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THE IMPLEMENTATION OF PROJECT BASED LEARNING TO IMPROVE THE COMPETENCES OF TEACHER CANDIDATES

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Abstract: Based on the legislation in Indonesia, the required competences of teachers in Indonesia include pedagogical, professional, social, and personality. As one of teacher candidate education institution, Chemistry Education Department, Islamic University of Indonesia contribute to produce competent teacher candidates. The department has developed course materials, learning strategies; system-oriented evaluation to develop student competence as chemistry teacher candidates. Project Based Learning (PBL) is an option that is applied to achieve these objectives. This study aims to describe the implementation of PBL towards the attainment of teacher candidates. Subjects were students of chemistry education level three in academic years of 2016/2017. The research instruments include project assessment, competency tests, observation sheets, and student satisfaction questionnaire. Learning is conducted in accordance with the stages in the PBL such as: start with the essential question, design a plan, create a schedule, monitor, and assess the outcome. The research data shows that PBL gives positive impact on the attainment of teacher candidates. Students also gave a positive response to the application of PBL. The data of assessment pedagogical, professional, social, and personality in consecutive is 1.6 (good categories), 1.3 (enough categories), 1.7 (good categories), 1.6 (good categories). The score of student assessment related to the implementation of PBL is 1.8 (good categories).

Keywords: Project Based Learning, Teacher Competence, Teacher Candidates

Introduction

The teacher is a key component in the educational system. All other components, such as curriculum, facilities, fundings, school environment, and so on will not be effective if the core of learning which the teacher interaction with students is not qualified. The quality improvement of education must begin with the quality improvement of teachers. During the last 3 decades, the quality in the teaching profession has been a central concern in a number country (Seferoglu, 2005). There are several studies that examine the important of teacher competence development efforts. Competency based teacher education become a focus in many universities (Smit, 2016). The preparation of teacher candidates academically and professionally is a vital responsibility of the state through the teachers training institutions (Nzilano, 2013). Since 2001, Norwegian educational policy has had a stonge focus on strengthening teacher education (Ostern, 2016) .The faculty of education should seek to prepare lifelong learning competences, to produce professional teachers (Akyol, 2016).

According to Government Legislation Number 14 Year 2005 and Government Regulation Number 74 Year 2008, competencies required for teachers in Indonesia include pedagogical, professional, social, and personality. Pedagogical competence is the ability of teachers in managing students learning that at least the following understanding to: a) foundation of education, b) learners, c) curriculum development, d) design instructional, e) implementation of learning that educates and dialogical, f) use of learning technology, g) evaluation of learning outcomes, h) development of learners. Pedagogical competence related to the ability to manage learning that must be held by teachers so that it can serve as a good educator.

Professional competence is the ability of teachers to master the knowledge of science being taught. The mastery

of at least involve the mastery of subject matter broad and deep based on the standard of teaching, mastering concepts and scientific disciplines are conceptually coherent with the subjects of teaching. A teacher must master the subject matter of teaching. The process of transferring knowledge would not be happened if the teachers do not have the knowledge.

Social competence is the ability of teachers as part of the community. Social competence at least the following: 1) communicate verbally and politely, 2) use information and communication technology functional, 3) interact effectively with students, educators, staff, leader of education unit, parents or guardians of students, 4) mingle politely with the surrounding communities to heed the norms and value systems that apply, 5) apply the principle of true brotherhood and the spirit of togetherness. Personal competence is competence related to the character that should be owned by teachers, such as faithful, thoughtful, honest, democratic, authoritative, and capable of being exemplary.

As one teacher candidates education institutions, Chemical Education Department, Islamic University of Indonesia contributed to produce competent teacher candidates. The department has developed course materials, learning strategies, system-oriented evaluation to develop student competence as chemistry teacher candidates. Learning strategy that is often used in the study program is Project Based Learning (PBL). PBL is an option that is applied to develop the competencies of students as teacher candidates. Therefore, PBL provides students a real experience to apply the lecture material in a project. PBL has great potential to make the learning experience interesting and meaningful for the students to enter the workforce. PBL facilitate students to develop the competencies needed when working,

PBL is an active student-centered form of instruction which is characterized by students' autonomy, constructive investigations, goal-setting, collaboration, communication and reflection within real-world practices (Kokotsaki et al, 2016). PBL is an instructional model that was developed from the thinking of John Dewey on learning by doing. The project became the core activity in the PBL. This model requires the activity of students to construct knowledge and produce concrete results. The issues that used in PBL is a problem that weighted, relevant, real, and complex. PBL facilitate students to apply the concepts in real situation. Thus, students not only get knowledge in cognitive structure, but also to develop competence. Global School Net reported the results of the research on the characteristics of PBL from Auto Desk Foundation. The results of these studies indicates that PBL has the following characteristics: learners make decisions about a framework, any problems or challenges posed to the students, the students design a process to determine a solution to the problems posed, students collaboratively responsible for access and managing information to solve the problem, the process of continuous evaluation, students periodically reflect on the activities already carried out, the final product learning activities will be evaluated qualitatively, tolerant learning situations through fault and changes.

PBL focuses on the concepts and the main principles of a discipline, engage students in problem solving activities and tasks of other significant, provide opportunities for students to work autonomously construct their own learning, and ultimately produce the works of students that valuable, and realistic (Okudan& Sarah, 2006). Learning steps (syntax) PBL developed by The George Lucas Educational Foundation include: start with the essential question, design a plan for the project, create a schedule, monitor the students and the progress of the project, assess the outcome, and evaluate the experience. The implementation of PBL gave a positive influence on the development of attitudes, self-concept, habituation-based learning environment (Alacapinar, 2008; Kalayci, 2008). In addition, PBL also gave positive effect on academic achievement, understanding contextual knowledge, interest and curiosity (Erdem, 2012).

Methodology

This study aims to describe the implementation of PBL towards the attainment of teacher candidates. The study used a descriptive approach. The subjects were students of chemistry education level three academic years 2016/2017. The research instruments include project assessment, competency tests, observation sheets, and

student satisfaction questionnaire. The stages in the research activities include the development of research instruments, teaching practices, collection and analysis of data.

Project assessment instrument consists of three aspects: planning, implementation, and products. Each aspect further elaborated in the assessment indicators. In order the project assessment can be objective; an assessment rubric is made to be used as a reference in the assessment. Assessment rubrics describe the achievements of each indicator and scores. Competency tests consisted of reviewing the performance of pedagogical, professional, social and personal competence observation sheet. The competency tests were developed from competency assessment indicators which refer to the applicable laws and regulations in Indonesia. Competency test scores in the range of 0-2, 0 if the expected indicator is not appear, 1 if the indicator appears but less suitable, 2 if the indicator appears and appropriate. The results of competency assessment have 3 categories (poorcategory for score < 1, enough category for $1 < \text{score} \leq 1.5$, good category for score > 1.5. The questionnaire was developed to evaluate the response and students assessment of the learning process quality using PBL.

PBL applied in subjects related to the achievement of the teacher competence, such as teaching and learning strategies, evaluation of processes and learning outcomes, instructional media, curriculum review, learning program development during 1 year. The projects undertaken by students such as create chemistry learning media, lesson plan book, and assessment instruments. The data collection is done throughout the implementation of PBL. Data observation, competency test, and project assessment is used to describe the implementation and effect of PBL.

Results

Before the lecture, the students are divided into groups that are heterogeneous. Lecture was in accordance with the stages in the PBL, first start with the essential question. Learning begins by providing essential questions, questions that can lead to the assignment of students in performing an activity. For example, students are directed to the urgency of the selection of learning strategies in designing chemistry quality of learning, teaching media urgency, and assessment urgency. Students showed great interest when the lecturer highlights the questions on the subject matter to be resolved. It is therefore, the questions were relevant to the needs of current students in the world of work in the future. This stage is not only meant to guide students in projects to be undertaken, but also to generate interest towards learning. The second phase, design a plan for the project, students gathers information that related to the focus of the project. The planning is about the rules, the selection of activities that can support in answering the essential question, by integrating a variety of subjects as possible, and to know the tools and materials that can be accessed to assist the completion of the project.

The third stage is create a schedule, the lecturer and students collaborate to draw up a schedule of activities in completing the project. Activities in this stage include making a timeline for completing the project, making the project completion deadline, guiding students as they make way not associated with the project, and asking the student to make an explanation of the election in certain way. The fourth stage is the students and monitors the progress of the project. Lecturer monitors and facilitates the activities of students in completing the project. The fifth stage, assess the outcome. Assessment is done to measure the achievement of learning, play a role in evaluating the progress and provide feedback about the level of student understanding has been reached. The assessment of the outcome is the process of analyzing product of project have been carried out, whether the products are to be used to answer questions that were formulated in the early part of learning. The last phase is evaluate the experiences. At the end of the learning process, reflection is done on the activities and results of projects already executed. Students express the experience in the completion of the project. Lecturers and students collaboratively evaluate the learning experience. The competency assessment tests data show that the student has had the required competence of teachers. Brief description of competency assessment data are shown in Table 1 to Table 5.

Table 1 The data summary of pedagogic competence assessment..

Assessment aspect	The average score (maximum score is 2)
Instructional design	1.8
Implementation of learning that educates and dialogical	1.5
Utilization of learning technologies	1.4

Table 2 The data summary of professional competence assessment.

Assessment aspect	The average score (maximum score is 2)
Understanding the concepts, laws, theories of chemical	1.2
Understanding the scope of chemistry materials at school	1.3
Mastering the skills of the laboratory	1.2
Managing chemical materials creatively	1.6

Table 3. The data summary of social competence assessment

Assessment aspect	The average score (maximum score is 2)
Communicate verbally, write politely	1.8
Use communication technology and information functionally	1.2
Interact effectively and polite	1.9
Apply the principles of brotherhood and togetherness	1.9

Table 4. The data summary of personality competence assessment

Assessment aspect	The average score (maximum score is 2)
Behave based on norms	1.6
Can be a role model	1.4
Present their selves as a person who is stable, mature and wise	1.4
Proud of teacher profession	2.0
Responsible to task	1.4

Table 5. The average score of competence assessment

	Pedagogic competence	Professional competence	Social competence	Personality competence
Average	1.6	1.3	1.7	1.6
Category	Good	Enough	Good	Good

The above data show that student as a teacher candidates has had the required competence of teachers in Indonesia. However, it still needs to be an effort to improve the professional competence, which is the competence related in mastering chemistry content. PBL provides real learning experiences for students. Projects undertaken are complex and real problems faced by students when they being a teacher. So that the pedagogic and professional competences can be developed. Through collaboration in project work, social skills and norms of pro-academic can be developed. Pro-academic norms, such as appreciate the difference, wise in deciding problems, responsibility. Social competence and personality of the students can be developed in PBL.

The implementation of PBL during teaching and learning process enhanced the students' motivation and experience. PBL offered challenging series of activities to students. This technique facilitated the students to understand the subjects effectively and easily as they solved the real world problem while developing the project. In addition, the group activities which the students had during the project development enhanced their involvement in the learning activities. The group activities enabled the students to work by sharing their knowledge and information to each other. They were able to work and contribute to the project based on their

expertise. The group was heterogeneous. It encouraged them to help and learn from each other. It also built positive bond of relationship among students. A classroom may consist of students with different kinds of ability, interests, and needs. Project work is suited to the classroom with varied ability students as it can bridge students to work together. By doing so, each student will be able to participate well in the project.

In PBL, lecturer as a facilitator for students. While in the class of conventional lecturer regarded as someone who had the most material and all information provided directly by the lecturer. In PBL class, students accustomed to working collaboratively. This differs from the class of conventional who are familiar with individual classroom situations. PBL class is more active when compared to a conventional classroom. Many students acquired skills, which are hard to come from conventional lectures. In terms of acceptability and assessment of students, the students considered that PBL is easy to implement, not burdening students, and feasible to implement. Students assess that PBL can help them understand and apply the lecture material. Student assessment score related to the implementation of PBL is 1.8 (good categories).

Conclusions

The research data shows that PBL gave a positive impact on the attainment of teacher candidates. The data assessment of pedagogical, professional, social, personality consecutive are 1.6 (good categories), 1.3 (enough categories), 1.7 (good categories), 1.5 (good categories). Students also gave a positive response on the implementation of PBL. Student assessment score related to the implementation of PBL is 1.8 (good categories). PBL provides students a real experience to apply the lecture material in a project. PBL has great potential to create the learning experience interesting and meaningful for the students to enter the workforce. PBL facilitate students develop the competencies needed when working, students become more involved in learning, there are several skills that built from the project in the classroom, such as team building skills, make decisions cooperatively, cooperation, problem solving. These skills are indispensable when working and is a skill that is difficult to teach through conventional learning.

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