Creativity of mathematics education students in producing instructional media-based on macromedia flash through blended learning

P Fitriasari1*, D Octaria2, and N Sari3
1,2Mathematics Education Study Program, Universitas PGRI Palembang, Jl. Jend Ahmad Yani, Lt. Gotong Royong, 9/10 Ulu, Palembang 30116, Indonesia.
3Mathematics Education Study Program, Sriwijaya University, Jl, Srijaya Negara Lr. Ogan Bukit Besar, Palembang 30139, Indonesia.

*Corresponding author’s e-mail : putrifitriasari20@gmail.com

Abstract. This study aims to train the creativity of mathematics education students in creating Macromedia flash-based instructional media through blended learning. Media is an important component in the learning process, which can help the student to achieve learning objectives. In order to produce instructional media, the teachers’ creativity of teacher is needed to create innovative products. This research is using a descriptive quantitative research method with 28 students of class VIB mathematics education study program, FKIP University of PGRI Palembang. Data were collected by observation and performance tests. The collected data from this research is analyzed quantitatively descriptively. Based on the analysis of observation data, it is known that there are 22 and 6 students included in the category of very good and good respectively. In the performance test, there are 20 students in the very good category, five students in the good category, two students in adequate category, and 1 student in the poor category.

1. Introduction
Media is very important in learning process that can improve the quality of education [1]. According to [2], media is everything that can be used to convey messages in the form of learning material in order to stimulate the thoughts, feelings, interests, and concerns of students so that the learning process occurs. One type of media commonly used in the learning process is ICT-based media. ICT-based instructional media is multimedia that consists of information and communication technology with the aim of conveying the message of education from educators to students and improving students understanding [3]. Lots of ICT-based learning media are available today, including applications that can support online learning such as edmodo, schoology, moodle, and so on. Educators can carry out learning anywhere not limited to space and time by using the applications. In addition to applications that support blended learning, macromedia flash is also one of the ICT-based media that can be used by every educator in the learning process. According to Lieu [4] Macromedia flash is an application that can display information in the form of images, writing, animation, etc. so that students are more
interested in participating in learning. Educators expected to develop their creativity in designing media with macromedia flash as basis in order to improve the quality of learning.

Balka states creativity is the ability to express new ideas in the form of a work that is different from what were previously or divergent thinking [5]. Whereas in the field of education, creativity can be defined as the ability to create new innovations that are useful for the development of education [6]. So that, in educational the research of students’ creativity is great importance [7]. An educator must develop his creativity in order that he can produce learning media that attracts students’ interest [8]. Developing creativity is not only the duty of educators, but students who are prospective teachers also need to develop it. However in reality, student creativity in producing learning media is still lacking. It can be seen from research [9] that 60.1% of students have poor creativity. In addition, based on the experience of researchers while teaching ICT courses, the purpose of this course is to produce a product in the form of learning media. Initially students have various ideas about the media that will be created, but the products they made are not in accordance with the concepts that have been made. In fact during lectures, lecturers have equipped students to master media-producing skills. From interviews, it reveals that there were found several obstacles, including lack of mastery of the software used (Macromedia Flash). In a short time, students are required to produce macromedia flash-based learning media products. Therefore students are expected to be able to learn independently, not only learn when in class but they should learn anywhere from various information. Consequently, lecturers must prepare facilities for students that allow students learn anywhere and anytime. This way of learning is called blended learning [10], which combines face-to-face learning with e-learning [11].

Based on the description above, researchers are interested in conducting research which can train the creativity of prospective teacher students in producing macromedia flash-based learning media. This is necessary because if students have creativity and ability to produce media, they can create the quality learning. It is according to research on creativity and blended learning conducted by [12] and [13]. They showed good results in the form of increasing student creativity in making ICT-based media for social studies and science. Moreover, [14] implements blended learning to improve student learning independence. However, there have been no studies that train student creativity in producing macromedia flash based instructional media within university level.

2. Methods
This study used a descriptive method. Subjects of this study are 28 students in class 6B of Mathematics Education Program Study, Faculty of Teacher and Training Universitas PGRI Palembang, academic year 2018/2019. Data were collected using performance tests and observations. Performance tests are given to assess products in the form of macromedia flash based mathematics instructional media. Otherwise, observation was used to observe student creativity when the learning process takes place. The data in this study are quantitative data that are analysed descriptively. Score of both performance test and observation are converted into percentage using the formula in Figure 1. Data is categorized based on modification of category in Table 1 [15].

![Figure 1. Percentage Formula](image)

| Percentage (%) | Category    |
|----------------|-------------|
| 81 – 100       | Very good   |
| 61 – 80        | Good        |
| 41 – 60        | Adequate    |
| 21 – 40        | Poor        |
| 0 – 20         | Very Poor   |
3. Result and Discussion

Data on student creativity in producing macromedia flash based instructional media was analysed descriptively in order to see their quality. Descriptive statistics for data include mean (\( \bar{x} \)) and standard deviation (s) from performance test and observations at each meeting. A summary of descriptive statistics on student creativity is presented in Table 2.

| Statistics            | \( \bar{x} \) | s   |
|-----------------------|----------------|-----|
| Performance test      | 86.07          | 16.85|
| Observation on the first meeting | 85.13          | 10.68|
| Observation on the second meeting | 86.83          | 10.48|
| Observation on the third meeting | 89.33          | 9.04 |

In Table 2, it can be seen that the results of the performance test and of observations are slightly different. All of them are in the range of 80%. From the result of observation data at each meeting, the average student creativity continues to increase and the standard deviation decreases. It shows a positive result. At the first meeting, the average of student creativity is 85.13%. This score is the lowest compared to the second and third meetings. It happened because students at the first meeting were still not used to using macromedia flash. However, mean of the next meeting continues to increase. At the second meeting the mean of student creativity rose to 86.83% and the standard deviation decreased to 10.68. Likewise for the third meeting, the mean rose again to 89.33% and the standard deviation declined again to 9.04. The data in Table 3 is the average data and standard deviation of performance tests and observations of student creativity whereas the distribution of categories can be seen in Table 3 below.

| Interval | Category | Observation | Performance Test |
|----------|----------|-------------|-------------------|
| 81 – 100 | Very Good | 20 20 20 20 | 20                |
| 61 – 80  | Good     | 8 8 8 5    |                   |
| 41 – 60  | Adequate | - - - 2    |                   |
| 21 – 40  | Poor     | - - - 1    |                   |
| 0 – 20   | Very Poor| - - - -     |                   |

Based on Table 3, it can be seen that there are differences in the distribution between the results of observations and performance tests. Observation data are evenly distributed in very good and good categories. On the other hand, two students are adequate and a student is poor in performance test. After further analysis on performance of these three students, their errors lie in the inconsistent programming language entered, in the action script that is written not the same as the display so the program cannot run. Whereas, students do not have significant obstacles during the learning process. It is because they are guided by researchers and group members. Student errors on program can be seen in the following picture.
Figure 1. Example of Student Error on Producing Media

Overall, both observation and performance tests are included in the good category. Good creativity is important in producing learning media [8,12]. The use of blended learning is able to train student creativity so as to create media which can improve the quality of learning.

4. Conclusion
Based on the results of the research that has been stated, it can be concluded that student creativity in producing instructional media based on macromedia flash both from the results of observations and performance tests, are included in the good category.

5. References
[1] Taufiq and Sainuddin S 2016 the Use Mathematics Learning Media with Lesson Study Setting IOSR Journal of Mathematics 12 6 p 75-79
[2] Ramdhani M A and Muhammadiyah H 2015 Proc. Int. Conf. of Islamic Education: Reforms,Prospects and Challenges Faculty of Tarbiyah and Teaching Training, Maulana Malik Ibrahim State Islamic University (Malang: Faculty of Tarbiyah and Teaching Training, Maulana Malik Ibrahim State Islamic University) p 174
[3] Keong C C, Horani S and Daniel J 2005 A Study on the Use of ICT in Mathematics Teaching Malaysian Online Jurnal of Instructional Technology 2 3 p 43-51
[4] Garcia R R, Quiros J S, Santos R G, Gonzalez A M, and Fernanz S M 2007 Interactive Multimedia Animation with Macromedia Flash in Descriptive Geometry Teaching 49 p 615-639
[5] Mann E L 2007 Creativity: The essence of Mathematics Journal for the Education of the Gifted 30 (2) p 236-260
[6] Seechialo T 2017 Instructional Strategies to Support Creativity and Innovation in Education Journal of Education and Learning 6 4 201-208
[7] Hosseini A S 2014 The Effect of Creativity Model for Creativity Development in Teachers International Journal of Information and Education Technology 4 2 p 138-142
[8] Masnuladevi, Prahmana R C I, Helsa Y, and Dalais M 2017 Teachers’ Ability in Using Math Learning Media J.Phys.: Conf.Ser. 943 012059 p 1-5
[9] Isnaniah 2017 Peningkatan Kreativitas dan Kemandirian Belajar Mahasiswa Melalui Model Pembelajaran Berbasis Proyek pada Perkuliahan Media Pembelajaran Matematika Suska Journal of Mathematics Education 3 2 p 83-91
[10] Skrypnik et al 2015 The History and State of Blended Learning
[11] Fitriasari P Tanzimah and Sari N 2018 Kemandirian Belajar Mahasiswa Melalui Blended Learning pada Mata Kuliah Metode Numerik. Jurnal Elemen 4 1 p 1-8
[12] Wahyudi and Winanto A 2018 Development of Project-based Blended Learning (PjB2L) Model to Increase Pre-Service Primary Teacher Creativity Journal of Educational Science and Technology 4 2 p 91-102
[13] Corso R and Robinson C H 2013 Enhancing Creative Thinking Abilities through the use of Social Media *International Journal of Knowledge, Innovation and Entrepreneurship* 1 p 92-105

[14] Fitriasari P and Sari N 2017 Implementasi Blended Learning untuk Meningkatkan Kemandirian Belajar Mahasiswa pada Mata Kuliah Metode Numerik

[15] Arikunto S 2013 *Dasar-dasar Evaluasi Pendidikan* (Jakarta: Bumi Aksara)

**Acknowledgments**

The researchers thanked to the Minister of Research, Technology and Higher Education for sponsoring this research through the Beginner Lecturer Research Grant for funding in 2019 and to Universitas PGRI Palembang, which has supported to us to conduct this research.