Perspectives of University Students on Cooperative Learning by Moodle

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Abstract

Many articles discuss the contributions of Moodle, but a focus on energy education and student perspectives in higher education are very limited. This study implemented an undergraduate energy education course in Moodle as an extension of a face-to-face course. 30 Taiwanese higher education students in the fourth grade were divided into six groups of five adopted STAD. To observe chat room and discussion forum messages in the course of 18 weeks, students filled out an online survey for web-based cooperative learning perspectives and were asked without pressure under semester scores on their experiences using an e-learning platform. Qualitative findings indicate student learning outcomes on energy technology plus success through cooperation via the Moodle e-learning platform.

Keywords: *Cooperative Learning, e-Learning, Energy Education, Moodle*

1. Introduction

E-learning is thought to be more convenient than traditional learning because it allows people to work at their own pace and gain fast access information [2]. Selecting or combining strategies still needs to be performed according to the interests of all stakeholders. In the academic field, the choice of a Learning Management System (LMS) is important for any e-learning activity/project intended to deliver didactic modules for higher education [1].

E-learning technology provides the opportunity to reduce the digital divide and to ensure faster and higher development trends. Unlike the face-to-face classroom, in online distance education, attention must be paid to developing a sense of community within the group of participants for a successful learning process [3]. The idea of learning as a cooperative process is highly important for students separated by distance.

Individual associations of e-learning that are negative include aspects that are impersonal, frustrating, and lonely. The main disadvantages of e-learning are thought to be time wastage (easy distractions), unreliable computer systems, poor quality, or gimmicky learning programs [2]. Students prioritize their personal goals and view classmates as academic enemies. Interaction and mutual trust between peers is deficient and learning effectiveness does not significantly improve [4].

Cooperative or collaborative learning is a team process where members support and rely on each other to achieve an agreed-upon goal. The classroom is an excellent place to develop team-building skills (http://www.studygs.net/cooplearn.htm). Cooperative learning is interactive. Teachers have to develop and share a common goal. A cooperative learning team member has to contribute to understanding their own problems (questions, insights, and solutions) and respond and work to understand the questions, insights, and solutions of others. Each member empowers the other to speak, contribute, and consider their contributions. Each is accountable to and dependent on the other.

Higher education is directed to increase enrollment in degree levels and to add to the number of private universities. However, the increasing demand for higher education puts a strain on academics to meet the demand and to sustain e-learning [5]. Researches concerned with energy education are generally subsumed or briefly mentioned in the energy education literature. Much research has contributed to understanding how students approach web-based learning at home. In contrast, fewer studies have been conducted on energy education and these are often much less available widely.

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This study adopts the cooperative learning method named STAD (Student Teams Achievement Divisions). This method is a simple instructional design for cooperative learning, with not only the widest range of applications, but also the most significant implementation [6]. Cooperative learning is composed of two or more heterogeneous components, through internal achievement motivation and external incentives, to complete the learning process. The specific context of each topic is arranged to facilitate communication and encouragement skills in members of the cooperative learning task. Each can construct knowledge through interdependence, assistance, and help, and share resources to complete cooperative learning between individuals and the group.

This study provides a teacher tool to integrate a strategy for cooperative learning. Students can self-learn and interact in the Moodle environment the teacher provides after classroom learning. This study explores student perspectives of cooperative learning and e-learning applications in the field of energy education. Finally, research results include qualitative findings and suggestions.

2. Background Literature

This study analyzes the effect of web-based cooperative learning on energy education. The Bureau of Energy, Ministry of Economic Affairs in Taiwan has customized energy education goals, as follows [7]: (1) Universal energy education at all school levels, educate students to have correct concepts of energy and energy conservation practices to improve their energy literacy; (2) Educate specialists on energy economics, energy technology, and energy management; and (3) Promote energy education and enrich energy information to enhance the public consensus on increasing income and decreasing expenditure.

The Energy Education and Promotion Group of National Taiwan Normal University (2008) indicated that the content of energy education should include: energy introduction, energy conservation, environmental protection, energy sources, energy utilization, energy technology, energy policy and management, and energy vision [7]. The development of e-learning to improve teaching quality involves overall planning and improvement oriented from teaching strategy, teaching content, teaching tools, and the teaching environment. Only the "proper use of e-learning" has the chance to improve teaching quality.

Hrastinski (2008) indicated that research can support practitioners by studying the effect of various factors on e-learning effectiveness. Studies typically compare two basic types of e-learning: asynchronous and synchronous [8]. Recent improvements in technology and increasing bandwidth capabilities have led to the popular growth of synchronous e-learning. Both Synchronous and asynchronous e-learning address how and when learning takes place [9].

Kareal and Klema (2006) suggested that the general purpose of educational platforms is to provide students with information as well as practical opportunities to help them acquire certain skills and to increase their active knowledge. Different learners may have various characteristics, prior knowledge, motivation, or needs [10]. They compared particular features of different e-learning systems (mostly open source, Moodle, MULTIPES and MetaTool), emphasizing user friendliness and adaptability. Moodle systems appear to the best at present.

Moodle is the dream tool for teachers concerning course management features that it offers, integrating a wide range of resources and assessment strategies, and powerful in content creation due to its built-in HTML editor. Particularly noteworthy is the module workshop, designed based on peer assessment. These assessment types can be made time and password restricted, and set to allow for limited or multiple retakes. Learning tasks or projects can be designed to allow for cooperation between instructor and students or among students, using various formats of social interaction. Students can be divided into subgroups, interact with each other synchronously in chat rooms, or engage in asynchronous discussions in Wikis and forums [11].

One of the most striking features of the favored design approach by Moodle is the ease with which course materials can be developed and refined in an iterative fashion [12]. Moodle (Modular Object-Oriented Dynamic Learning Environment) is a free and open-source e-learning software platform, also known as a Course Management System (CMS), Learning Management System (LMS), or Virtual Learning Environment (VLE). As of January 2010, it has a user base of 45,721 registered and verified sites, serving 32 million users in three million courses. Its open source license and modular design allow any developer to create additional modules and features. The stated philosophy of Moodle includes a constructivist and social constructionist approach to education, emphasizing that learners (and not just teachers) can contribute to the educational experience. Moodle has many features typical

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of an e-learning platform, plus some original innovations (such as its filtering system). Many types of environments such as education, training and development, and business settings can use Moodle [13].

Students appreciate the added value that e-learning platform provides, but it cannot operate without a detailed demonstration and explanation of Moodle features and its eventual bottlenecks. If participants know conceivable problems in advance, they are much more ready to tackle them and maintain a positive attitude towards the course. The results show that the course is created in such a way that integrates students into active collaboration with the subject under study [10].

A statistical analysis suggests that students taught by web-based collaborative learning instruction scored significantly higher in business creativity than students taught by traditional lectures [4]. Organizations develop cooperative relationships through creating a learning environment so that they can facilitate mutual learning. Cooperative learning emphasizes the role of cooperation in alliances, rather than competition [14]. Web-based courses conducted purely on network overcome limits of space, time, and classroom size, while taking advantage of networks to facilitate cooperative teaching and share knowledge among courses [15]. While the level of learning within an alliance depends upon the absorptive capacity of partners, the success of collective learning effort is determined by cooperative learning among partners [16].

Huang and Lin (2007) indicated three methods for delivering teacher instruction, cooperative learning, competitive learning, and individual learning [6]. Teachers have previously used competitive learning and individual learning. Cooperative learning means that partners can share knowledge, information, and resources [17]. Cooperation depends upon a supportive community of actors who agree to help one another in activities aimed at attaining the goals of each person involved [18].

Among new tendencies, the most important and clear evolution concerns learning strategies, evolving from a directive attitude that tutor supervise and coach learner for cooperative behavior between the learner and other virtual learners. A component of operative learning also includes criteria such as the ability to learn in a group [19]. Universities increasingly provide technical support to professors and also manage student databases. Many articles in Taiwan discuss the contribution of Moodle, but a focus on energy education in the university is very limited. Therefore, this study implements an undergraduate energy education course in Moodle as an extension of the face-to-face course and attempts to provide additional materials (web-based homework) to help students delve deeper into concepts and subjects developed in the classroom. Researchers show the main features of an online energy education course (implemented in Moodle) as well as conclusions derived from this experience. The study examines the obtained results and student responses.

3. Methods

This study presents an overview of an undergraduate energy education course that researchers implement in a Moodle e-learning platform. This course is developed to enhance the face-to-face course.

3.1. Methodology

In Moodle, all available information within a course (for a specific subject) is organized in separate blocks. The first block is always devoted to general and administrative information, and supports the contents of the course including timetables, teachers, news, forums, and chats [20].

Researchers set up the Moodle e-learning platform in this study, named "National Changhua University of Education - Introduction on Energy Technology e-Learning Course," to provide a cooperative learning environment as a tool. The usable functions of the modules include work templates, chat rooms, forums, tests, and e-books (course). Course resources can be updated at any time through the Internet, which Moodle makes full use of in the teaching environment.

All Moodle images are in Chinese interface. Students click on the group cooperative learning website and fill out a peer evaluation form before beginning the course. As mentioned earlier, this study integrates interdisciplinary energy research knowledge. The course, "Introduction on Energy Technology," trains energy education personnel for higher education to bridge employability and competitiveness.

In addition to observing chat rooms and discussion forums, students must fill out a survey for web-based cooperative learning perspectives a week before the final examination. Students can fill out the

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questionnaire without pressure of semester scores. The web-based cooperative learning perspective survey consists of open-ended questions and a closed-end questionnaire, which refers to and compiles the "IT integrated instruction survey" [21] and the "Network cooperative learning survey" [22]. According to the research purposes of this study, the questionnaire includes eight titles for e-learning platforms to understand student perspectives of Moodle. The questionnaire is rated according to the Likert 4-point scale. Each question has four options: "strongly agree," "agree," "disagree," and "strongly disagree," and the sequences are given four, three, two, and one points. A high student score means higher satisfaction, contrasted to a low score and lower satisfaction. The open-ended questionnaire is intended to gain an in-depth understanding of student perspectives about web-based cooperative learning. Based on the closed-end questionnaire, this study prepares three questions in open-ended questions. Finally, this research consolidates information to explore student cognition.

3.2. Participants

This study considered the importance of analyzing students that are mature enough to make valid and careful judgments about their web-based cooperative learning to ensure careful responses. This research also emphasized the necessity of students who are established in their place of learning and have formed certain learning habits. 30 students at the fourth-grade level were accepted. Students were divided into six groups (from A to F) of five (from one to five) and adopted the STAD, which is the simplest instructional design for cooperative learning, with the widest applications and most significant implementation effect [6].

3.3. Procedure

The "Introduction on Energy Technology" course is taught by a professor (first author) using a traditional teaching method, who also edited the materials. The Moodle e-learning platform helps students learn again after class. The platform includes three classes per week, for a period of 18 weeks. The professor is responsible for teaching, and a graduate student serves as assistant. A syllabus is distributed the first day of class. Class discussions include renewable energy development, new energy utilization technology, technology energy conservation, energy regulations development in Taiwan, and research and development of future energy technology.

Course contents are placed in the Moodle course resources before the start of each class. Students can browse the contents through the Internet. At the end of class, students can review the lectures, discuss with peers, or pre-visit resources for the new class in the Moodle e-learning platform any time and anywhere. In the "questionnaire for web-based cooperative learning perspectives," students reflect on their experience of using cooperative learning in Moodle. Questions include the following:

1. Have you ever had any learning experiences in Moodle, or any other e-learning platform? What are your opinions about this method of learning?
2. What do you think about implementing cooperative learning in energy education?
3. How does cooperative learning help you in the "Introduction on Energy Technology" course?

3.4. Data analysis

Data analysis focuses on the verbal meanings in the learning process. The researchers spent a considerable period of immersion in the transcripts. This list expanded with subsequent analysis of transcripts. Gradually, the "micro-themes" initially identified were clustered into larger meaningful themes as the analysis process unfolded, concepts were recorded, and discussion took place between the researchers. A method of "free" and "open" coding was employed to classify responses into meaningful themes and categories. Followed by a more careful "interactive reading and re-reading" to establish similarities and differences in the data [23]. To provide realistic insights, data from the survey was not edited but rather presented in verbatim form. Student responses were presented as they were spoken.

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4. Results and Findings

This study explored qualitative perspectives on cooperative learning in Moodle, particularly on energy education. Students participated in an online survey and recorded their messages during the course of 18 weeks. They were asked about their experiences in an e-learning platform adopting cooperative learning to enhance knowledge of energy education. The results indicate that students learn energy technology plus success by a cooperative Moodle e-learning platform.

4.1. Descriptive statistics for student perspectives of the e-learning platform

This study used the student learning module provided by Moodle to observe students to understand their perspectives on cooperative learning activities during the platform course. Students filled out the "questionnaire for web-based cooperative learning perspectives," for researchers to observe and analyze student perspectives on cooperative learning for integrated internet teaching. Finally, the current study analyzes and discusses the results.

There are 90 % of students agree that this website facilitates learning that is very appealing to them. 10 % of students disagree that the website offers a good space for grouping together for learning. 90 % of students agree that the teaching forum on this website allows them to express their opinions. 10 % of students not only disagree that this website offers a good place for chat and discussion with others, but also think that this website offers a good space for discussion. All students agree that this website provides a good communication tool and offers a good space for grouping. 10 % of students disagree that this website offers a good space for studying assignments.

The above analyses show that students think Moodle provides cooperative learning and good communication, and that students can operate it easily, that it is attractive, and that they are willing to express their opinions. However, some students still disagree with group discussions and chatting for learning with others on this website, and also disagree that the website offers a good space for discussion and studying assignments.

4.2. Student perspectives on using Moodle or other e-learning platforms

"Yes! Using the e-learning platform allows me to read it over and over again to learn, to interact, and to ask questions and solve problems."[A-3] According to the literature review, the e-learning platform is very efficient and convenient for learners. E-learning is the trend for the future.*"Information on the e-learning platform updates continuously. We can always learn something new and increase knowledge." [B-2] "This is my first time using the Moodle e-learning platform. Its advantages include sharing information with team members and communicating directly with with team members on the Internet." [C-4] "A special function of this e-learning platform is to upload photos of school teaching. It was fun." [D-5] "Using the e-learning platform is wonderful, it is especially easy to understand the interface and it takes only a few times to get started." [E-1]*

4.3. Student perspectives about implementing cooperative learning in energy education

Student opinions about cooperative learning used in implementing teaching energy education are below. *"More cooperative learning, learning is more relatively easy." [A-2] "It is very special. In addition to the school's e-learning platform, this is my second time to use the e-learning platform. I not only exchange homework or watch classes on PPT, but also learn more from the same group discussion. Overall, I really learn a lot." [D-1] "We get together to discuss online and increase opportunities for interactive learning." [C-2] "Comparing cooperative learning discussion or exchange homework with a general class, I feel more relaxed and less pressure." [C-1]* A student who wants to be a teacher thinks that a blend of traditional teaching and e-learning is a good teaching method. *"Using the e-learning platform for teaching may be getting a better chance than others for future teacher selection" [F-1].* At the same time, there is opposition. *"I don't seem to learn anything. I spend most of my time studying information. I think I need a teacher to explain to me face to face." [A-1]*

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4.4. Student perspectives about cooperative learning as an aid to learning

Students think that cooperative learning helps them understand the course, *"Introduction on Energy Education"* clearly. *"I not only ask questions and discuss with classmates, but also find information to help with my own learning on the Internet."* [D-4] *"It gathers together the entire team and does everything well. To compare with other courses, teamwork is very important. We share information with each other; however, more importantly is not only absorbing information from each other, but also training the team to work cooperatively together."* [F-5]

Cooperative learning is very novel, which includes not only absorption of knowledge, but also more skill training. *"Group discussion with classmates allows me to find related articles and news online, and then post on the e-learning platform to discuss further."* [C-4] *"I discuss course progress with classmates and submit homework in the shortest time."* [A-5] *"The contents facilitate discussion with classmates. We share course information any time."* [C-2] *"As for Green Energy, Biodiesel, Wind Power, and Solar Power Generation, I learn so much. We really have a lot of help."* [B-4] *"I have a better understanding of some knowledge that the teacher do not teach at school."* [E-5] *"I can learn the introduction of energy education without going to school."* [D-5] *"I do not have to take notes in class. I can download materials and access information from the Internet."* [A-3]

4.5. Student perspectives about the weakness of cooperative learning in Moodle

There are many weaknesses of cooperative learning. For example, *"Account level and experience values are factors that are more able to attract students to express their opinions."* [E-4] *"After several discussions in Moodle, I often found that the interface lags."* [B-3] *"The number of words in the dialog box is too limited."* [C-1] *"I often have to review an entire article several times after division and it will be sent completely."* [D-2] *"To compare school platforms with Moodle, the school's integrity is better in refinement and structure is quite construction than Moodle."* [F-4]

4.6. Student perspectives on future e-learning platforms

"The Moodle platform puts more information about energy on the introduction page, such as technical journals and the latest reports. If there are pictures or animation about energy, effect of implementation on energy education will be more substantive function." [F-3]

Students think that sometimes the teacher can interact online at home. The teacher can record videos as teaching materials online for students to download and then use chat rooms to discuss and write down ideas. Furthermore, students appreciate the convenience and practicality of Moodle, and hope to learn how to set up courses on the platform.

Through mutual discussion, students can understand each other's ideas regarding energy. Some participants have a more in-depth understanding of solar energy; others are more specialized in biofuels. In the learning process, not all problems can be answered immediately. Students can help answer questions from each other and combine both teaching and learning. When students present what they know, they begin to speculate on the easiest interpretation. Therefore, cooperative learning is not only absorption of knowledge, but also skills training.

5. Conclusions

Based on the findings of research results, students feel that using the Internet to search for information and to compile reports is easy. Students like to use the Internet cooperative learning environment, ask questions, or express opinions. Most students think that the Moodle e-learning platform is easy to use and provides a good communication tool, discussion area, group space, workspace, and makes learning more interesting.

Most students find acceptable cooperative learning activities and produce a positive attitude. Good reasons for the Moodle e-learning platform are summarized below:

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1. Different teaching methods attract student motivation and make students feel that these methods are novel and interesting. Images make it easier for students to pay attention than a text.

2. Students are interested in implementing web-based cooperative learning, set up and use the Moodle platform. This method is helpful for them to transfer experience to the workplace in the future.

3. Students learn and discuss themes in the classroom, which are not limited to time or space in cooperative learning. They post their own data collected in the discussion area and compile discussions of group members into a report.

Many researches have concluded that the Moodle e-learning platform has a significant effect on learning (ex. [24, 25]). Other findings about learning achievement of students show no significant difference between the Moodle e-learning platform and traditional classes (ex. [26, 27]). The results of this research indicate that students have positive attitudes about implementing cooperative learning into the Moodle e-learning platform.

Cooperative learning is helpful for the course "Introduction on Energy Education." Comprehensive perspectives of students include activity records, discussion contents, homework quality, and questionnaire feedback in the Moodle e-learning platform. Special findings of this study include:

1. Most students visit the website and download the professor's teaching file in the platform before the beginning of the course.

2. Students discuss energy issues positively and efficiently.

3. Every group member works to gather relevant content and post references on forums, to finally compile into a report.

4. Students work together and complete a project completely by cooperative learning.

5. Through cooperative learning, students study interactively, share information, learn repetitively, and have less pressure.

6. Students agree that e-learning is the trend to help future employment.

E-learning helps to implement courses efficiently [1, 5, 8, 9, 17, 20]. Based on the research results, implementing cooperative learning into the Moodle e-learning platform can enhance student learning. Teaching activities can implement cooperative learning to more diverse fields, to help students form self-study habits and achieve self-knowledge management.

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