

Blended Learning Method In Teaching And Learning of Renewable Energy

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Abstract. The energy crisis in the future becomes a very crucial issue at the global and regional level. The discussion of other energy substances is an attempt to find alternative energy, one of which is renewable energy. It is necessary to look for renewable energy issues in the lecture forum to find a format that is challenging and fresher, creative and meaningful through the development and use of the Blended Learning classroom flip method. The results of the study showed a significant impact due to the application of the model. With the quantitative method for 500 students participating in the general course of Conservation with the subject of Energy Development, it was conducted in 10 meetings. To obtain data, were used questionnaires, interviews, and tests on competencies, attitudes and design portfolios of renewable energy technologies. The results of the study show a significant impact that students comprehensively understand the concept of renewable energy, have a wise attitude towards the use of renewable energy, competently compile a drafting portfolio. In conclusion, the Blended Learning Model of the Flipp Classroom Method is effectively applied in lectures on Conservation Courses.

1. Introduction

In 2012, the Secretary-General of the United Nations, Ban Ki-moon designated the year as the International Year of Renewable Energy for All. The target, by 2030, is that all people in the world have used energy from renewable sources. The aim of this target is to increase awareness about the importance of optimizing access to sustainable energy, energy efficiency, and the use of renewable energy [4]. The issue of sustainable energy is increasingly emerging in the global domain, especially with the emergence of economic decline and the problem of climate change.

Sustainable energy is defined as the utilization of energy resources that are capable of meeting current needs without overriding the needs of future generations [1]. At present, most of the energy supply comes from unsustainable fossil energy sources [5]. The use of sustainable energy should be an alternative that is commonly considered for Indonesia.

Conservation Courses with discussion material on Energy Conservation, especially renewable energy, are very urgent to be carried out with information technology-based innovations. The innovation in question is to use the blended learning model with the classroom flip method which is very possible to further encourage students to better understand, interpret, be competent, and build creativity. Various sources of knowledge or the most up-to-date renewable energy issues can be presented through blended learning.

2. Problem Statement

The application of blended learning in the learning process or lecture cannot be avoided along with the development of information and communication technology [6]. Presenting new innovations in learning according to some literature will make it easier for students to understand new materials, improve attitudes, build competencies. The skills of lecturers to utilize information and communication technology become a necessity in the midst of many sources of information on science.

Through the implementation of blended learning for students, participants in Conservation courses with the subject matter on Energy Development, especially renewable energy, are the main pillars of research that include: 1) The impact of applying blended learning on students' understanding of renewable energy sources; 2) Student learning attitudes as an indicator of the level of seriousness and involvement following the lecture process; 3) The ability of students to design the concept of renewable energy technology

3. Learning Construction with Blended Learning Flipped Classroom Method

The definition of blended learning as follows, "blended learning generally means methods or solutions to a learning needs". So, blended learning is the application of more than 1 (one) method in learning [7].

As the name implies, blended learning is a learning method that combines face-to-face meetings, computer-based learning (offline) through powerpoint slides with harmonious on-line material. A combination of conventional learning where lecturers meet directly with students in face-to-face activities in class with online learning that can be accessed anytime, anywhere 24 hours a day, 7 days a week. As quoted from which states, "Over time, the class evolved in a way I know now that is called Blended learning where the content is taught using face to face and online methods." Means that learning blended combining conventional/traditional face-to-face learning and learning that uses on-line methods and various other alternatives that can be used by lecturers or students [7].

Flipped Classroom is a learning method that "reverses" traditional methods, where the material is usually given in class and students do tasks at home [2]. The concept of a flipped classroom includes active learning, student involvement, and podcasting. The material is first provided through the internet (blended learning) and class sessions are used for discussion and work on assignments or exercises [3].

Flipped classroom is a learning strategy that can provide educators to minimize instruction and allow students to interact with each other in class and also interact with lecturers [5]. Flipped Classroom is a learning model where lecturers give homework to students to actively learn in advance the material to be delivered through digital media in the form of videos or e-books along with some task instructions/problem training, as discussion material during classroom activities (face to face advance) [5]. The technique of this classroom flipped learning model is:

The lecturer prepares and provides a media (can be a learning video / digital book) that students will watch and learn about at home [1].

- Students watch the video and learn the instructions given by the lecturer through the video so that they first know the concepts and material that will be given at the next meeting.
- In the classroom, students work on assignments based on instructions that have been delivered previously (via video). In this case, students can focus more on the difficulties in understanding the material or its ability to solve problems related to the material.
- Lecturers act as facilitators who assist students in carrying out these tasks.

4. Research Methodology

This research is quantitative research with research and development design and will be abbreviated as R & D. Research and development methods are research methods used to produce certain products and test the effectiveness of these products [4].

R & D is a process or steps to develop a new product or perfect existing products that can be accounted for. He also explained that the products produced were not only books, modules, learning media tools but could also be software (software) such as data processing applications, learning applications.

In this study the authors used the R & D method with the research procedures developed in the form of 1). Preliminary stage; 2). Development stage and 3). Validation stage and 4). Implementation Phase. The first step that must be done is the initial research relating to the learning that will be developed, the development of learning in this study based on the background. Based on preliminary research, a new learning plan is designed which will be used as a solution, namely "the development of blended learning using the flipped classroom method with the Edmodo application in the Energy Conservation course. The development of blended learning using the Flipped Classroom method on algorithmic and programming subjects was produced by using the Edmodo application.

4.1 Introduction Stage

The preliminary stage is the initial stage carried out in this study conducting literature studies, preliminary research, description, and analysis of findings, syllabus analysis, determining the substance of the material and determining/selecting and developing learning objects.

Literature studies are carried out to collect data related to research, such as syllabi syllabus semester development plan (syllabus) and lecture material about algorithms and programming. The literature on blended learning using flipped classroom methods was also collected for research.

From the literature study, the description and analysis of the initial findings were obtained, which the researchers used as the background of this study. And from the syllabus analysis, the determination of material substance will be applied by researchers in this study. The material to be presented is the basic competency regarding looping, then determining and developing learning objects.

4.2 Development Phase

The research development stage makes the framework or map of the development of blended learning begin with the method of flipped classroom on looping material either in online or face-to-face learning such as 1). formulate learning materials online and face to face (F2F), 2). Design blended learning with flipped classroom methods, 3). Developing the initial product is to install Edmodo, and input the lecture material by determining the learning object. And learning objects can be text, graphics or images, animation, audio, video and interactive links to present information. After mapping the object, it was integrated into the Edmodo application for algorithmic subjects and looping material programming.

4.3 Validation Phase

The validation stage is carried out to determine the feasibility of blended learning using the flipped classroom method for students using validation, before being validated there are steps to product evaluation by experts, students and lecturers, to get advice on improving blended learning media with the flipped classroom method, after past improvements re-evaluation and validation by experts. The validation used is internal validation with the Delphi exercise technique, namely the researcher makes a questionnaire for the assessment group, namely material experts and media experts. The material is intended to find out the compatibility of the subject matter of Renewable Energy subject matter, while media experts are intended for the extent of blended learning Edmodo application.

The results of the questionnaire in the form of input, criticism, and suggestions from experts and used by researchers to improve and improve blended learning using the flipped classroom method were then revised to refine the blended learning model development model and to try to get a blended classroom learning design development model

5. Result and Discussion

5.1 Attitude of Learning

The results of the calculation of student learning attitude scores after treatment, based on the table above, obtained the number of samples = 500; mean score = 36.34; standard deviation = 1.01; variant = 1.01 and total score = 1163.

Results of student learning attitudes before and after treatment if labeled as follows:

Table 1. Comparison Tables Before and After Treatment

	n	Σ	$\bar{x}$	s^2	s
Before	500	1008	31,50	3,55	1,88
After	500	1129	36,34	1,01	1,01

Explained from the table above to 500 students who have filled out questionnaires/questionnaires before the implementation of blended learning flipped classroom method obtained the value of the average learning attitude scale of 31.50. After the implementation of the learning obtained the questionnaire average value/questionnaire 36.34.

5.2 Learning Competencies

The study was conducted in the even semester of 2017/2018 for students of Conservation Participants. The data obtained from research on the development of blended learning flipped classroom methods is the result of pre-test and post-test. The results of the trial are illustrated in the following table using the normalized gain test:

Table 2. Results of Pretest and Posttest Values

Criteria	n	Highest Value	Loeest Value	Avarage	s^2	s	Gain
<i>Pretest Value</i>	500	88	51	73,16	86,97	9,33	High Crietria
<i>Posttest Value</i>	500	100	80	89,63	27,34	5,23	

Based on the table data, the average initial ability of students is 73.16 and the final average ability is 89.63. The highest value of the pretest is 88, while the lowest value is 51. The highest value in the posttest result is 100, while the lowest value is 80. The increase in the average score (gain) is 1 or in high criteria. And researchers conducted data processing using SPSS, namely one group t-test (pretest and posttest).

Current technological developments in all fields allow learning to be blended in the flipped classroom method. A combination of various learning models that are aimed at optimizing processes and services in both remote, traditional, and even computer-based learning [2]. Flipped Classroom itself changes the inverse learning method that instructors usually provide material face-to-face or in class, and

assignments are done at home by flipped classroom methods (upside down) instructors provide material online and assignments or discussions are conducted in class, so students have studied the material before face to face lectures.

Blended learning in the flipped classroom method in this study used the Edmodo platform as a Learning Management System (LMS). LMS is a software system that virtualizes conventional learning processes according to Asrori, 2011, while Edmodo according to Rita Kurniawati [4] is a social learning platform designed to support online learning activities.

The choice of the Edmodo platform was due to the ease of downloading free of charge and the context of the social network system so that it can be more familiarly used, as Wenne [8] stated that Edmodo was developed following the trend of developing social media such as Facebook, students and lecturers can communicate and connect in social media environments specifically for safe and secure learning.

With the blended classroom method of blended learning that is applied to these students, students can study material online anywhere and anytime, without limited classrooms. The material can be downloaded by students using an internet-connected laptop, PC or notebook.

The definition of learning itself according to an activity carried out by the teacher in such a way that students' behavior can change in a better direction, as well as what is expected by researchers to develop blended classroom learning is one way that the instructor conducted information on online material to students through the Edmodo platform.

Presentation of the material at Edmodo for this algorithm and programming course only shows one basic competency, namely renewable energy. Students are expected not to be left behind material due to out-of-town service reasons or overtime work which is a barrier factor for students to attend lectures, with online material such as this students can study material anywhere and anytime during internet connection. And students are also expected to repeat online material to learn, remember or apply renewable energy materials.

The features used on the Edmodo platform used in this study include notes, assignments, quizzes, and maps. Notes on Edmodo are used for means of asking, assignments are used to place task information to students, quizzes are used to provide quiz questions to students, and maps are used as a means to store lecture material.

Learning evaluation is needed to find out the effect of blended learning on flipped classroom methods on increasing students. Before being tested to respondents, this learning has gone through the stages of validation testing of material experts and media experts. The average percentage of the material validity test is 97.5% or with very feasible criteria, while the percentage of media experts is 38.5% or the criteria are very feasible. And by obtaining the average results of expert validation test, blended learning in the flipped classroom method was developed in the criteria of validity is very feasible.

Some of the results of research on learning show a positive impact on students. The research results of Fisher [1] state that the results of the analysis of understanding the material concepts show a moderate increase of 0.56 with a gain test.

The results of other studies based on H Ye [3] prepare students to be more diligent in understanding PISA mathematics literacy and feel high excitement and enthusiasm in learning mathematics literacy so that it will continue to improve the quality of learning that is getting better.

Blended learning design flipped classroom method in the form of an inverted online learning method where the material is given online and tasks are done in class, some things that need to be considered in making material online

The results of this study indicate a positive and significant influence because there is a change in student learning attitudes, so that blended learning flipped classroom methods have an influence on student learning attitudes because student learning attitudes are increasing.

6. Conclusion

Blended learning applied with the flip classroom method has the effect of increasing the ability of students to understand the concepts of renewable energy lecture material, building a positive attitude towards efforts to develop future energy needed by the community, students able to conceptually design renewable energy technologies

7. References

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