has the power but no prestige. When the suppression and difficulties in learning has been accumulated to a certain degree, the student will be weary of learning, give up learning and not obey the teacher any more and the total teaching process is beset with difficulties. Second, the traditional learning focuses mainly on the course objective and requirements. It is curriculum-centered, and the students are restrained by the course content and rules and are in a restrained learning state, especially in the computer courses in which human who should dominate the machine actually become the slaves of the machine. Besides, homework, especially those which have standard answers, have suppressed the students' thinking model and turned the originally interesting practice of exploration of knowledge into simple simulation, duplication, and repeated and mechanical labor. The student's curiosity, thirst for knowledge and creative power are all restrained and wore down so that they are neglected and abandoned. Therefore, the teaching ideas of "the teacher is the center" and "the classroom is the center" in traditional teaching model can not meet the needs of the students any more.
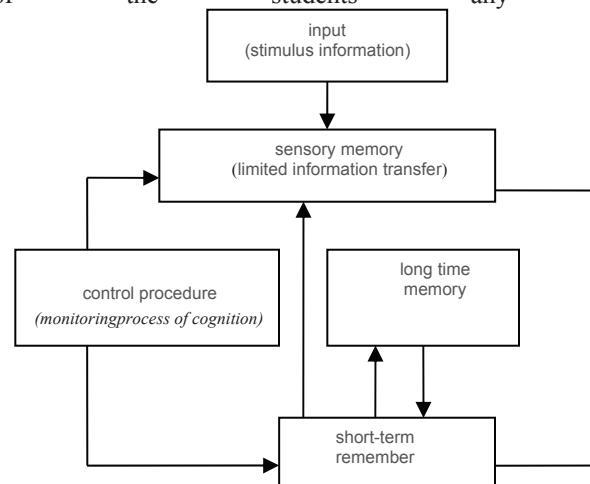

Figure 1. The traditional education model figure caption

II. THE CONSTRUCTIVE TEACHING MODEL OF THE DATABASE COURSE

The Constructivism emphasizes sociality and the context of learning and the initiative for leaning. It thinks that learning is not acquired through the teachers' imparting, but is acquired through meaning construction under a certain context (the social background) in the process of which the learner makes use of necessary learning materials and has others' help. The core of the constructivism theory is as the following: taking the student as the center; emphasizing the students' initiative exploration and initiative finding of the knowledge and their initiative constructions of the meanings of the learned knowledge; Learning requires communication and cooperation, emphasizes creation and establishment of the context in the teaching process and importance of resource for meaning construction. Therefore, this article puts forward the constructive teaching model of database course.

First, the teacher introduces an actual project of database application system as example, and carries out discussion on relevant theories around the theme of how to solve actual problems. Under the guidance of the relational data base theory, the teacher make the student comprehend the basic concepts, theories, and techniques of the database and understand the whole process of solving the problems comprehensively through the step-by-step explanations, demonstrations, and experiments from the proposing and analyzing of the problems, design and implementation of the schemes, to the final solution of the problems. For example, in the teaching process, the teacher selects the project "teaching management system" which is familiar to the students, and carries out teaching in three stages.

A. Stage of system development system and system analysis

Teachers and students discuss the application background together and carry out functional analysis. It will start from the requirements such as the student enrollment, teacher information management, curricula-variable situations of students, the teachers' instructions, and information management of the students' academic records, and let the students know that this stage is the requirement analysis stage which is stated in the textbook, and require the students to realize the importance of requirements analysis in the whole design process. Herein the teacher weaves the contents of the course into the design process of the project rather than carry out teaching in accordance with the sequence arranged by the textbook. The teacher explains the tasks which should be completed in the stages of requirement analysis, conceptual design, logical design and physical design according to the needs rather than carrying out teaching according to the sequence which is arranged by the textbook. The teacher should analyze which data are to be stored in the database and which processing functions the system will complete and guide the students to analyze which entities exist in the system, the relationships between the entities and which objects in the real word are corresponding to the entities, and take these cases as the start point and ask questions step by step, draw E-R drawing of the system and come to the stage of conceptual design and then let the students design the structure of database preliminarily: How many relations (table) are contained in the database and which attributes each relation is composed of? The teacher will introduce the knowledge about the transformation from E-R drawing to relational model in the textbook and let the students know the application development process from theories to practice.

B. Stage of relation normalization

After confirming the database and the tables it contains preliminarily, the teacher introduces learning of the knowledge which is relevant with the relational model and explains the concepts of the relation, tuple, attribute, code and etc. Then the teacher guides the students to find out the irrationalities in the designed structure of the database and the resulting problems of the irrationalities of the structure of the database, and illustrates the insertion anomalies, modification anomalies and deletion anomalies which are possibly occur when relevant data about the student situation and the student curricula-variable situation are put in one relation. To solve this problem, the relation normalization theory should be introduced. The teacher explains the basic knowledge about relational calculus and relation normalization and herein introduces basic theories such as normalization theory of database design and data integrity theory which are difficult to be understood and very important. At the same time, the teacher should materialize the basic concepts of three-level model and two-level image, three worlds and two kinds of models which have been introduced above so that the students can materialize these abstract theories and realize how to solve actual problems with these theories and the directive functions of these theories for reality intuitively. The teacher should make use of the knowledge about relation normalization which has been learned to analyze that if any dependence of the non prime attributes on the code part or transfer function exist in the project, if any dependence of the prime attributes on the code part or transfer function, which normal form each relation belong to and how to handle the "degree" of normalization and normalize the relations of the project concretely. In the physical design stage of the database, the teacher should guide the students to analyze each relations of the database according to the database of the above design stages and to make sure on which attributes the index should be established, the advantages of establishing an index, and why only one index can be established for one relation so that the students can understand the abstract knowledge and theories (take the index for example) deeply.

C. Machine implementation stage

In this stage, the relation structured query language (SQL) should be learned firstly. Learn the usage of date definition statements of SQL through establishment of the example teaching base and tables such as student relations, teacher relations, curricula-variable relations and etc. At the same time, learn to establish relations through the two methods—interaction and command, establish connection among the relations, and realize the integrity constraint of the relations. Introduce usage of

the database management system SQL-Server. Make use of the C Language which is popular currently to establish inquiries, forms, and reports in the project of "teaching management system", explain alternately the relevant commands of data manipulation function and data query function of SQL and apply them to query, form objects. After completion of the designs of these basic objects, connect the objects through changing-over the panel to form complete application software. At this time, retrospect the former learning and practice and review the development process of the database application system. Summarize the development process of the "teaching management system" comprehensively according to the idea of database life cycle. Thus, all the contents of each chapter of the textbook (i.e. theories which are contained in each stage of database design) are integrated in a practical project skillfully through a completed design process of a specific project. In this way, the students will not be bored with these theories. They will find that these theories are very lively and interesting and can understand the directive function of the theories in practice clearly.
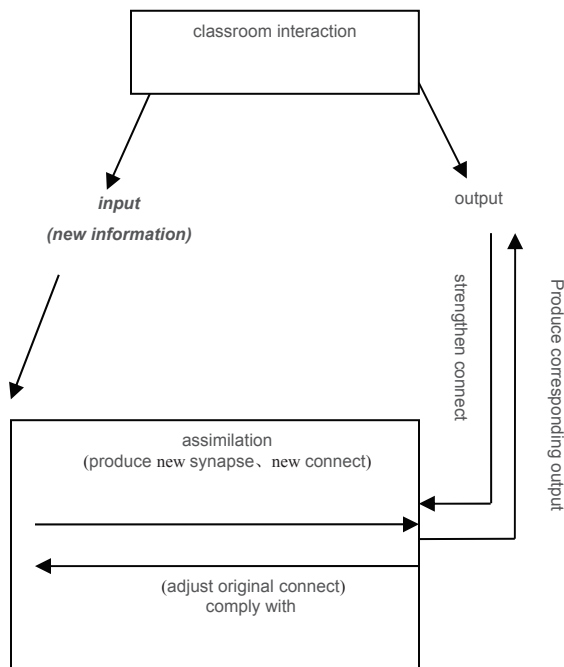

Figure 2. class atmosphere figure caption

III. SAFEGUARD MEASURES OF THIS TEACHING MODEL

A. The student is the subject of information processing

The constructivism emphasizes learners' function as the cognitive subjects, at the same time, it doesn't neglect teachers' guiding function. The teachers are help-providers and facilitators for the meaning construction rather than the instructors and inculcator. The students are the subjects of information processing and the initiative constructors of the meaning, rather than the passive acceptors for external stimuli and the objects of inculcation. Teachers of the database course should guide the students to collect initiatively the abundant, full and accurate materials about the origin, contribution, and application cases of the database technology in human development, in order to bring out the students' thirsts for knowledge, and integrate relevant concepts and theories into them. The teachers should make the establishment of the concept of database process from the easy to the difficult and complicated, from the human life to the computer world through analyzing relevant information and materials so that the difficulties in the study can be solved, at the same time, students' interest and thirst for knowledge can be kept. This is a true student-centered learning. Certainly, this requires the teachers to understand the theories and operations of the database course itself thoroughly, have deep understanding of the database technology and development of human social life, and have broad understanding of concrete businesses. Thus, this demands high for the teachers' scope of knowledge and the ability of integrating.

B. The cooperative learning approach is adopted

"Learning to live together" is one of the four "learning backbones" in the 21st century. The students fulfill a task together through cooperation, make use of their respective advantages, contribute ideas of them own, and realize the same problem from different points of view. The management method of software engineering is adopted to renew the original student organization management mode. There are different problems and difficulties for different students when they grasp the concept and operate practically so that it is obviously impossible for the teachers to make respective teaching programs and course schedules for so many students. Therefore, taking the mode of software engineering group as a reference, the teacher can divide the students of a class into several groups and appoint a group leader for each group. The group leader will unify the schedule within the unit time for his group members, collect problems, trace and report the collection of problems and the individual progresses of students, allocate the members of the group to help one another and synthesize the group situation. The teacher manages all the students indirectly through the group leaders and can discuss the typical problems deeply with students who have problems and explain to them. In addition, in the process of mutual cooperation, regarding to the advanced students, their skill will be more proficient, their understanding of knowledge will be sturdier, and their operation will be more deftly. Regarding to the less advance students, they will be more confident and have more approach to overcome difficulties and master the skills. At the same time, because of the formation of the synergetic learning mechanism among the students, the learning attitudes and learning strategies of students of different levels have been adjusted, the leaning efficiency has been improved, and the learning space and time is expanded from the classroom to the time and space outside the classroom.

C. Help the students to construct meaning in the learning process

The database course has close intrinsic relations with many basic courses and specialized courses. These courses are carried out before the database course, at the same time with the database course, or after the database course. If those relations are isolated, degree of difficulty in the learning process will increase which may even cause rote learning. For this matter, the teacher may even give up some details of the course and let the students learn by themselves, but they must break through these key links and let the students establish professional knowledge frame on the basis of their original knowledge structure as soon as possible and define the position, function and restraints of the course in the professional frame so that the students can face up to the difficulties in learning calmly, in case that some students may be stuck in difficulties which are caused by the limitations of their current levels. The analyses on the difficulties of the students often trace back further. To help the students overcome difficulties and arouse their interest for the database course, the teacher must analyze and explain students' problems thoroughly and make the students' understandings of the problems be synchronous with these of the teacher, or all the problems will be accumulated and reserved for concrete courses or teachers.

IV. Conclusion

The database course is one of the important specialized courses for the students major in computer. The teaching model proposed in this article is to transform the teaching design to the design of learning environment in the database course under the guidance of constructivism learning theories. Learning of the students is not the passive acceptance of the knowledge which is concluded and summarized by the predecessors but is carried out through students' self-experience in the context of a certain real project. The students are the subjects of information processing and the initiative constructor of the meaning rather than the passive acceptor of external stimuli and the objects of inculcation. This teaching model emphasizes that the students should explore and find the knowledge, and construct the meaning of the learned knowledge initiatively and learn to cooperate and communicate with others. It has been found in practice that this model has aroused the enthusiasm of the students and improved student's ability of analyzing problems and solving problems.

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