Shared or Integrated: Which Type of Integration is More Effective Improves Students’ Creativity?

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Abstract. Integrated science learning has various types of integration. This study aims to apply shared and integrated type of integration with project based learning (PjBL) model to improve students’ creativity on waste recycling theme. The research method used is a quasi experiment with the matching-only pre test-post test design. The samples of this study are 108 students consisting of 36 students (experiment class 1st), 35 students (experiment class 2nd) and 37 students (control class 3rd) at one of Junior High School in Tanggamus, Lampung. The results show that there is difference of creativity improvement in the class applied by PjBL model with shared type of integration, integrated type of integration and without any integration in waste recycling theme. Class applied by PjBL model with shared type of integration has the higher creativity improvement than the PjBL model with integrated type of integration and without any integration. Integrated science learning using shared type only combines 2 lessons, hence an intact concept is resulted. So, PjBL model with shared type of integration more effective improves students' creativity than integrated type.

1. Introduction

According to the curriculum 2013 of Junior High School which is a new curriculum in Indonesia, science learning is developed as an integrated science, not as a discipline [1]. An integrated learning can be said as a learning model which combines the concept of several disciplines in one theme so that science learning to be more meaningful, effective and efficient. According to Forgarty, there are 10 types of integration which are divided into 3 groups of integrations which are within single disciplines consists of (1) fragmented, (2) connected, (3) nested, across several disciplines (4) sequenced, (5) shared, (6) webbed, (7) threaded, (8) integrated, and within across learners consists of (9) immersed and (10) networked [2]. On this study, the integration types that are used are shared and integrated types. Shared and integrated type is chosen because the researcher wants to know the difference of creativity improvement in each type. Shared and integrated type is the type of integration that is still in one group that is the type of integration that can integrate across several disciplines. The integrated type is the development of the shared type, so both types have similarities.

On shared type, teacher combines two disciplines in which overlapping concepts or ideas emerges so concept becomes intact [2]. Shared type is like looking with binoculars, as the two lenses are adjusted,
a more focused view result. The advantages of shared types are showing the integrity of concepts, skills, and attitudes, there are shared learning experiences, and involving two teachers in a team, it is easier to create collaborations in designing and implementing learning [3]. The integrated type describes an interdisciplinary approach that is an integration model blends all disciplines by selecting the priorities of each discipline and finding the overlapping skills, concepts and attitudes of all those disciplines [2]. The advantages of the integrated type are to reduce the number of learning matters so as to avoid the phenomenon of "full of matter", developing the ability of holistic thinking, create an interdisciplinary teacher togetherness in planning and implementing learning, more efficient and very contextual, encouraging and motivating students to see the interrelation and interdependence between disciplines science [3].

One of the environmental problem that always happens and we must solve it is waste. Wastes have two types, organic waste and inorganic waste. Organic and inorganic waste need time to decompose. Inorganic waste takes longer to decompose than organic waste. According to data from Statistics Indonesia about sorting garbage in Lampung Province, the percentage of sorted garbage is 15.31%, and unsorted garbage is 84.69% in 2014 [4]. Based on these data, it is still very much waste that is not reused and recycled. Waste is one of the pollutant sources in soil, water and air. Therefore, some efforts need to be taken in order to overcome the pollution issue by implementing 4R (reduce, reuse, recycle and repair). Science is subjects that closely with daily life. As the problem of waste which is the concept of class VII Junior High School in Environmental Pollution chapters. One solution that students can do to cope with the pollution caused by waste is by recycling waste. Therefore, the theme of waste recycling should be given to the students. Based on the waste problem in daily life, it is a necessary method of learning that can provide hands-on experience to students in solving waste problems by waste recycling. The approach used in the science of learning is the scientific approach. In order to strengthen the scientific approach in science learning, a learning model as suggested in curriculum 2013 is a discovery based learning or inquiry, problem-based learning, and project based learning [5].

Project based learning (PjBL) is one of a learning model as suggested in curriculum 2013. Project based learning model has a capability in improving the students’ creativity [6]. It is suitable for some previous studies which stated that project based learning model can improve the students’ creative thinking in solving problems [7]. PjBL model with a contextual approach is effective in improving the students’ creativity [8]. Other previous studies stated that creative thinking which is integrated with PjBL model can support the students’ creativity in developing products [9]. PjBL model can improve the students’ creative thinking in making projects to solve waste problem surround their school [10].

Based on scientific approach in curriculum 2013, project based learning model is very suitable to be used on waste recycling theme. So students can solve the environmental problem regarding any kinds of waste which are one of the pollutants by recycling the waste. Students can solve the waste problem by making a product from waste into useful things and have aesthetics value. PjBL model is a learning model using the project as the core of the learning process. The product produced by the students is the solution for the real problems faced by the students such as the trash issue through the inquiry process [1]. On the waste recycling theme, it needs creativity in making a product from the waste into useful things. That is why creativity is definitely needed in project-based learning. According to the introduction of this research as stated previously, a research regarding the implementation of PjBL model with shared and integrated types of integration to improve the junior high school students’ creativity on recycling theme is necessary. In this research, the researcher would like to find out how the implementation of PjBL model with shared and integrated types of integration to improve students’ creativity on waste recycling theme will be.

2. Research Method
The research method used is a quasi-experiment with the matching only pre test-post test design [11]. The population in this study were students of class 7th in one of the junior high schools in Tanggamus, Lampung Province, on the 2nd semester year 2016/2017. The samples of this study are 108 students
consisting of 36 students (experiment class 1st), 35 students (experiment class 2nd) and 37 students (control class 3rd).

The sampling technique used in this research is a purposive sampling. It is due to each class has different characteristics in 6 of the classes (there are superior classes which are grade 7A and 7B). The experiment class consists of experiment class 1st (7C), experiment class 2nd (7D) and control class 3rd (7E). The experiment class 1st is given a treatment PjBL model with shared type of integration, the experiment class 2nd is given a treatment PjBL model with integrated type of integration and the control class is given a treatment project based learning (PjBL) model with science learning without any integration.

The creative data collected with using the test to measure the students’ creativity before and after the learning process. The creativity improvement can be seen from the pre-test and post-test values. The test instrument used is a written test in a form of essay questions in which the indicator arrangement is based on indicators according to Torrance which includes the fluency, flexibility, originality, elaboration and sensitivity to problems [12].

3. Result and Discussion
The data of the students’ creativity consist of the pre-test and post-test values with the scale from 0 to 100. To find out the creativity improvement before and after given a treatment on three groups which is the experiment class 1st is given a treatment PjBL model with shared type of integration, the experiment class 2nd is given a treatment PjBL model with integrated type of integration and the control class is given a treatment PjBL model with science learning without any integration, normalized gain (N-Gain) which is developed by Hake is used [13].

Figure 1 shows that the value of the students’ creativity improvement (N-Gain) is 0.43 for experiment class 1st with medium category. Then, 0.23 with low category for experiment class 2nd, and 0.17 with low category for the control class. It proves that the students’ creativity improves after project based learning model is applied either the integrated science learning using shared type, integrated type, and without any integration. It concur with an opinion by Pujiriyanto that PjBL model effectively improves creativity than conventional learning process [14].

![Figure 1. N-Gain of students’ creativity](image)

3. Statistical test of students’ creativity can be seen in Table 1. Pre-test of the students’ creativity of the three groups is no significantly different and the post-test of the students’ creativity is a significantly different. Meanwhile, the improvement students’ creativity (N-Gain) is significantly different. In order to see the effectiveness of the learning model, the effect size analysis is used with Cohen’s d effect size formula [15]. Table 2 shows that the experiment class 1st has effect size as much as 0.84 with high category and the experiment class 2nd has effect size as much as 0.36 with medium category. It means
that PjBL model with shared and integrated types of integration is effective in improving the students’ creativity on the waste recycling theme than PjBL model without any integration. The effect size of the class which is applied with PjBL model with shared type of integration is higher than the class applied with PjBL model with integrated type of integration.

| Data    | Sig  | Category                                      |
|---------|------|-----------------------------------------------|
| Pre-test| 0,091| Ho accepted, no significantly different students’ creativity pre-test |
| Post-test| 0,000| Ho rejected, significantly different students’ creativity post test |
| N-Gain  | 0,002| Ho rejected, significantly different improvement of students’ creativity |

**Table 1.** Statistical test of students’ creativity (α = 0,05)

| Class               | N   | Mean of N-Gain | Sd   | D   | Category |
|---------------------|-----|----------------|------|-----|----------|
| Experiment Class 1st| 36  | 0,37           | 0,20 | 0,84| High     |
| Control Class       | 37  | 0,13           | 0,35 |     |          |
| Experiment Class 2nd| 35  | 0,24           | 0,26 | 0,36| Medium   |
| Control Class       | 37  | 0,13           | 0,35 |     |          |

**Table 2.** Effect size of improvement students’ creativity

PjBL model with shared type of integration is more effective in improving the students’ creativity than the PjBL model with integrated type of integration. This is supported by Fogarty’s theory that integrated science learning using shared type only combines 2 lessons, hence an intact concept is resulted [2]. In this research, the teacher combined chemistry and physics, chemistry and biology, chemistry with earth and space sciences, and chemistry with craft. Meanwhile, in the integrated science learning using an integrated type, the teacher combined 5 lessons consist of chemistry, physics, biology, earth and space sciences, and craft by selecting priority from each discipline and finding the overlapping aspect from all of those disciplines [2]. It causes the PjBL model with shared type of integration to be more effective in improving the students’ creativity than the PjBL model with integrated type of integration. Thus, the students will receive a more intact concept with the shared type than using the integrated type which is only selecting concept priority from each discipline.

The improvement of each indicator of students’ creativity before and after applied the learning process of the three groups, the normalized gain (N-Gain) needs to be determined. Table 3 shows about N-Gain data and effect size of each indicator of students’ creativity on each group. According to the data in Table 3, the fluency indicator, the classes applied with PjBL model with shared and integrated types of integration can improve the students’ ability in expressing their ideas fluently. The class applied with PjBL model with integrated type has more effective in improving the students’ fluency. With science learning using integrated type, the learning process can be more efficient and contextual [3]. Hence, after the learning process has been implemented, the students can be more fluent in expressing their ideas since the problems they occur in their daily life. Besides, there is a factor that influences creativity aspect especially in improving the students’ fluency development which is technology. By using the technology, the students can browse information through the internet. This might not have an effect on the ability but it can give effect to the quality of the students’ creativity [16].

On the flexibility indicator, PjBL model with shared type has medium category effect size. Hence, this model is effective in improving the flexibility. Compare to the class applied with PjBL model with integrated type, it has negative value effect size. It means that the flexibility improvement of this class is smaller than the control class. Flexibility refers to the ability to generate many kinds of ideas and in the problem solving, this relates to the ability to try a variety of approaches to solving a problem [17].
In the creativity test, the students were asked to provide various solutions towards given problems. According to Goodwin and Sommervold, to be flexible it needs to encourage openness that the solution and remove prejudices that the solution cannot be successful or unworkable [18]. There are factors that affect the difficulty of developing students’ flexibility. According to Ayan, many people difficult to open themselves to new ideas [19]. So, the new idea for them is something that is difficult to understand and contrary to the existing one. So they become afraid and objections in applying new ideas.

| Table 3. N-Gain and effect size of each indicator of students’ creativity |
|---------------------------------------------------------------|
| **Indicator** | **Class** | **Mean of N-Gain** | **Category** | **Effect Size (d)** | **Category** |
|---------------------------------------------------------------|
| Fluency | Experiment Class 1<sup>st</sup> | 0,47 | Medium | 0,48 | Medium |
| | Experiment Class 2<sup>nd</sup> | 0,51 | Medium | 0,70 | Medium |
| | Control Class | 0,20 | Low | 0,43 | Medium |
| Flexibility | Experiment Class 1<sup>st</sup> | 0,53 | Medium | 0,60 | Medium |
| | Experiment Class 2<sup>nd</sup> | 0,01 | Low | -0,26 | No Effect |
| | Control Class | 0,18 | Low | 0,51 | Medium |
| Originality | Experiment Class 1<sup>st</sup> | -0,14 | - | -0,22 | No Effect |
| | Experiment Class 2<sup>nd</sup> | -0,09 | - | -0,18 | No Effect |
| | Control Class | -0,02 | - | 0,53 | Medium |
| Elaboration | Experiment Class 1<sup>st</sup> | 0,43 | Medium | 0,76 | Medium |
| | Experiment Class 2<sup>nd</sup> | 0,18 | Low | 0,23 | Medium |
| | Control Class | 0,05 | Low | 0,48 | Medium |
| Sensitivity to Problems | Experiment Class 1<sup>st</sup> | 0,42 | Medium | 0,12 | Low |
| | Experiment Class 2<sup>nd</sup> | 0,30 | Medium | -0,07 | No Effect |
| | Control Class | 0,34 | Medium | 0,47 | Medium |

On the originality indicator, all of the class have negative value effect size. It means there is no effect to improves originality indicator of students’ creativity after applied treatment. According to Torrance, there are various factors that cause difficulties in generating original ideas, such as difficulty in finding words to describing original ideas, inability to express imagination using new ideas, difficult to freeing oneself from the existing idea, and fear of going to far-out in the imagination [12]. Besides, tests of indicators originality indicator are related to the design process of PjBL. So students will write down ideas of creativity that other students have expressed. Hence, the originality decreased.

On the elaboration indicator, the improvement is more effective with the implementation of PjBL model with shared type of integration. Elaboration is the students’ ability in adding and detailing in detail [12]. In the class applied with PjBL model with shared type science learning shows that the students are more detail in explaining the steps of work and detail pictures in their explanation. As well as flexibility and elaboration indicators, the improvement on sensitivity to problems indicator is more effective if PjBL model with integrated science learning using shared type is applied. Sensitivity to problem indicator is the ability to recognize that a problem exists [17]. The class applied with PjBL model with integrated type has negative value effect size. It means that the flexibility improvement of this class is smaller than the control class. There are external factors that influence that the class is not conducive when implemented post-test (post-test at the end of school hours and home hours accelerated, so students want to go home quickly). So in post-test, there are some score 0 (students not answer) on the sensitivity to problem indicator.

In the class applied with PjBL model with shared type of integration, the students will get concept which is the combination of two science disciplines [2]. It is different from the class applied with PjBL with integrated type of integration which combines more than two science disciplines [2]. As many as matter given, the students will not focus on developing their creativity. Although the combined matters are interrelated, but more suggested in developing the students’ creativity, we should only combine only
the primary matter that can improve the creativity of the students. Hence, in improving the students’ creativity, the teacher can use PjBL model with shared type of integration. It is proven to be more effective in improving the students’ creativity than to PjBL with integrated type integration and without any integration.

4. Conclusion
According to the analysis and discussion’s, it can be concluded that there is a significant different in the creativity improvement on the classes applied with project based learning model with shared type of integration, project based learning model with integrated type of integration and project based learning model without any integration on waste recycling theme. The project based learning model with shared type of integration has the highest N-Gain score in improving the students’ creativity compare to the integrated type and without any integration. Implementation project based learning model with shared type of integration is more effective in improving the students’ creativity than project based learning model with integrated type on waste recycling theme.

Acknowledgments
The researcher would like to deliver her biggest gratitude to Directorate General of GTK Ministry of Education and Culture which has provided the scholarship at School of Post Graduate, as well as student and teacher of SMPN 1 Sumberejo who have participated in this study.

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