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OIDDE-PJBL LEARNING MODEL: PROBLEM-SOLVING SKILLS AND PRODUCT CREATIVITY FOR ENVIRONMENTAL STUDY OF BIOLOGY PROSPECTIVE TEACHERS

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Abstract: Abstract: Problem-solving skills and product creativity to overcome environmental problems and to fulfill various needs are significantly needed by prospective teachers of biology. These two skills were considered poor in Biology Education Study Program, University of Muhammadiyah Malang. Therefore, this study aims to analyze the improvement of learning quality in terms of students' problem-solving skills and product created through the implementation of the integrated OIDDE Learning Model and Project-based Learning (PjBL). This Classroom Action Research involved forty-five students who have enrolled in Integrated Science I course (Environmental Study). Three research instruments were exemplified: product skill assessment sheets (project design and product assessment), problem-solving skills assessment sheets, and learning observation sheets carried out by three observers for the total of three cycles. The results projected that there was an increase in mean score in problem-solving skills, that was 14 points (Pre-Cycle: 67; Cycle I: 72; Cycle II: 78; Cycle III: 81); the increase in product creativity by 13 points (Pre-Cycle: 69; Cycle I: 71; Cycle II: 75; Cycle III: 82), and in learning quality by 19% (Pre-Cycle; 65%; Cycle I: 68%; Cycle II: 74%, and Cycle III: 84 %). It can be concluded that the implementation of the integrated OIDDE Learning Model and Project-based Learning is able to improve the quality of learning, problem-solving skills, and product creativity for prospective teachers of biology, even though it is still at "good" category.

Keywords: OIDDE, PjBL, problem-solving skills, product creativity, prospective teachers

INTRODUCTION

Higher education is administered to develop student's potential in order to shape a fully grown human being, who has faith and fear, comprehensively smart, and has balanced hard and soft skills. This potential can be achieved through various activities, one of which is through intra-curricular activities or in-learning activities (Direktorat Kemahasiswaan, 2018). In the context of constructivism, the development of this view in the world of education demands changes in the learning as well as in the assessment processes (Hidayah, Umamah, & Marjono, 2015). Innovation and adaptation of the teaching and learning should be continuously sought after (Alonso, Lopez, Manrique, & Vines, 2008; ChanLin, 2008; Sendag & Odabasi, 2009). Some of the efforts that can be done are by implementing the teaching and learning process that encourages the

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improvement of student creativity (Yuliarma, 2010). The development of creative skill is deemed useful for students in adapting to the demands of life (Irmayati, 2017).

Biology and its scientific family have a mission to imprint students who are skilled at solving problems. Creative thinking skills are the capital to create real work or so-called product creativity (Jumroh, 2016). Prospective biology teachers are expected to develop the creativity to create products so that they can teach concepts in a contextual manner (Muspiroh, 2015) in this case, related to solving environmental problems. Creativity means a form of thinking to produce new, unpredictable, and useful things. Creativity emphasizes more on individual products and performance. A lecture that is designed to gain knowledge through the mechanism of building own concepts and oriented towards the creative involvement of students to produce products will arouse student's motivation (Gunawan, 2014). The produced product will be of creative value if the expert/observer (in this case the teacher) assesses that it is creative (Darmawan, 2014). Products resulted in students' creativity become authentic, real, and measurable images by lecturers (Muspiroh, 2015).

One of the courses that needs be completed by students in the Biology Education Study Program of Faculty of Teacher Training and Education, University of Muhammadiyah Malang, is Integrated Science 1 (Environmental Study) course. This course aims to foster students' knowledge to study the relationship of living things with their environment in relation to the impact of human life and strives to preserve the environment. This course is expected to provide an understanding of basic concepts of humans and their environment; present an understanding of the concept of actual environmental conditions that occur locally, regionally or globally; and to encourage an understanding of alternative solutions on how to overcome environmental problems through ecological approaches and technology application.

Researchers, as the course lecturer team, assume that it is necessary to improve the learning process. This is seen as an effort to continue maximizing the learning process, to avoid boredom and monotonous conditions in learning, as well as to broaden students' point of views. Based on the reflection on the situation and condition of students taking this course, it was found that: 1) Students had not been conditioned to accept an innovative learning approach, which emphasizes contextual learning through complex activities such as designing an object/event that ultimately produces a product. 2) Students had not been given challenging assignments or problems that involve problem-solving, decision making, skills, and reflections facilitated by the lecturer. 3) Students had not been provided enough opportunity to work autonomously to construct their own knowledge and arrive into a conclusion to produce real products. 4) Some students were found less enthusiastic in following the learning process. Many students did not pay attention to the lecturer's explanation during the learning process. 5) Students were more interested or engaged when learning activities are in the form of discussions. 6) Students had neither been asked to associate the knowledge they already have with the material they would not learn to realize what they already knew from the

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studied material. 7) Students have not been requested to develop the ability to think, to think about what they think, to reflect on their learning, and to develop initiatives.

Therefore, based on the results of the discussion and agreement with the team of lecturers and observers, two research foci were agreed; the development of problem-solving skills and product creativity. In order to achieve these targets namely fulfilling the objectives of the course and literature study, it was agreed that the there is a need for project-based learning (PjBL) implementation by combining the latest learning models to obtain learning innovations. The team agreed to integrate PjBL with the OIDDE learning model.

PjBL is a learning model that instills students to work cooperatively in solving problems, communicating ideas, thinking critically and making creative works/products (Dewi, 2015). PjBL emphasizes learning activities that are longer, holistic-interdisciplinary, student-centered, and integrated with contextual and realistic practices and issues (Husamah Husamah, Pantiwati, Restian, & Sumarsono, 2016; Muspiroh, 2015; Syam, 2016). PjBL has the potential to develop problem-solving skills and product creativity (Jumroh, 2016). PjBL has 6 stages; (1) start with the essential question, (2) design a plan for the project, (3) create a schedule, (4) monitor the students and the progress of the project, (5) assess the outcome, and 6) evaluate the experience (Kemendikbud, 2013). The disadvantages of PjBL are the limited explanation or lecturing session from the teacher/lecturer and the absence of the reward given. The lecturing session is seen important as it provides provisions or reinforcement for students to avoid misconception or missteps in the efforts to solve problems that they might face in the learning process. The absence of the "reward" session allows for the minimum development of student motivation and confidence (H. Husamah, 2013; Husamah Husamah, 2015b, 2015a; Husamah Husamah & Pantiwati, 2014). In addition, as an effort to enrich the learning model repertoire that can be used by teachers/lecturers in teaching to avoid boredom, and as an effort to develop learning quality, PjBL needs to be developed, or at least integrated with other learning models.

Lecturers are required to have the ability to choose learning models or strategies that are suitable with the teaching material (Gunawan, 2014), as well as the achievement of the expected competencies and learning outcomes. Thus, it is necessary to integrate PjBL with OIDDE learning. OIDDE is an acronym for Orientation, Identification, Discussion, Decision, and Engagement of Behavior. This model was developed from a variety of learning models, especially social learning models and behavioral learning models (Hudha, Amin, Sutiman, & Akbar, 2016). These models emphasize social values, behavior assertion, and consistency of ethical behavior decisions (Fariati, Hudha, & Husamah, 2017; H. Husamah, Fatmawati, & Setyawan, 2018, 2017; H. Husamah, Pantiwati, & Hudha, 2017), including behavior related to the environment (H. Husamah, Fatmawati, et al., 2017). This study aims to describe (1) problem-solving skills, (2) product creativity in students, and (3) improvement of the quality of learning through the application of an integrated OIDDE Learning Model on Project-based Learning.

ISBN: 978-602-361-102-7

APPROACH & RESEARCH METHOD

This study implemented Classroom Action Research (CAR). The approach in this study is a qualitative approach. This research was carried out in three action cycles; each cycle consisted of two meetings for two hours of study (2x50 minutes). Each action cycle included four stages, referring to the Spiral Model from Kemmis, McTaggart, and Nixon (2014). The implemented syntax of learning was a combination of PjBL and OIDDE learning models.

The presence of researchers in the field is significant since the researchers act as instrument managers, action designers, implementers of actions, and reporters of research results. During the implementation of the action, the researchers were assisted by three observers with the intention to support the data collected from the students that were needed in the classroom as well as to be collaborators in the implementation of reflection.

This Classroom Action Research (CAR) was conducted in VIA class involving forty-five students of Biology Education Study Program at the Faculty of Teacher Training and Education, University of Muhammadiyah Malang, who took the Integrated Science 1 course (Environmental Study). The study was conducted in even semester, academic year 2017/2018. Three research instruments were used, including product skill assessment sheet (H. Husamah, 2013), problem-solving skills assessment sheet (Rhodes, 2009), and learning observation sheet (Hudha et al., 2016) fulfilled by three observers during the three cycles.

The data analysis included the activities to manage raw data, present, draw conclusions and reflect the data. The data were obtained in the form of problem-solving skills data, product creativity, and learning quality. In addition, supporting data were obtained from the lecturer activities and field notes. In order to facilitate the assessment of learning quality, a percentage is made, referring to Arikunto (2001) and Hudha et al. (2016) as in Formula 1.

$$P = (E/N) \times 100\% \qquad (1)$$

Notes:

P = quality percentage/accomplishment

E = total achieved score

N = maximum score

The obtained score was adjusted to Table 1 to determine the category.

Table 1. Quality percentage category/learning accomplishment

Percentage (%)	Categories
86-100	Very good
76-85	Good
60-75	Sufficient
0-59	Poor

ISBN: 978-602-361-102-7

RESULTS AND DISCUSSION

a. Problem-solving skills

The observed data on students' problem-solving skills score are presented in Table 2 and Figure 1.

Table 2. Students' problem-solving skills score on Integrated Science I (Environmental Study)

No.	Aspects	Score Cycles			
		Pre	I	II	III
1	Formulating problem	68	70	76	80
2	Developing problem solution strategies	66	74	80	83
3	Proposing a problem solution hypothesis	65	73	79	81
4	Explaining the weakness and advantage of the chosen problem solution.	69	71	77	80
Mean score		67	72	78	81

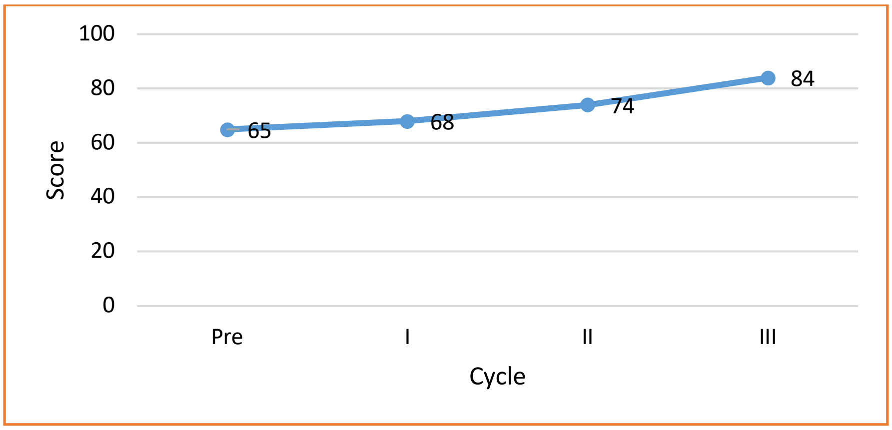

Figure 1. Trends in Students' problem-solving skills score

Table 2 portrays that there was an increase in problem-solving skills mean score of 14 points from Cycle I to Cycle III. The achievement of problem-solving skills in Cycle I was categorized as sufficient and Cycle II and Cycle III were categorized as good. These findings indicated that the integration of PjBL with OIDDE has encouraged an improvement of student problem-solving skills.

Students have been able to formulate a problem, find the right solution, predict the result, and think about the advantage and disadvantage of the selected solution. Students choose the most appropriate solution based on their contextual condition or real experience, in line with the information and references obtained in learning. This result indicates that the integration of PjBL-OIDDE applied by lecturers provide a deeper understanding and allow students to able to select the most appropriate alternative solutions, as the strengthening of in-depth consideration and based on openness to various group ideas through this learning. According to Fariati et al. (2017), the implementation of OIDDE learning has encouraged students not only to provide solutions but also to strengthen ethical considerations so that they truly believe what is done and chosen is right and does not actually cause a further adverse

ISBN: 978-602-361-102-7

impact. Ethical considerations are needed as a basis of what should be done to prevent the occurrence of subsequent problems.

Positive experience and right decision in the form of problem-solving skills acquired by students through OIDDE learning are expected to be firmly rooted so that they become skills that are strongly attached, and well develop into the personality and positive character of the nation's generation. Character building integrated into learning can provide meaningful experiences for students, since they will not only understand, but also inseminate, internalize, and actualize the skills in daily life (H. Husamah et al., 2018; H. Husamah, Fatmawati, et al., 2017; H. Husamah, Pantiwati, et al., 2017).

b. Product Creativity

The observation result data on students' product creativity scores are presented in Table 3 and Figure 2.

Table 3. Students' product creativity scores for Integrated Science I (Environmental Study)

No.	Aspects	Cycles Scores			
		Pre	I	II	III
1	PREPARATION: Preparing learning sources (syllabus and additional works of literature)	69	71	75	80
2	DESIGN PLANNING PROCESS: Job Division	71	75	75	80
	Seriousness/totality of work	69	70	76	82
3	PROJECT PLAN DESIGN CONTENT: Component completion	67	68	74	79
	Writing systematics and tidiness	69	70	76	83
	Innovative ideas	68	70	70	83
4	PRESENTATION DESIGN: Performance	67	70	76	80
	Idea mastery and ability to defend the idea	70	73	75	85
	Openness in discussion and receipt of input	71	73	77	84
5	PRODUCT PRESENTATION: Performance	69	71	75	85
	Idea mastery and ability to defend the idea	68	70	73	85
	Openness in discussion and receipt of input	71	74	77	83
6	PRODUCT: Compliance with the initial design	67	70	75	83
	Physical appearance (attractiveness)	69	70	76	81
	Conformity and usability (applicative)	70	71	77	83
	Innovation and creation (novelty and impact on environmental conditions changes)	70	72	78	83
	Ability to select and use the material	69	72	76	85
	Ability to select and use the media	68	70	76	85
	Ability to select and use the technique	70	72	78	83
	Mean Scores	69	71	75	82

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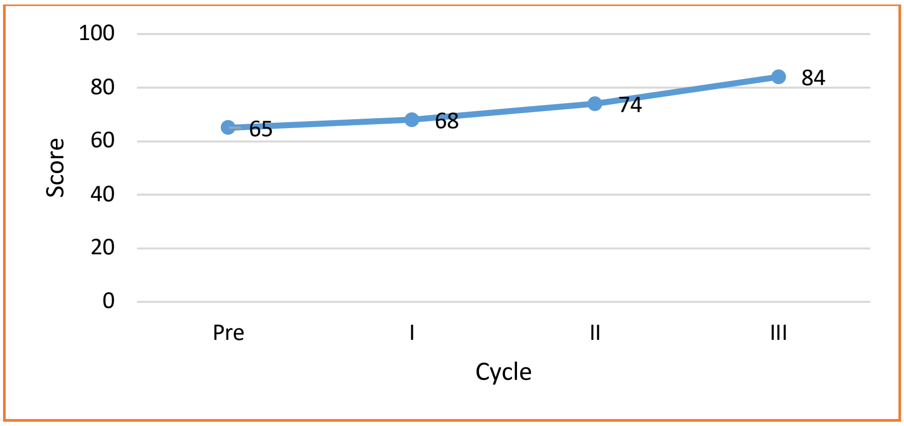

Figure 2. Trends in Students' product creativity scores

Table 3 suggests that there was an increase of product creativity mean scores by 13 points from Cycle I to Cycle III. The achievement of problem-solving skills in Cycle I and Cycle II was categorized as sufficient, as of the Cycle III was categorized as good. These findings indicate that the integration of PjBL with OIDDE encourages the improvement of student product creativity.

The findings of the study are in line with H. Husamah, Fatmawati, et al. (2017) and H. Husamah, Pantiwati, et al. (2017), the learning that is designed to tackle environmental problems and propose students to find creative-innovative solutions, will eventually encourage students to be more aware and have high sensitivity, as mentioned that learning aims to provide awareness and sensitivity. Students are conditioned to explore experiences, knowledge, and theories that have been constructed previously into a solutive and real idea (in the form of products). This process begins with finding meaning and understanding of a certain concept, then considering the decision, then giving a solution to a problem.

c. Learning Quality

Observation result data on learning quality is presented in Table 4 and Figure 3.

Table 4. Learning Quality Score of Integrated Science I (Environmental Study) with PjBL-OIDDE learning

No.	Activities	Cycles Percentage (%)			
		Pre	I	II	III
1.	Before the activities begin, learning apparatus has been prepared	63	65	74	85
2.	Model lecturer performs as agreed before	65	68	70	83
3.	Model lecturer performs individually (not in the team)	65	69	74	85
4.	Model lecturer discusses the learning objectives	66	70	75	85
5.	The model lecturer gives apperception in learning	66	68	76	84
6.	Students deliver questions during the learning process	65	71	74	86
7.	Model lecturer provides accurate answer towards the question asked by the students	66	68	75	88
8.	No misconception occurred during the session	64	66	76	82

ISBN: 978-602-361-102-7

No.	Activities	Cycles Percentage (%)			
		Pre	I	II	III
9.	Model lecturer adheres to the syntax, however, he/she is able to modify the lesson plan to suit the occurred learning situation	65	67	73	82
10.	Model lecturer implements learning media in accordance with the lesson plan	64	68	75	84
11.	Students work in groups in the learning process	65	68	76	83
12.	Group discussion can be delivered smoothly (cooperatively)	67	69	70	81
13.	No student has difficulty and no student is paid less attention during the learning period	65	68	74	84
14.	Students are given chances to do task/assignment, to raise opinion, and ask a question	64	67	74	85
15.	Evaluation is conducted at the end of the learning process	66	70	73	85
16.	Time is used in accordance with the time allocation in the lesson plan.	65	66	75	82
Mean Percentage		65	68	74	84

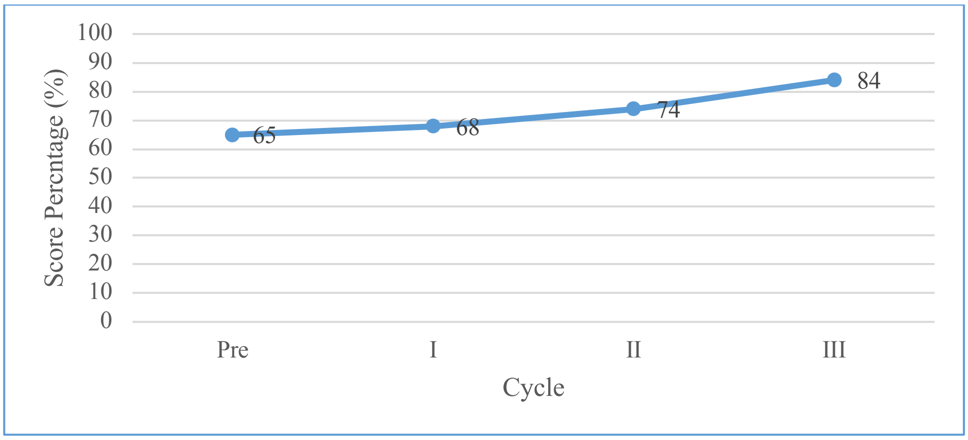

Figure 3. Trends of students' learning quality score percentage

During the learning process, three main observers inspected the activities of lecturers and students using observation sheets and field notes. All VB class students consisting of forty five participants attended the learning process in full session, starting from Cycle I, Cycle II and Cycle III so that further data analysis was carried out on those 45 students.

Observations on the implementation of learning were carried out on activities conducted by the model lecturer. The learning should be in accordance with the lesson plan that has been made so that the planned learning objectives were likely to be achieved. The result of observations on the implementation of learning in Pre-Cycle was 65% and Cycle I was 68% (sufficient category). This figure was still far from the target of > 80%. The aspects that need to be improved included all activities listed on the table. Furthermore, the result of observations on the implementation of learning by the lecturer in Cycle II was 74% (sufficient category). Thus there has been

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an increase in the quality of learning by 6%. However, learning had to be continued to Cycle III for a better result. Aspects that need to be considered are that lecturers needed to continue to encourage students for better involvement in groups and class discussions and to come up with more creative ideas in making products. Evaluations should also be done holistically (covering various aspects). The achievement of learning quality in Cycle III was 84% , which was classified in the good category.

In addition to the quantitative data as presented in Table 4, additional qualitative data were also obtained in the form of reflection notes from observers and model lecturer. Based on these records, the advantages of learning Cycle I and Cycle II are as follows. (1) Students seem enthusiastic about following the learning process. Student enthusiasm can be seen from the response to the answers from the lecturers' questions at the beginning of the learning and other questions that the students conveyed as a form of curiosity. (2) The creation of active and enjoyable learning. All students are active to convey the results of their group work. (3) Students make a great effort to prepare their own media and materials needed so that the implementation of investigation and assessment activities runs smoothly. (4) Problem-solving strategies designed by students make them confident when conducting investigations.

The weaknesses of Cycle I and Cycle II learning are as follows. (1) Determining a problem-solving strategy that is still less varied. (2) Groups only succeed in making creative solutions or ideas that are still limited to common ideas (has been widely known). (3) The dominance of certain students in the group and other students still lack a role. The group works less compact; it requires a relatively long time to finish a task compared to the other groups. (4) There are groups that conduct standard presentations and there has been no development of creativity.

Based on the reflections of Cycle I and Cycle II, process improvements were made in Cycle III. In this cycle, there was an increase in problem-solving aspects and product creativity. The study was stopped until the third cycle because the expected target had been achieved, even though it was still in the good category. The shortcomings that still exist in Cycle III are at the stage of product development and presentation of some students who were still lacking as well as group work (including small discussions) that were not optimal.

These findings indicate that the integration of PjBL with OIDDE encourages the improvement of the quality of learning carried out by the model lecturer. OIDDE promotes the improvement of the learning quality since it is possible to support the theory that the provided learning has to increase students activity (student-centered) to find and solve problems, work cooperatively, have an ethical attitude and be able to make ethical decisions on ethical problems faced during the learning (Hudha et al., 2016). Meanwhile, PjBL has also seen an innovative learning approach that

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emphasizes contextual learning through complex activities. The focus of learning lies in the core concepts and principles of a study discipline, involving students in the investigating problem, solving the problem and other meaningful tasks, giving learners the opportunity to work autonomously in constructing their own knowledge, and culminating ideas to produce tangible products. PjBL uses projects/activities as media. Students conduct exploration, assessment, interpretation, synthesis, and information collection to produce various forms of learning outcomes. PjBL is a learning method that uses problems as a first step in gathering and integrating new knowledge based on experience in real activities. PjBL is designed to be used on complex problems where students are triggered to investigate and understand a certain concept (Husamah Husamah et al., 2016; Kemendikbud, 2013).

CONCLUSION

There is an increase in mean scores from Pre-cycle to Cycle III: problem-solving skills for 14 points, product creativity as many as 13 points, and learning quality for 19%. From these results, it can be concluded that the implementation of OIDDE Learning Model integrated into PjBL is able to improve: problem-solving skills, the product creativity of prospective teachers, and the quality of learning, although in general, it is still at the "good" level. Therefore, it can be suggested that this learning should continue to be applied and developed so that the quality of learning becomes “very good”. It is also deemed important to apply the model in other courses or other materials.

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