An Innovative Web-Based Collaborative Learning Model and Application Structure

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Abstract—Web-based learning is becoming a popular learning approach with the rapid development of web technology, and collaborative learning can improve learning performance of students. Web-based collaborative learning provides students with collaborative skills, communication skills, creative, critical thinking skills, and skills in information technology application. This paper presents a web-based collaborative learning model which emphasizes student-centered instruction. The procedure in this learning model consists of five steps: definition of learning task, team plan, collaborative research, achievement summary, and final assessment. Then the application structure of the web-based collaborative learning model is developed with latest information technology and data technology. A case based on the collaborative learning model is developed in the end, and the collaborative learning environment could foster students to be cooperative, caring, reflective, critical and creative.

Keywords—collaborative learning; web-based learning; learning approach; learning model; learning performance

I. INTRODUCTION

It is the theme of the current educational reform to foster Collaborative and communicative abilities among students in China. Contemporary information technology brings out web-based communication techniques, and the traditional collaborative approach is adopting web-based techniques. Collaborative skills, communication skills, creativity, critical thinking skills, skills in using information technology, calculation skills, problem solving skills, self management skills and study skills are thought to be the essential skills to be mastered by students. Students should be well equipped with so many skills that they can be capable of solve any potential problems in the dynamic and complicated workplace.

Web-based collaborative learning environment is developed with information technology and collaborative education method, and web-based collaborative learning is one of the many student-centered approaches that aim to promote education achievement, and to foster interpersonal communication and cooperation.

II. COLLABORATIVE LEARNING METHODOLOGY

The term "collaborative learning" refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students together in small groups toward a common goal. The students are responsible for one another's learning as well as their own. Thus, the success of one student helps other students to be successful. Collaborative learning refers to methodologies and environments in which students engage in a common task on which each individual depends on and is accountable to each other. Groups of students work together in searching for understanding, meaning or solutions or in creating an artifact of their learning. The approach is closely related to cooperative learning.

Collaborative learning has taken on many forms: One form is Collaborative Networked Learning for the self-directed adult learner. Youth directed collaboration, another form of self-directed organizing and learning, relies on a novel, more radical concept of youth voice. Computer-supported collaborative learning has emerged as a new educational paradigm among researchers and practitioners in several fields, including sciences, sociology, and engineering.

Collaborative Learning also has a particular meaning in the context of Learning Management Systems where collaborative learning refers to a collection of tools which learners can use to assist, or be assisted by others. Such tools include Virtual Classrooms (i.e. geographically distributed classrooms linked by audio-visual network connections), chat, discussion threads, application sharing among many others.

A. Activities of Collaborative Learning

The collaborative learning system can be classified as five activities: (1) definition of learning goal and task; (2) team design; (3) selection of team members; (4) practice; (5) summery and assessment. The collaborative learning system emphasizes the student-centered collaboration and cooperation among them. Collaborative learning encourages students to learn knowledge by research and exploitation.

B. Characteristics of Collaborative Learning

Constructivism is the basic theory of Collaborative learning, which emphasizes that students are the center during teaching and learning activities, and learning would an active process where students learn to discover principles, concepts and facts for themselves. Hence students in collaborative learning are encouraged in guesswork and intuitive thinking. Students become active learners while they were passive receivers in traditional teaching and learning environment, and
they construct knowledge by social interaction with knowledgeable members of the teams.

Sustaining motivation to learn is strongly dependent on the learner’s confidence in his or her potential for learning. The feelings of competence and belief in potential to solve new problems are derived from first-hand experience of mastery of problems in the past and are much more powerful than any external acknowledgement and motivation. By experiencing the successful completion of challenging tasks, students gain confidence and motivation to embark on more complex challenges.

Collaborative learning can exceed spatial and temporal barriers, and students can learn knowledge by interaction which might happen synchronously or asynchronously. Collaborative learning can be classified as four learning approaches (shown in Table 1) based on learning time and place.

<table>
<thead>
<tr>
<th>TABLE I.</th>
<th>FOUR LEARNING APPROACHES IN COLLABORATIVE ENVIRONMENT</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>same time</td>
</tr>
<tr>
<td>same place</td>
<td>Concentration learning by face to face instruction and</td>
</tr>
<tr>
<td></td>
<td>learning in one classroom</td>
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<tr>
<td>different place</td>
<td>Simultaneous learning by distance through internet or</td>
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<td></td>
<td>information technology</td>
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</tbody>
</table>

III. COLLABORATIVE LEARNING SYSTEM STRUCTURE

The collaborative learning system can be implemented in five steps: (1) definition of task; (2) plan of learning teams; (3) collaborative learning and research; (4) summary of achievements; (5) assessment of learning. The collaborative learning system structure is shown in Figure 1.

A. Definition of Task

This phase is very important for teachers to group students according to their background, to set up scenarios, and to instruct students. This phase consists of:

1) Grouping.

The procedure of grouping students is to change individual learning into a collaborative status, and suitable grouping is prerequisite in collaborative learning.

2) Training social skills.

The social skill is one of elements in collaborative learning. Social skills would help team members maintain mutual benefit relationship and improve learning scores.

3) Setting up scenarios.

Teachers would set up learning and research scenarios which students could be active to involve in and try to find out innovative solutions from.

4) Definition of learning goal and task.

While students are grouped, they will analyze the learning assignments, and define their common learning goal and evaluation criteria.

B. Plan of Teams

When learn goal is defined, the collaborative team would discuss and analyze learning task. Then each member will be assigned with relevant duties and roles in learning collaborative environment.

C. Collaborative Practice

Students and teachers will implement collaborative in this phase. The basic techniques in collaborative learning are to solve problems and communicate with different roles. The teachers are organizers, observer, and instructor while students are actors in collaborative learning system. The communication techniques and skills are crucial for collaborative members.

D. Summary of Achievements

The collaborative teams would reveal their achievements and present the assignments. The summary of achievements should involve exposure of team achievements, plans of team activities, every member’s achievement and collaborative implementation.

E. Evaluation of Learning

Evaluation criteria are the basis of all learning evaluation, but the evaluation forms could be different according to evaluation objectives and students. The evaluation of learning should involve: general process evaluation, general evaluation of collaborative teams, individual performance evaluation in collaborative teams, and evaluation of general collaborative performance in teams.

Since stimulus is needed to promote the relationship among students, and the relationship between students and teachers, the evaluation is a part of stimulus mechanism.
IV. STRUCTURE OF WEB-BASED COLLABORATIVE LEARNING MODEL

The web-based collaborative learning model consists of five parts: collaborative learning strategy, user information library, student interface, teacher interface, and administration. The structure of web-based collaborative learning model is shown in Figure 2.

A. Collaborative learning strategy

It is the basis of collaborative learning management, and the strategy lies in the rules which are recorded as collaboration rule library. Collaboration rules are represented by conditions and results.

B. User information library

It consists of administrator information, teacher information, student information, and authority assignment.

C. Student interface

It consists of user interface, learning model, and basic information model, which will help students fulfill learning goal. This interface will instruct students and record learning information during learning phase.

D. Teacher interface

It is to help teachers to monitor and manage teaching process, through which teachers can establish, organize, modify and delete education resources, and provide instruction services for courses.

E. Administration

Administration is responsible for maintaining and managing this web-based system, and administrators could maintain this system and databases through this module.

Since collaborative learning approaches can be divided as synchronous learning and asynchronous learning, administrators and teachers would manage collaborative learning environment, such as making grouping policies, collaboration rules and requirements. The key functions in collaborative learning system are user management module, database administration module, teacher module, student-centered learning and test module, and learning resource module where courseware is included, the system modules are showed in Figure 4.

V. IMPLEMENT OF WEB-BASED COLLABORATIVE LEARNING SYSTEM

A web-based collaborative learning system is developed in B/S three layers structure (shown in Figure 5), through which users can request to read ASP files by browsers, and then servers run ASP files and send the results back to users’ browsers.
The system’s database is SQL server 2000 and the operation system is Windows 2000 server, which can support multi-user services. This three layer structure system can be maintained and expanded easily, and can be deployed with multi database servers which would decrease the demand of internet bandwidth.

Students and teachers can communicate with each other by browsers and learning groups can discuss and learn more from each other by online resources and libraries. The web-based application system provides a robust and efficient learning environment for students and teachers.

VI. CONCLUSION

This paper presents an innovation web-based collaborative learning model which is developed by sophisticated education methodology and current information technology. Web-based collaborative learning provides students with collaborative skills, communication skills, creativity, critical thinking skills, and skills in information technology application. The learning model consists of five steps: definition of learning task, team plan, collaborate research, achievement summary, and final assessment, and then the application structure of the web-based collaborative learning model is analyzed. Implement of the web-based collaborative learning system testifies that students could benefit from the integration of modern information technology and education methodology.

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