The Effectiveness of Blended Learning in Chemistry Creative Media Course

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Abstract. This study has purpose to figure out the effectiveness blended learning activity in creative media course through blended learning for education chemistry students year 2017. The effectiveness declared from learning outcome and students’ response. The study was held in odd semester 2019-2020 for 15 meetings. After the instrument of blended learning (Students worksheets, visual and video/audio media) showed validity then learning activity was conducted from August to December 2019. There were combination of online and offline in teaching-learning activity for 15 meetings. Discussion, Assignments and its submission activities was using vilearn for 4 meetings, and the rest of meetings were used offline. As final project, students in team presented chemistry creative media in internal exhibition. The theme of exhibition is physical chemistry creative media. The media assessed by lecturers and students (other years or other study programs) who attended the exhibition. The data of learning outcome were obtained from final project score and assignments. While the data of students’ response were gained after the exhibition was held. The result of this study showed 100% students could achieve mastery learning outcome and student responded this course in very good criteria. It can be concluded that chemistry creative media course effective to be conducted by using blended learning activity.

1. Introduction
The 21st century education requires adaptation in every line which is marked by very tight competition in the fields of technology, management and human resources (HR). Mastery of technology and science is a must so that the nation’s competitiveness increases. The learning process with e learning is increasingly developing as a result of the development of science, knowledge, and the need for distance education.

The use of e learning as distance learning is increasingly being used in the world of education because of its practicality. Distance learning is structured learning that takes place without the presence of direct education in front of students [1]. Other terms of distance learning that apparently synonymous and interchangeable and are merely the preferred delivery mechanism for most distance learning are online learning, digital learning, e-learning and virtual learning [2].

Distance learning can be combined with traditional teaching which need face-to-face class interaction, this strategy can be called as blended learning. Blended learning is an innovative concept that embraces the advantages of both traditional teaching in the classroom and ICT supported learning including both offline learning and online learning for the same students studying the same content in the same course [3], [4], [5]. Blended learning forces teacher and learner to consider the characteristics of digital technology, in general, and information communication technologies (ICTs) [6]. Blended learning also known as hybrid or mixed-mode learning [5]. Asynchronous on-line learning experiences provide students with opportunities for meaningful reflection [7]. Most campus-based classrooms with their large class sizes do not provide students with an environment conducive for reflection [7]. Education institutions all around the world for over decades concern to certain skills, such as language skills and critical thinking, while some other skills are more recently emergent, namely, digital literacies [8].

In blended learning implementation, digital literacies also to be one concerned by education institution. For this reason, requirements that must be met in the implementation of blended learning are:
well trained teachers, teachers with scientific attitude, teachers with a wider outlook and positive approach towards change, complete facilities, students have access to the internet at their private computers, flexibility in the system, fully aware and agreed parents, and formative evaluation and continuous internal assessment [4]. Blended learning provides an effective learning environment that can ease students' access, success, withdrawal, and perception [6].

Blended learning also can be conducted in Creative Media course, one of the elective courses provided, for undergraduate Chemistry Education study program students. In the 2019/2020 academic year this course was provided for undergraduate Chemistry Education student year 2017. Creative Media courses aim to meet the demands of 21st century education which requires students to be creative, communicative, collaborative, and critical individuals. Some of the topics raised in the creative media course are 1) the characteristics of chemistry competence standard for student in high school and vocational school, 2) the characteristics of creative media, 3) student characteristics and their relationship with creative learning media and chemistry materials.

Hopefully, blended learning in this course could improve the quality of activities, strengthen and improve online lectures. The use of visual and audio-visual media at online lecture meetings will be optimized to facilitate and facilitate the quality of learning and learning experiences received by students so that they can achieve the expected competencies.

2. Method
This research aims to describe the effectiveness of blended learning in creative media course in project based activity. The research was conducted on odd semester in 2019-2020 academic year. There were 35 students enrolled creative media course that were devided into 11 groups containing 3-4 students. From 15 meetings, there were 4 meetings conducted online, while the rest of them were conducted offline. Online meetings were on third, fourth, sixth, and seventh meetings. Which every online meeting students were given assignment. Online meeting using vilearn Unesa (Universitas Negeri Surabaya). This vilearn used moodle 3.0.

Research instrument and data collecting method were assignment, middle test, final project, and student response questionnaires. For final project, students in groups presented chemistry creative media in internal exhibition. Assignment and final project conducted in group so the score was group score. While middle test was individual paper test that was held on 8th meeting. The distribution of questionnaires was used to determine student responses to the effectiveness of blended learning in creative media courses. Questionnaire sheets were given to each students after the final test was held. This questionnaire was using google form.

Students were said to have completed their studies if they have succeeded in obtaining a success rate of 70% (assignment, middle test, and final project) and classical completeness is 85%. The results of the student response questionnaire were analyzed using descriptive statistics. Data from student response questionnaires were analyzed by adding up student ratings then calculating the average score. The rating ranges from 1 (not good) to 5 (very good). From the average value, conclusions are drawn which is determined by the score as follows:

- Not good = 1.00-1.80
- Not good = 1.81-2.60
- Good enough = 2.61-3.40
- Good = 3.41-4.20
- Very good = 4.21-5.00

Chemistry creative media course can be concluded effective to be conducted by using blended learning activity if the response of the students in good and very good criteria.

3. Results and Discussion
The blended learning design in this study is the implementation of e learning in creative media courses that has been carried out starting from the first lecture meeting in the odd semester 2019-2020. The obstacle that occurred at the first meeting was that many students were unfamiliar with e learning, so some students still needed to be accompanied to enter the e learning menu of the Creative Media course. This phenomenon is in accordance with the results of research by Arkorful and Strzeciwick which found
that e learning can lead to inefficient use of time, especially for the first experience of using e learning [9], [10].

The learning material tool (PPt and worksheet) that already developed for Creative Media course have been validated by 2 experts and the results are obtained that the course of the development of Creative Media courses is used to support online lectures (e-learning) [11].

At the first meeting, students were asked to visit e learning in the Creative Media course. The menu at the first meeting was a discussion forum related to student understanding of the term creative media. The discussion forum was used by all students (35 students who enroll) in the first meeting. In this activity there were no obstacles experienced by students. The students are getting used to the new e learning site. This can be seen from the upload time of each student's comments, which do not differ too much between comments from one student to another. In online discussion (in this case is discussion forum), all students have a voice and no students can dominate the conversation [12]. If an information is to be retained in memory, and is related to the previous information stored in memory, then the individual (in this case students) who learns must be involved in cognitive rearrangement or elaboration of the material [13].

When students use e-learning in the discussion forum menu, students individually gave their opinion about the meaning of creative media based on the material read in PowerPoint (PPt). PPt is one of the learning media used in lectures which are carried out by e learning. The use of e learning also involves digital-based learning tools such as PPt [9].

For the second meeting, lecturing activities through blended learning by utilizing e learning, especially when uploading group work for worksheet 1. At worksheet 1 students were asked to look at the competency standards for chemistry graduates in high school and vocational school, then the groups were asked to analyze its characteristics. The results of student work are then uploaded via e learning. The menu selected for this activity is an assignment. The task of the supervising lecturer after the assignment upload activity is to assess the assignment through e learning.

In this assignment, students were asked to upload individually in e learning even though this assignment was a group assignment. However, the menu at e learning still could not accommodate this need. So, when entering grades through e learning, the lecturer pays close attention to the names of the groups so that they were not mistaken for giving the same score to students in the same group. The use of vi learn has advantages, that is able to maintain student discipline in doing and submitting assignment/task [14].

3.1 Student Learning Outcomes
The implementation of e-learning using e learning was carried out in 4 meetings. The four meetings were the 3rd meeting, 4th meeting, 6th meeting, and 7th meeting. There were also 4 assignment that must be completed. The first assignment (at 3rd meeting) deals with standard competency for high school and vocational school student and Media analysis. In this assignment, students were asked in groups to look at the competency standards for chemistry graduates in high school and vocational school, then they write down the characteristics of chemistry competence standard for student in high school and vocational school. Students in groups were also asked to plan appropriate learning media to achieve the standard competency. In the 2nd assignment students in groups analyzed suitable media to teach material with various student learning styles. From the analysis of the selected media, students were also asked to describe the media design. The 3rd assignment was to compile a storyboard and flowchart of the media plan to be developed. Students were also asked to write down tools and materials from the media to be developed. For the material to be developed, the learning media was devoted to physical chemistry material. From the planned material tools, students were also asked to determine the costs required in media development. The 4th assignment was the development of creative media. In this fourth assignment, this was not done in only one meeting, but gradually until the 15th meeting. The results of this assignment are illustrated by the student scores in Table 1.
The 1st assignment (from worksheet 1) has been done by students in their groups with an assessment range between 84 and 90. The group who scored 84 gave more answers using IT media such as PowerPoint compared to real-life media, this is not in line with expectations in the creative media course. In the creative media course, students were expected to be able to use material tools that are easily found around them to be able to transfer chemistry to students. For groups of students who scored 90, they were more likely to choose media that prioritized hands on activity and minds on activity, not only in the form of visual (PPT). For example, gilding coins with copper using electric cables, batteries, CuSO4 0.1 M solution, copper metal, and zinc coins. This activity train student creativity by constructing their prior knowledge and collaborated with creative idea to take advantage tools and materials available around them. Constructivist teaching approaches create opportunities for learners to extend their own knowledge by engaging them in stimulating learning experiences [8].

The 2nd assignment (from worksheet 2) regarding student characteristics, linkage of student characteristics, creative learning media, and chemical materials was carried out online through vi learn Unesa at the fourth meeting. For the results of assignments, the assessment range is between 82 and 90. The group that scored 82 actually wrote down the media that would be used to facilitate students with different types of learning, but it was more likely for students who had visual learning types only. Because this group said was only making/developing the atomic form of several atomic theories. The group that scored 90 has provided a more concrete picture of the media that can be used for students with different types of learning (audio, visual, and kinesthetic learning styles).

The third online activity at the 6th meeting was carried out with the help of worksheet 3 assignments, regarding storyboards. The results of the worksheet 3 assessment were in the assessment range in the score 75 to 90. The group that scores 90 has displayed a design drawing on the storyboard. Whereas for the group that got a score of 75, the results of the assignment did not present a description of the media design that would be developed, only contained a description of the media design.

On assignments from worksheet 4 which were carried out online through vi learn at the 7th meeting, the assessment range obtained by the student group was between 86 and 90. Score 86 is given if the assignment is done does not list sequentially how to use creative media that will be developed by students. A score of 90 is given to groups that have listed how to use the creative media to be developed. In worksheet 4, which assigns students to produce creative learning media, they could practice their higher-order thinking skills. This is in line with Valente's statement that this training provides a marginal increase in creative problem-solving skills by reducing perceptual and functional fixations and mental blocks [15].

This group assignments were also related to practicing tolerant attitudes and communication between students. As they work on the task, they monitor their performances and judge whether their performances are moving them toward outcome attainment [16].

The activities of doing assignments were carried out not in class but outside the classroom with the hope that students can freely express ideas without being limited by space and time. Students can communicate directly or through communication tools when discussing and consulting with lecturers regarding assignments. Students may be able to choose the social and physical settings they use to work

| Group | 1st assignment | 2nd assignment | 3rd assignment | 4th assignment | Average |
|-------|---------------|---------------|---------------|---------------|---------|
| 1     | 85            | 90            | 85            | 86            | 86.50   |
| 2     | 86            | 88            | 86            | 87            | 86.75   |
| 3     | 86            | 85            | 86            | 90            | 86.75   |
| 4     | 90            | 90            | 90            | 86            | 89.00   |
| 5     | 88            | 87            | 75            | 88            | 84.50   |
| 6     | 85            | 90            | 85            | 87            | 86.75   |
| 7     | 86            | 83            | 85            | 88            | 85.50   |
| 8     | 84            | 85            | 85            | 86            | 85.00   |
| 9     | 86            | 85            | 90            | 90            | 87.75   |
| 10    | 90            | 89            | 86            | 87            | 88.00   |
| 11    | 85            | 82            | 85            | 90            | 85.50   |

The table above shows the students' assignment scores ranging from 82 to 90.
on the task given by teacher, so that they structure their environments to make them conducive to learning and seek help when they need it [16].

At 8th meeting, the students did middle test individually. This test consist of students’ knowledge about storyboard and flowchart in chemistry material. At 9th to 15th meeting the students in group continued preparing and developing creative media in physical chemistry topic. The topics were: exothermic and endothermic reaction, factors affecting reaction rate, electrolysis, voltaic cell, colligative characteristic of solution, and chemistry equilibrium. Each group selected one topic that differ from other group. Table 2 illustrate the total score of each component (assignment in average, middle test, and final project).

Table 2 Students’ Total Score

| Student/group | Assignment Average | Middle test | Final project | Student/group | Assignment Average | Middle test | Final project |
|---------------|--------------------|-------------|--------------|---------------|--------------------|-------------|--------------|
| S1a/1         | 86.50              | 86.00       | 93.00        | S7a/7         | 85.50              | 82.00       | 90.00        |
| S1b/1         | 86.50              | 82.00       | 93.00        | S7b/7         | 85.50              | 82.00       | 90.00        |
| S1c/1         | 86.50              | 82.00       | 93.00        | S7c/7         | 85.50              | 77.00       | 90.00        |
| S2a/2         | 86.75              | 75.00       | 95.00        | S8a/8         | 85.00              | 86.00       | 89.00        |
| S2b/2         | 86.75              | 82.00       | 95.00        | S8b/8         | 85.00              | 82.00       | 89.00        |
| S2c/2         | 86.75              | 86.00       | 95.00        | S8c/8         | 85.00              | 82.00       | 89.00        |
| S3a/3         | 86.75              | 82.00       | 94.00        | S9a/9         | 87.75              | 75.00       | 91.00        |
| S3b/3         | 86.75              | 86.00       | 94.00        | S9b/9         | 87.75              | 86.00       | 91.00        |
| S3c/3         | 86.75              | 82.00       | 94.00        | S9c/9         | 87.75              | 75.00       | 91.00        |
| S4a/4         | 89.00              | 82.00       | 97.00        | S9d/9         | 87.75              | 82.00       | 91.00        |
| S4b/4         | 89.00              | 75.00       | 97.00        | S10a/10       | 88.00              | 86.00       | 95.00        |
| S4c/4         | 89.00              | 75.00       | 97.00        | S10b/10       | 88.00              | 82.00       | 95.00        |
| S5a/5         | 84.50              | 78.00       | 90.00        | S10c/10       | 88.00              | 82.00       | 95.00        |
| S5b/5         | 84.50              | 82.00       | 90.00        | S11a/11       | 85.50              | 82.00       | 96.00        |
| S5c/5         | 84.50              | 78.00       | 90.00        | S11b/11       | 85.50              | 86.00       | 96.00        |
| S5d/5         | 84.50              | 78.00       | 90.00        | S11c/11       | 85.50              | 82.00       | 96.00        |
| S6a/6         | 86.75              | 82.00       | 92.00        |               |                    |             |              |
| S6b/6         | 86.75              | 82.00       | 92.00        |               |                    |             |              |
| S6c/6         | 86.75              | 75.00       | 92.00        |               |                    |             |              |

Based on Table 2, the lowest score of middle test is 72.00 and the highest score is 86.00, this score shows that students already mastery the knowledge of components in developing learning media for chemistry matter. The lowest score shows the ability to create storyboard still can be optimized during the rest of meetings (9th to 15th meeting). At the final project, it is not only assess the storyboard and flowchart, but also assess creativity of group in creating storyboard into real learning media. By doing hands on activity and minds on activity, students can process the information to be stored in long term memory. Information processing theories emphasize the transformation and flow of information through the cognitive system. It is important that information be presented in such a way that students can relate the new information to known information (meaningfulness) and that they understand the uses for the knowledge. Learning should be well structured so that it builds on existing knowledge and can be clearly comprehended by learners. Teachers also should provide advance organizers and cues that learners can use to recall information when needed and that minimize cognitive load [16].
3.2 Result of Student Response Questionnaire

Students were asked to fill out a response questionnaire at 15th meeting. This was done with the assumption that all worksheet and assignment have been done by students. The results of the student response questionnaire presented in Table 3.

Table 3 Student Response Questionnaire Data Related to Creative Media Courses

| Aspect                                                                 | Range | Average | Criteria  |
|------------------------------------------------------------------------|-------|---------|-----------|
| 1. Generating motivation / interest / curiosity.                        | 3 - 5 | 4.40    | Very good |
| 2. According to your level of thinking.                                 | 3 - 5 | 4.43    | Very good |
| 3. Asking you to be creative in solving problems                        | 3 - 5 | 4.62    | Very good |
| 4. Systematic content (layout) is appropriate.                          | 3 - 5 | 4.37    | Very good |
| 5. The PPT and LKM formats (size, etc.) are appropriate                 | 3 - 5 | 4.54    | Very good |
| 6. Up to date content.                                                  | 3 - 5 | 4.23    | Very good |
| 7. Using good and correct Indonesian.                                   | 3 - 5 | 4.57    | Very good |
| 8. The terms used are precise and understandable                        | 4 - 5 | 4.66    | Very good |
| 9. Use terms and symbols consistently.                                  | 3 - 5 | 4.49    | Very good |
| 10. Presentation of the material is straightforward (not wordy).        | 3 - 5 | 4.66    | Very good |
| 11. Meet the components of the analysis (SKL analysis, student characteristics, creative media) | 3 - 5 | 4.69    | Very good |
| 12. Meet the evaluating components                                      | 3 - 5 | 4.57    | Very good |
| 13. Meet the components create / Create                                 | 3 - 5 | 4.63    | Very good |

Based on Table 2, the range of assessment is generally between 3 and 5. However, in terms of "the terms used are appropriate and understandable", the student assessment range is between 4 and 5. The criteria for all aspects are very good.

Based on the suggestions and criticisms submitted by students, in general students think that the Creative Media course requires discussion time of more than 2 credits. Even though students think that vi learn can help in this lecture, based on the criticism and suggestions that are provided, it shows that this course is more comfortable if it is carried out with more face-to-face discussions.

Some of the criticisms conveyed by the students were related to limiting material for media development, which according to students could limit creativity. The reason for this limitation is so that the materials and concepts that are carried through the creative media do not deviate far and become more focused. Each year a different theme will be given for students programming Creative Media courses.

4. Conclusions and Recommendations

4.1 Conclusion

Based on the research results obtained, namely the learning outcome data which has a minimum value and the results of the student response questionnaire which have very good criteria, it can be concluded that Creative Media lectures are effective to be conducted when combined with E-Learning (blended learning). The effectiveness of blended learning in this course was showed by the student discipline in doing and submitting assignment on time because in vi learn (other e learning platform) the teacher can set and adjust the due date time. If the student submits late, the teacher can reduce the score. Another advantage of using e learning is the student creativity and critical thinking can be optimized because the student can communicate and argue freely in discussion forum.
4.2 Suggestions
Technical problems can be overcome by using the internet network from the provider. Students need to use e-learning not only for uploading assignments but for simple communication such as discussions in forums so that communication skills are getting better.

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