Blended Learning for Undergraduate Students: Validity, Practicality, and Effectivity

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Abstract. This study aimed to implement blended learning in Integrated Science Learning Course for undergraduate students by using three parameters, namely, validity, practicality, and effectivity. The research design was post-test group design. This research was conducted for eight months in Science Department, Universitas Negeri Surabaya. The data of research were collected in three ways, that were, validation, observation, and test. The results obtained in this study indicated that the blended learning was: (1) valid based on the expert judgments laid on didactic requirements, construction, content, and technical aspect; (2) practicable in which all teaching and learning instructions were implemented well; and (3) effective in which all students and groups learning could exceed the minimum limit score for cognitive learning outcomes and skills.

1. Introduction
Learning is an activity to gain knowledge, practice skills, and foster attitudes. Over the past several decades, this activity was often carried out in class and face to face learning between instructors and learners. Learners get certain training, lectures, discussions, or treatments from the instructor during classroom learning to achieve certain goals. Thus, the process of interaction directly with the instructor is a major component in the learning process.

Traditional or face- to-face learning directly has advantages and disadvantages. The advantages of this learning are that learners obtain unwritten information, learners can interact with colleagues and experts, can increase interest in a topic, and humanize humans. On the other hand, face to face learning costs more because they have to attend class. This method will also require learners to provide special time or scheduled time. If learning is done through lectures, discussion activities and interactions with peers will be reduced [1].

In the millennial era, teaching and learning can be done without having to face to face directly between the instructor and the learner, especially at the university level. This is called online lecturing. In line with the vision of higher education revealed that higher education must be of high quality and have the ability of science and technology and innovation to support the nation’s competitiveness [2]. In order to realize this vision, since 2014 - 2015 the Directorate General of Higher Education through the Director of Learning, has piloted the application of Open and Integrated Indonesian Online Learning.

As with traditional learning, online learning also has weaknesses and strengths. The main disadvantage is that it is difficult to grow a learner's character. On the other hand, online learning has efficiency in terms of distance, time, and costs needed during the learning process [1].

Universitas Negeri Surabaya as one of the state universities in Indonesia responded to the phenomenon of traditional and online lectures in Indonesia. Through the Regulation of the Chancellor
of Universitas Negeri Surabaya Number 005 of 2017 concerning the Guidelines for Implementing Universitas Negeri Surabaya e-Learning, the e-learning is carried out to strengthen class-based lectures rather than to replace the entire process, so that the learning principle is to blend the learning process between the face-to-face process in the classroom and the e-learning process.

Blended learning is a combination of online and traditional lectures using learning resources to improve learner learning outcomes and achieve certain goals [3, 4, 5, 6, 7]. In other words, this lecture maintains interaction in class and efficiency.

Thus, this study focuses on the development of blended learning in Integrated Science Courses, Science Department, Faculty of Math. and Nat. Sci., Universitas Negeri Surabaya, with indicators of validity, practicality, and effectiveness.

2. Research Methodology

The model for developing blended learning was adopted from 4-D model [8]. This model consists of four stages, namely define, design, develop, and disseminate. The disseminate stage is not carried out and is limited to the development stage. The blended learning consisted of the courses in class and a virtual system developed by Universitas Negeri Surabaya. The blended learning instrument (lesson plan, material, and student worksheet) was applied to learning process to find out the practicability of the instrument. The design was post-test group design.

3. Results and Discussions

3.1. Validity of learning tool

Validation was carried out by two validators, which are the lecturers of the Natural Sciences Department of Mathematics and Natural Sciences, based on didactic, construction, content, and technical requirements. The recapitulation of the results of the validation of blended learning teaching materials can be seen in Table 1.

| Table 1. Recapitulation of the Results of Validation of Blended Learning Teaching Materials. |
|-----------------------------------------------|---------------------|-----|-----|----------------|
| Aspects                                      | Score               | Average | %  | Criteria       |
| ---------------------------------------------|---------------------|---------|----|----------------|
| Didactic                                     | In line to curriculum | 4 | 4 | 3.85 | 96% | Very feasible |
|                                             | Practicality learning tool toward individual academic capabilities | 3.7 | 3.7 | 93% | Feasible |
| Construction                                 | Identity: title     | 4 | 4 | 3.73 | 93% | Very feasible |
|                                             | Purposes delivery   | 4 | 4 | 94% | Feasible |
|                                             | User instruction    | 3.3 | 3 | 94% | Feasible |
|                                             | References          | 3.7 | 3.7 | 94% | Feasible |
|                                             | Language            | 3.7 | 3.7 | 94% | Feasible |
|                                             | Structure of sentences | 3.7 | 3.7 | 94% | Feasible |
| Content                                      | Materials           | 4 | 3.3 | 3.75 | 94% | Very feasible |
|                                             | Tasks and articles  | 3.7 | 4 | 94% | Feasible |
| Technical                                    | Layout              | 2.7 | 3 | 2.71 | 68% | Feasible |
|                                             | Pictures delivery   | 2 | 2 | 68% | Feasible |
|                                             | Color combinations  | 3.3 | 3.3 | 68% | Feasible |

Based on Table 1 it can be concluded that the developed blended learning teaching materials are feasible, with all components in the feasible or very feasible category.

The minimum value of eligibility is 61% [9]. Another opinion, states that the instrument must obtain an average validation result of > 63% to be used [10]. If the eligibility requirements are reflected in each component of validation of blended learning teaching materials, it can be said that all components of teaching materials (didactic requirements, construction requirements, content requirements, and technical requirements) meet the minimum requirements for eligibility.
3.2. Practicality of Blended Learning

One indicator of the quality of blended learning teaching materials is the practicality of the teaching materials as measured by the level of implementation of each stage of teaching and learning instruction on the success of development. The results of the implementation are presented in Table 2.

**Table 2. Learning Outcome of Blended Learning Instrument Implementation**

| Meeting | Activities                                                                 | Implementation | Notes                                                                 |
|---------|-----------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------|
| I       | 1. Explaining definition of science.                                        | 100%           | -                                                                     |
|         | 2. Identifying characteristics of topics/area of learning related to science.|                |                                                                        |
|         | 3. Explaining purposes of integrated science learning.                      |                |                                                                        |
|         | 4. Describing concepts of integrated learning in science.                   |                |                                                                        |
| II      | Asking students to do a workshop to create a media for presentation containing: | 100%           | At the beginning, the students seemed confuse and stress to respond the task. |
|         | a. Analysis of strengths and weaknesses of integrated models.              |                |                                                                        |
|         | b. Examples of integrated models in science learning.                      |                |                                                                        |
| III     | Asking students to do a workshop to create a media for presentation containing: | 100%           | The Students were still getting a difficulty in terms of presenting a rationalization of integrated models they have chosen. |
|         | a. Analysis of strengths and weaknesses of integrated models.              |                |                                                                        |
|         | b. Examples of integrated models in science learning.                      |                |                                                                        |
| IV      | Providing an opportunity for the students to present connected and threaded model. | 100%           | The students discussed intensively about a perspective that view natural “science is a single discipline of science” or “it is a combination of some disciplines.” |
| V       | Providing an opportunity for the students to present webbed model.         | 100%           | The discussion ran well and intensive. Also, active learning happened. |
| VI      | Providing an opportunity for the students to present integrated model.     | 100%           | The discussion ran well and intensive. Also, active learning happened. |
| VII     | Providing an opportunity for the students to present STEM (Science-Technology-Engineering-Mathematics) and SETS (Science- | 100%           | The discussion ran well and intensive. Also, active learning happened. |
The cognitive test did the students independently. However, the skills test were performed in group.

Based on Table 2 shows that all instructions can be carried out. However, at Meetings II and III it was observed that in a row "... At the beginning, the students seemed confuse and stress to respond the task" and " The Students were still getting a difficulty in terms of presenting a rationalization of integrated models they have chosen." This shows that students are still in the process of adaptation for initial meetings.

3.3. **Effectivity of Blended Learning**

In the study of learning outcomes in question are learning outcomes obtained from the results of written tests and performance. The written test results that show students' cognitive abilities are presented in Table 3.

| Students | Characteristics of integrated models | Strengths and weaknesses of integrated models | Schema/diagram of integrated models | Rationalization of integrated models | Total of score |
|----------|-------------------------------------|--------------------------------------------|-----------------------------------|--------------------------------------|---------------|
| 1        | 25                                  | 25                                         | 25                                | 20                                   | 95            |
| 2        | 20                                  | 15                                         | 20                                | 15                                   | 70            |
| 3        | 18                                  | 18                                         | 20                                | 18                                   | 76            |
| 4        | 22                                  | 20                                         | 22                                | 20                                   | 84            |
| 5        | 20                                  | 18                                         | 18                                | 20                                   | 76            |
| 6        | 24                                  | 23                                         | 25                                | 20                                   | 92            |
| 7        | 25                                  | 23                                         | 20                                | 20                                   | 88            |
| 8        | 22                                  | 22                                         | 20                                | 20                                   | 84            |
| 9        | 22                                  | 21                                         | 20                                | 22                                   | 85            |
| 10       | 22                                  | 20                                         | 23                                | 20                                   | 85            |
| 11       | 23                                  | 20                                         | 20                                | 18                                   | 81            |
| 12       | 23                                  | 21                                         | 20                                | 23                                   | 87            |
| 13       | 20                                  | 18                                         | 24                                | 20                                   | 82            |
| 14       | 20                                  | 22                                         | 21                                | 18                                   | 81            |
| 15       | 23                                  | 20                                         | 20                                | 21                                   | 84            |
| 16       | 20                                  | 20                                         | 20                                | 23                                   | 83            |
| 17       | 20                                  | 22                                         | 23                                | 21                                   | 86            |
| 18       | 22                                  | 23                                         | 21                                | 20                                   | 86            |
| 19       | 25                                  | 23                                         | 22                                | 20                                   | 90            |
| 20       | 25                                  | 24                                         | 23                                | 20                                   | 92            |
| 21       | 18                                  | 20                                         | 20                                | 18                                   | 76            |
| 22       | 18                                  | 20                                         | 21                                | 20                                   | 79            |
| 23       | 21                                  | 20                                         | 20                                | 18                                   | 79            |
| 24       | 20                                  | 21                                         | 21                                | 18                                   | 80            |
| 25       | 18                                  | 20                                         | 22                                | 18                                   | 78            |
Table 3 shows that all students get a total score above the remedial limit, which is 68. In addition, Table 3 also shows that there are four components asked by students, namely (1) Characteristics of integrated models, (2) Strengths and weaknesses of integrated models, (3) Schema/diagram of integrated models, and (4) Rationalization of integrated models. For each component, students have scored above 50%. However, there are still components that need to be improved, namely "Rationalization of integrated models". There were seven students who got a score of 18 on the component. This shows that they still have difficulty in providing logical reasons for their cohesiveness.

In addition to written tests, students are also given a performance test that represents oral and cognitive testing. The results of performance tests are obtained through the results of student presentations presented in Table 4.

**Table 4. Results of Presentation Skills Test.**

| Team | Score of each component | Total |
|------|-------------------------|-------|
|      | Organizing presentation |       |
|      | Mastering of knowledge/theory I |       |
|      | Mastering of knowledge/theory II |       |
|      | Visualizing layouts |       |
|      | Eye contact |       |
| 1    | 15 | 15 | 25 | 20 | 15 | 90 |
| 2    | 15 | 15 | 25 | 20 | 10 | 80 |
| 3    | 15 | 15 | 25 | 20 | 10 | 80 |
| 4    | 15 | 15 | 25 | 20 | 15 | 90 |
| 5    | 15 | 15 | 25 | 20 | 10 | 80 |
| 6    | 15 | 15 | 25 | 20 | 10 | 80 |

Table 4 shows that all study groups have performed well, including the ability to organize presentations, mastery of knowledge / theory I (ability to answer all questions), mastery of knowledge / theory II (ability to convey all material), ability to make visualizations, and eye contact. Even so, there are still components that need to be improved, namely the ability to answer questions. This is because none of the groups were able to answer all the questions posed during their presentation. In addition, eye contact when presenting still needs to be trained. Some students still look less confident and often look towards the power point slides.

Blended Learning Teaching Materials have been able to have a positive impact on students' cognitive and skills because they are influenced by the opportunity to work in teams and obtain feedback from discussions during the application of Blanded Learning Teaching Materials. The existence of group work will improve student achievement through three different ways, namely increasing attention, feeling of mutual help, and responsibility [11]. Discussion (expressed language) provides information about what students already know and to form new knowledge, so that it is able to encourage cognitive development [12].

4. Conclusion

Based on the results and discussion it can be concluded that:

a. the Blended Learning was (1) valid based on the expert judgments laid on didactic requirements, construction, content, and technical aspect, (2) practice where all teaching and learning instructions were implemented well, and (3) effective in which all students and groups learning could exceed the minimum limit score for cognitive learning outcomes and skills.

b. the layouts in virtual system should be improved in terms of aesthetics. In addition, for further implementation researchers should pay attention to student responses to the initial lecture meetings. For further research, it is necessary to measure student responses to the application of Blended Learning.

5. References

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