Creative skill improvement of the teacher candidates in designing learning programs through a project-based blended learning

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Abstract. The students’ 21st century skills are also determined by the teachers’ 21st century competencies. One of them is the skill in designing learning programs. This applies as well for the teacher candidates. Improving the teacher candidates’ skill in designing learning programs is highly required and be the scope of this study. This study aims to improve the creative thinking skills of the teacher candidates in designing learning programs through a project-based blended learning (PjBL). This study was designed as an action research involving 32 teacher candidate students in a teacher education institution in Central Java, Indonesia as participants. The data collection was performed through an assessment on the process and product design of the learning programs. The data obtained were analyzed descriptively quantitatively and were categorized. An increase in the teacher candidate students’ creative thinking skills was achieved in this study with quite good and very good categories.

1. Introduction

The 21st century is called by Richard Crawford as the Era of Human Capital; an era where the rate of science and technology development undergoes very rapidly. Digital literacy, inventive thinking, critical and creative thinking, effective communication, high productivity, and spiritual values are required along with the development of technology. In addition, life always deals with problems so creative ideas are needed to overcome and solve these problems [1]. Creative thinking makes people, especially the students, to have many ways to solve problems with a variety of different perceptions and concepts [2].

Creative thinking skill is a type of thinking that leads to new insights, new approaches, new perspectives and new ways to understand various things. This kind of skills is required for the students in order to be able to face the 21st century. Experts have agreed that the 21st century skills can be transferred through a learning to generate creative ideas. Blended learning models could be a choice that enable the students to learn independently with the assistance of ICT according to their needs [3], as well as support their creative thinking skills [4]. In addition to encouraging the growth of creative thinking skills, an online learning with ICT assistance could increase the students' proficiency in understanding the recent knowledge and broaden its application from that knowledge further in the professional activities.

However, the students’ creative thinking skills are generally low [2]. This condition was revealed during class observations and interviews with the teachers in some schools in Central Java, Indonesia. The process of chemistry teaching and learning seemed still apply a teacher-centered style; the teacher is more active in explaining, the students listen more to, record and memorize the teacher's
explanation, and do the assignments. The used teaching method seemingly shows that learning has not emphasized the students’ creative thinking skills. Probably, the learning also has not optimally utilized technological facilities available in schools such as the internet, laptops, students’ Android mobile phones, and LCD projectors. The teaching and learning process was in a face-to-face mode and has not been designed using ICT-aided technique. It was lack of creativity to encourage the students’ creativity and creative thinking skills. In addition to his ability to teach, a teacher is required to be able to design a learning with innovative and creative models, strategies and methods that could provide opportunities for the students to think at a higher level. Considering this requirement, the teacher candidates should be well prepared in term of their cognitive abilities and those in designing and developing an innovative learning.

“Designing learning programs” is one of the courses in the university level that equipment for the teacher candidates in the professional and pedagogical competences. In this course, the teacher candidates have the opportunity to practice and develop innovative and creative ICT-based learning programs. However, some obstacles arose; the lecturers were often oriented more to the extent of the fundamental concepts being discussed and the acquisition of the academic values. The latter would mainly focus on the students’ cognitive abilities and show less impact on the students’ abilities in designing learning programs. The lecturers have indeed applied an innovative learning model but have not provided many opportunities for the students to develop their creative thinking skills. Those would lead to the lack of students’ creative thinking skills in developing learning programs.

This study was focused on a project-based blended learning to improve the creative thinking skills for the teacher candidate students. Project-based blended learning (PjBL) is a project-based learning carried out in both face-to-face and online learning that would provide a convenience in communication. The students were provided much more freedom in accessing the teaching materials and interaction between students and between the students and the lecturers. This model could provide the students an opportunity to apply their knowledge into their daily lives [5-6] and could be used to enhance the students’ creative thinking skills [4]. In the PjBL model, the individual students work in groups in completing complex assignments through discussion. As a result, the students’ social skills would also be improved and developed [7]. Some studies also reported that the PjBL could increase the students’ learning success, including in achieving the learning outcomes [8-9]. In this study, the PjBL model has been applied to the “designing learning programs” course. The analysis was carried out on the enhancement of the students’ creative thinking skills in designing a high school chemistry learning topic through the implementation of the PjBL model in the “designing learning programs” course.

2. Methods

This study was conducted at a teacher education institution in Central Java Indonesia involving 32 participants in “Designing Learning Programs” course. The product obtained in this study was a Chemistry Lesson Plan for High School. One lesson plan was produced by one teacher candidate student. The lesson plan was assessed for its eligibility. The analysis on the teacher candidate students’ creative thinking skills was also performed. The assessment sheet used was a Likert scale ranging from 1-5 with very poor (with a score of 1) to very good (with a score of 5) criteria.

The assessment results were analyzed using percentage and categorical descriptive techniques to describe the lesson plan categories. The results obtained were grouped into five categories as shown in Table 1.

| Score acquisition interval | Categories   |
|---------------------------|-------------|
| 81 – 100                  | Excellent   |
| 61 – 80                   | Good        |
| 41 – 60                   | Fair/average|
| 21 – 40                   | Poor        |
| 0 – 20                    | Very poor   |
The students' creative thinking skills in preparing lesson plans or learning programs was also analyzed using the creative thinking skills criteria which include the aspects of fluency, flexibility, originality and elaboration (Torrance-Guilford) that has broken down into 10 indicators i.e. 1) engaging a lot of ideas, 2) offering a lot of ways, 3) working more quickly on more things, 4) producing various answers, 5) seeing problems from different perspectives, 6) bringing up new ideas, 7) sparking ideas and able to carry them out appropriately, 8) enriching othersides, 9) detailing ideas and improving their quality, and 10) providing responsible reasons.

3. Results and Discussion
The “Designing Learning Programs” aims to ensure that the undergraduate students of chemistry education study program could show the ability to accumulate the basic knowledge of chemistry and pedagogical knowledge. Also, the students could implement them in designing the learning programs as provisions to pursue the “microteaching” course and to fulfill one of the assignments on “chemistry for high school” course.

The implemented learning model was a combination between formal classes (face-to-face) and e-learning. This approach required three components i.e. a mentor or lecturer, on-line learning material, and skills developed during the class experience [10]. The project-based blended learning carried out provided a convenience in communication, freedom in accessing teaching materials and unlimited interaction between students and lecturers [11].

Table 2. The achievement of the students’ creative thinking skills in each aspect

| Aspect of creative indicators                              | Indicator of achievement (%) | Category   |
|------------------------------------------------------------|-----------------------------|------------|
| Engaging a lot of ideas                                    | 82                          | Excellent  |
| Offering a lot of ways                                     | 83                          | Excellent  |
| Working more quickly on more things                        | 89                          | Excellent  |
| Producing various answers                                  | 82                          | Excellent  |
| Seeing problems from different perspectives                 | 82                          | Excellent  |
| Bringing up new ideas                                      | 78                          | Good       |
| Sparking ideas and able to carry them out appropriately     | 76                          | Good       |
| Enriching othersides                                       | 83                          | Excellent  |
| Detailing ideas and improving their quality                 | 78                          | Good       |
| Providing responsible reasons                              | 80                          | Good       |
| Average score                                              | 84.3                        | Excellent  |

A total of 32 teacher candidates experienced a “designing learning program” course using an education network platform based on Learning Management System (LMS) called “Elena”. This platform could be accessed through http: elena.unnes.ac.id. Elena has the advantage of giving facilities for the lecturers and the students a safe space to communicate, collaborate, share learning contents, homework/assignments, virtual class discussions, online tests, and assessments. Elena could be accessed at any time. The students could take advantages of learning outside class hours. Through Elena, the lecturers and students could discuss the difficulties in learning that cannot be discussed in a real class due to a limited hours in the classroom. The lecturers can provide several projects and ask the students to work on it and submit the result through Elena. The interaction between lecturers and students could undergo online. The students’ grades could be accessed through their Elena accounts to see their learning progress.

The teacher candidate students could undertake several activities using Elena, such as sharing the developed learning plans, checking and evaluating the learning plans, using learning plans for a practice
in real classrooms and sharing stories about their teaching experiences. The data collection was carried out using questionnaire sheets. The results showed that in generalusing Elena could provide good impacts to the students. The majority of the teacher candidate students stated that using Elena had positive influence on their pedagogical knowledge. The developed learning plans uploaded through Elena were evaluated by the lecturers and their friends with the comments feature to correct the possible mistakes and produce an improved version of the learning plans. Almost half of the participants who have never used Elena stated that using Elena could improve their ability to use mobile applications and websites. By 82% of the teacher candidate students emphasized that Elena showed a positive influence on their communication and collaborative learning.

The students' creative thinking skills in developing lesson plans/learning programs as a project assignment were assessed. Each student was given the freedom to determine the topics and learning tools. A peer assessment was used to assess the creative process and products. The result of the students' creative thinking skills is presented in Table 2.

The results of this study indicated that the students' creative thinking skills in producing learning programs were in a very good category. The production of the learning programs was in the form of improvement of the existing learning programs and/or development the new forms. This condition was feasible due to the implementation of the PjBL model during the “designing learning programs” course. These abilities could be achieved when the teachers/lecturers played a role in using appropriate learning strategies, centered in students, and could explore the learning resources.

Learning with project assignments could provide the students opportunities to correlate their knowledge with the environment around them, as well as with their daily “real” lives. It would have positive impacts on themselves and their environment. In addition, they could create fun and a meaningful learning atmosphere [10]. An online learning with project assignments could increase the student-student interaction during the learning process [11]. Blended learning with project assignments would be able to support asynchronous online social processes and communication. Therefore, the students could be actively involved in their own learning process. Blended learning with project assignments could also increase the student motivation and satisfaction in the learning process. It was probably due to its possibility to improve the students’ cognitive skills such as reflective analysis, metacognition and problem solving skills.

The excellent creative thinking skills resulted in this study indicated that the implemented PjBL model has successfully developed 21st-century skills, i.e. innovation, information, media and technology skills [12] which would have an important impact on the students’ life and career in the future [13]. These three skills will produce creative individuals. The computers and the internet have made it easier to do tasks, enrich information, understand new knowledge, and expand the implementation of that knowledge [14, 15].

4. Conclusion
The project-based blended learning (PjBL) model has provided a variety of experiences inside and outside the classroom for the teacher candidates. They built participation in the democratic process including cooperating, listening and responding to each other's ideas, coordinating the different efforts and contributions of members and all subgroups, resolving disputes reaching understanding how to solve the problems and complete the tasks. This PjBL model could be utilized by the lecturers as an alternative learning strategy that equipped the students with creative thinking skills as one of the 21st-century competency demands.

However, several things need to be considered in its implementation, e.g. 1) the lecturers needed to always be ready whenever the students need them; 2) the lecturers needed to also take time to always monitor what activities were being done by the students in completing their project assignments such as reading, researching, observing, interviewing, recording, visiting certain objects or accessing the internet; 3) the lecturers needed to monitor all of the students’ activities from the initial process to the completion of the project, as well as providing feedback on the processes and products.
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