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Developing a PBL-Based Thematic-Integrative Learning Instrument for Grade IV Students

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Abstract

This study aimed at generating a valid and effective PBL model-based integrative-thematic learning instrument for improving the critical thinking skills and the environment-caring characters for the Grade IV students of SDN Serayu. The research design was research and development by Borg and Gall. The subjects in this study were the students and the teachers of Grade IV SDN Serayu, the City of Yogyakarta. Then, the data gathering techniques that the researcher employed were interview, questionnaire, observation, and test. The product effectiveness was tested using the quasi-experiment. Then, the data were analyzed qualitatively and quantitatively using the differential test with degree of trust 95%. The results of the study show that the product that has been developed is feasible for implementation and this feasibility has been confirmed by the score of feasibility 44.50, the score of lesson plan feasibility 74.00, the score of teachings books 56.00, the score of students' worksheet 33.50, and the score of assessment instrument 21.00; all of these scores belong to the "Good" category. The product that has been developed is effective for improving the students' critical thinking skills with the rate of significance 0.000 for the differential test of two classes namely the control class and the experimental class. The product that has been developed is also effective for improving the students' environment-caring characters with the rate of significance 0.000 for the same differential test of two classes namely the control class and the experimental class.

Keywords: thematic-integrative learning instrument, PBL, critical thinking skills, environment-caring characters

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Introduction

Elementary education is one of the formal education levels that have important meaning in the implementation of national education in Indonesia. As a part of national education system, elementary education contributes to the achievement of national education objectives. The role of elementary education actually is very central and strategic because the elementary education serves to lay the foundation of intelligence and characters among students.

However, there are a number of problems that should be highlighted in the Indonesian education. One of these problems is the low students' critical thinking skills. The results of PISA (OECD, 2010, pp. 13, 19, 25), especially on the aspect of Reading, Mathematics, and Natural Science, has shown that almost 95% of Indonesian students only finish on Level 3 whereas the students from other countries have already finished on Level 4, 5, and even 6. Similar findings are also attained from the results of TIMSS (Wahab, 2014, p. 13) in which more than 95% Indonesia students have only finished on the intermediate level in the aspect of Reading, Mathematics, and Natural Science skills whereas almost 40% Taiwanese students have already finished on the highest or the advance level. This problem occurs because both the learning contents and the learning process less explore the students' higher order thinking skills (Sutriningsih, Suherman, & Khoiriyah, 2014, p. 363). Even, the learning model or approach that has been dominantly

applied is teacher-centered and provides less space for the students to exploit their higher order thinking skills such as the critical thinking skills (Tiarani, 2013, p. 340).

The problems of low students' critical thinking skills are also experienced by the Grade IV Students of SDN Serayu. The results of observation toward the learning process in the preliminary study show that Grade IVA and Grade IVB only had 15 students (55.60%) and 16 students (59.26%), respectively, whose critical thinking skills belonged to the "Good" category. These results are also supported by the questionnaire that had been gathered in the preliminary study. The teachers as the respondents admit the fact that the students have quite significant difficulties in answering questions or in solving problems that demand them to analyze and synthesis the test items. In general, the students are dominant in terms of factual knowledge and concept understanding.

Another problem that should be highlighted in the Indonesian education is the character education. In the empirical setting, the implementation of character education, including the environment-caring characters, has not been optimally conducted. A study by Barus (2015, p. 222) shows that the implementation of integrated character education in five cities of Indonesia has not yielded the expected results because the character education in these cities still focus on the cognitive setting (knowing the good).

In relation to the character education, the results of interview with the Principal of SDN Serayu show that this state elementary school has paid serious attention to the education of environment-caring characters. In addition to achieve the *adiwiyata* school programs, the improvement of these characters should be pursued because the students have not fully developed them in their behaviors. This situation is apparent from the following students' behaviors: littering in inappropriate places, messing up the classrooms, and messing up the school yard. Through the same interview, the researcher has found that the development of environment-caring characters that has been performed up to date in general is still limited to the extracurricular activities.

Then, there is still another problem that becomes the highlight in the Indonesian (elementary) education namely the minimum teachers' preparation in implementing 2013 Curriculum. The results of a study by Wangid, Mustadi, Erviana, & Arifin (2014, p. 181) show that elementary school teachers in Yogyakarta still demand assistance or guidance especially in preparing the learning instruments for the implementation of 2013 Curriculum. The teachers still have difficulties in the aspect of planning the 2013 Curriculum. The teachers still also have difficulties in designing the learning instruments for the 2013 Curriculum. The obstacles in the implementation of 2013 Curriculum that comes from the teacher are mainly related to the learning media design, the teacher's understanding, the integration of inter-learning contents into the thematic learning, and the mastery of information technology (Krissandi & Rusmawan, 2015, p. 457).

Similar problems are also experienced by the teachers of SDN Serayu. The results of an interview with the Principal of SDN Serayu show that the teachers in general have not developed their own thematic learning instruments that are in accordance with the characteristics of this state elementary school. The teachers use the learning instrument that has been prepared by the Center of 2013 Curriculum as the main learning sources. This statement does not imply that the learning instruments prepared by the government are less qualified; instead, not all of those learning instruments have answered the students' learning needs or have been in accordance with the social, cultural, and environmental characteristics of SDN Serayu. Furthermore, the teacher's book that has been issued by the Center of 2013 Curriculum has not explained the learning stages in detailed according to the approaches that have been selected. The characters that will be achieved are not clearly and specifically written in the learning objectives and stages. The characters are only written in the learning scope. In addition, some of the assessment rubrics are incomplete and not all competencies are measured through the existing assessment rubrics.

Departing from the problems of unavailable learning instruments that have been in accordance with the characteristics of SDN Serayu, through this study the researcher would like to develop a more detailed and systematic learning instrument that includes syllabus, lesson plan, teaching book, student's worksheet, and assessment instrument. Specifically, the development of this learning instrument is integrated to the PBL model in order to overcome the problems of low critical thinking

skills and environment-caring characters among Grade IV students of this state elementary school. The development of this learning instrument is pursued because the PBL model focuses on the strengthening of problem solving skills, critical thinking skills, and also self-direction and self-regulation skills (Akınoğlu & Tandoğan, 2005, p. 71). In addition, the problems that have been packaged using the PBL model in this instrument are the environmental ones. Such problems assist the students to be aware of the existence of the dangers that they may cause and encourage them to be involved in the efforts of preserving the nature. Thereby, through the learning process using this instrument it is expected that the environment-caring characters in the students will be strengthened further.

Based on the above explanation, the researcher has identified three problems that become the focus of this study: (1) the students' critical thinking skills are still low; (2) students' environment-caring characters are still weak; and (3) the PBL model-based integrative thematic learning instrument has not been available. Therefore, this study is: (1) generating a feasible Problem Based Learning model-based integrative thematic learning instrument in order to improve the critical thinking skills and the environment-caring characters for the Grade IV students of SDN Serayu; and (2) identifying the effectiveness of the learning instrument.

The learning instrument that was developed in this study is integrated into the integrative thematic approach and the PBL model. This integration is conducted because the integrative thematic approach presented using the PBL model provides holistic, authentic, and meaningful learning experiences for the students. Thematic approach is a theme-based learning approach that covers multiple scientific aspects in order to provide meaningful learning for students (Akbar, 2013, p. 69). In such learning, the students are conditioned to learning in active and meaningful learning.

PBL is a learning model that turns problems into the starting points of a learning process. Arends (2012, p. 397) argues that learning process in the PBL model is organized around real life situations in which solutions are not simple yet competing one to another. Thereby, the PBL model provides authentic learning experiences through the problem solving activities that have been done investigating, analyzing, and solving the problems. In this process, the students are actively involved in integrating the skills and the concepts from multiple learning materials in order to find multiple solutions or resolutions for the related problems.

The skills that were developed in a PBL model-based learning are the problem solving skills, the critical thinking skills, the self direction and self regulation skills, and the collaborative skills (Akınoğlu & Tandoğan, 2005, p. 71; Davidson & Major, 2014, p. 27). Authentic problems as the organizational centrum of learning process and experiences encourage and develop curiosity, inquiry, and critical thinking skills in order to solve the problems. In addition to having been based on the problems, the PBL based-learning problem is conducted collaboratively. Such learning process enables opinion sharing among the students in relation to the problem understanding, to the problem solving, and even to the solution alternatives. In addition, in the PBL model the problem solving is performed through an investigation process by asking, discussing, gathering information, observing, performing experiments, drawing conclusions, and communicating the investigation results through a report of investigation results. During the investigation process, the teachers' role as facilitators is very vital especially for providing scaffolding and supportive framework that facilitate the students in their learning process. It is such learning process that encourages the development of the students' critical thinking skills so that they become more aware of their actual self-direction and self-regulation.

Critical thinking is a learning process that has been conducted consciously for pursuing certain objectives. Ennis (Nitko & Brookhart, 2011, p. 232) proposes that critical thinking is a reasonable, reflective thinking that focuses on deciding what to believe or to do. Different than general thinking, critical thinking that has been performed rationally and reflectively helps people to define their side in dealing with certain matters.

The critical thinking skills are categorized as part of higher-level thinking. In Bloom's taxonomy, the critical thinking skills belong to the top three levels namely analyzing, evaluating, and creating (Moore & Stanley, 2010, p. 10).

Critical thinking is a process and can be developed through an effective guideline. As a process, critical thinking is based on curiosity,

flexibility, honesty, and uncertainty that encourage the process of questioning. Therefore, teachers should develop the students' critical thinking process by designing learning using active learning approaches such as PBL model.

The reference of critical thinking indicators used in this study is the 12 indicators that have proposed by Norris and Ennis (Nitko & Brookhart, 2011, pp. 234–236). The 12 indicators are as follows: (1) focusing questions; (2) analyzing arguments; (3) asking and answering questions; (4) assessing the credibility of sources; (5) designing and assessing observations; (6) drawing and assessing deductive conclusions; (7) drawing and assessing inductive conclusions; (8) taking and considering the values of decisions; (9) defining terms and considering definitions; (10) identifying assumptions; (11) deciding actions; and (12) having critical interactions with other people.

However, not all of these indicators will be implemented because critical thinking in the context of elementary school students will be different than that in the context of adults. According to Piaget (Berk, 2013, pp. 298–299), cognitively elementary school students are in the stage of concrete operational that has been marked by several thinking skills namely: (1) skills in performing or awareness toward the principles of conservation that enable the students to see the relation and the causal relationship among events in more logical or rational manner and the reversible thinking; (b) skills in performing classification namely the skills to combine two groups or more into a bigger class; (c) skills in ordering sequences namely the skills to order certain items according to the quantitative dimension such as length or weight; and (d) skills in performing spatial thinking namely the skills to perform mental representation (cognitive maps) toward wide scale rooms that students have identified. In this stage, the students are also able to develop the skills to use inductive logics. The students are able to perform observation and in fact the elementary school students are good observers (fairly good observational scientists) (Boyd & Bee, 2009, p. 252). Based on the observations, these students are able to perform generalization and classification.

Based on the explanation about the characteristics of elementary school students' cognitive skills and the 12 critical thinking indicators proposed by Norris and Ennis, the critical thinking skills in this study are limited to 5 indicators. The 5 indicators are as follows: (1) focusing to questions/problems; (2) asking and answering questions; (3) creating and assessing objects; (4) drawing and assessing inductive conclusions; and (5) deciding actions.

In addition to improving the critical thinking skills, the development of this integrative thematic learning instrument is also intended to improve the students' environment-caring characters. Environment-caring characters are the attitudes and the behaviors that always strive to maintain the environmental sustainability and to prevent the damage that might occur in their surrounding environment. People who have environment-caring characters will always strive to embody the balance and the harmony between themselves and the environment, to maintain the environmental sustainability, and to exploit the nature wisely. These characters are based on the responsibility to maintain and to preserve the environmental sustainability (Yaumi, 2014, p. 111).

Environment-caring characters are not merely related to attitudes and behaviors but also to the knowledge regarding how to maintain the environmental sustainability and to prevent the damage of the nature. As having been stated by Lickona (1991, p. 51), the good characters include knowing the good, demanding the good, and performing the good; as a result, the good environment-caring characters will be knowing, demanding, and performing any efforts to maintain the environmental sustainability and to prevent the damage in the surrounding environment. Thereby, the environment-caring characters are the behaviors that have been based on the presence of knowledge, attitudes, and actions that always strive to maintain the environmental sustainability and to prevent the damage in the surrounding environment.

The values of environment-caring characters are important to develop especially in the context of escalating environmental problems recently. In general, environmental problems occur because of the human beings' behaviors that do not protect and preserve the environmental sustainability. Therefore, there should be efforts of creating, directing, and shaping individuals to have environment-loving soul.

In order to develop the environment-caring characters within students, schools should provide learning experiences that might motivate them to maintain the environmental sustainability. Such learning experiences are designed through the student interactive

pedagogical strategies (Berkowitz & Bier, 2005, p. 29) and the student-centered approach (Schaefer, 2012, p. 4). Such learning strategies will create conducive learning environment for the students in developing their competencies in the cognitive, affective, and psychomotor domain.

PBL is part of interactive learning strategies because in the PBL process there is an educative interaction between teachers and students, students and students, and also students and other learning sources (including the environmental problems around the students). The PBL model is a learning model in which the students' learning environment has been designed in such a way that they should be actively involved in the cognitive, the affective, and the psychomotor domain in order to investigate and to find resolutions to authentic problems (Torp & Sage, 2002, p. 15). The development of the three competence aspects is certainly relevant to the character development that occurs through the improvement of knowledge (knowing the good), attitudes (desiring the good), and positive behaviors (doing the good).

In relation to strengthening the environment-caring characters, the problems that have been turned into the main learning sources in the PBL based-integrative thematic learning instrument are the environmental ones. Through the implementation of PBL model, the students perform a collaborative investigation in order to solve this problems and the collaborative investigation starts from identifying and realizing the presence of environmental problems in their neighborhood (knowing the good) to realizing the importance of performing actions in order to solve these environmental problems (desiring the good) until taking actions in order to find solutions or resolutions toward these problems (doing the good).

Integrating the PBL model to the integrative thematic learning instrument that will be developed throughout this study enables the students to attain learning sources and learning experiences that can improve their critical thinking skills and environment-caring characters. Thereby, theoretically it can be said that the use of PBL model based-integrative thematic learning instrument is effective to improve elementary school students' critical thinking skills and environment-caring characters.

Method

This study was a research and development using the Borg & Gall (1983) design which consisted of 10 stages and by Sukmadinata (2013, p. 184). These stages were grouped into three main consecutive steps namely: (1) preliminary study; (2) model development; and (3) model testing. The preliminary study (needs analysis) included three essential steps namely: a) library study; b) field survey; and c) draft of product design. In the model development stage, the researchers validated the product prototype using expert judgment in order to value the feasibility of the product prototype. Next, the researcher performed the limited and the expanded experiment. In the model testing, the researcher performed the product effectiveness test based on the influence of the product toward the critical thinking skills and the environment-caring characters. Therefore, the data regarding the product effectiveness were gathered and were tested through the experimental design.

The product testing was performed using: (a) expert testing that involved learning expert, curriculum expert, material expert, media expert, and evaluation expert; (b) limited experiment; (c) expanded experiment; and (d) operational testing in order to identify the effectiveness of the product that had been developed. Therefore, the researcher should perform a quasi-experiment using non-equivalent group pretest-posttest design (Cohen, Manion, & Morrison, 2007, p. 283).

The study was conducted in SDN Serayu, Gondomanan District, City of Yogyakarta, from July to November 2015. The subjects in this study were Grade IV students and classroom teachers of SDN Serayu as the product users. The subjects in the limited experiment were 9 Grade IV students and 2 classroom teachers, while the subjects in the expanded experiment were 18 Grade IV students who had not been involved in the limited experiment and 2 classroom teachers of SDN Serayu and also 1 teacher of SDN Lempuyangwangi. Then, the subjects in the operational testing were the Grade IV Students of SDN Serayu who consisted of three learning groups namely Grade IVA, Grade IVB, and Grade IVC.

The data in this study were those of: (1) the school's needs toward the product that would be developed from the interview (with the principal of SDN Serayu) and the instrument in

the form of interview guideline; (2) the teachers' needs and preparedness toward using the product that would be attained from the instrument in the form of teachers' needs and preparedness questionnaire; (3) the feasibility of the product that would be attained using the following instruments: (a) questionnaire of validity on syllabus feasibility; (b) questionnaire of validity on lesson plan feasibility; (c) questionnaire of validity on teaching book feasibility; (d) questionnaire of validity on students' working sheet feasibility; and questionnaire of validity on assessment instrument feasibility; (4) the students' environment-caring characters that would be attained through the questionnaire and the observation using the following instruments: (a) questionnaire of environment-caring characters; and (b) rating scale on environment-caring characters; and (5) the students' critical thinking skills that would be attained through the test and the observation using the following instruments: (a) test of critical thinking skills; and (b) rating scale on the critical thinking skills.

The data analysis technique that the researcher employed was the qualitative and the quantitative descriptive analysis. The qualitative descriptive analysis was conducted toward the data from the interview results, from the questionnaire of the preliminary study, and from the validators' and the respondents' feedback and suggestions for the product revision. On the other hand, the quantitative data analysis was conducted toward the data from the product validation. The mean score of each aspect was calculated for each product component using the following formula:

$$M = \frac{\sum fx}{N} \quad \text{..... (Formula 1)}$$

(Azwar, 2010, p. 33)

Note:

M = Mean per aspect
$\sum fx$ = Total score per aspect
N = Number of validators

The classification of qualitative category for each assessment aspect within a product component was based on the mean score of each assessment aspect. On the other hand, the overall qualitative category of a product component was based on the total mean score. The classification of qualitative category was conducted using the following formula (Widoyoko, 2013, p. 238).

Table 1. Score Range and Category of Learning Instrument Quality

No.	Quantitative Range Score (*i*)	Qualitative Category
1.	$X > (\overline{Xi} + 1{,}8\ sbi)$	Very Good
2.	$(\overline{Xi} + 0{,}6\ sbi) < X \leq (\overline{Xi} + 1{,}8\ sbi)$	Good
3.	$(\overline{Xi} - 0{,}6\ sbi) < X \leq (\overline{Xi} + 0{,}6\ sbi)$	Moderate
4.	$(\overline{Xi} - 1{,}8\ sbi) < X \leq (\overline{Xi} - 0{,}6\ sbi)$	Poor
5.	$X \leq (\overline{Xi} - 1{,}8\ sbi)$	Very Poor

Note:

$\overline{Xi}$ (ideal mean)= $\frac{1}{2}$(ideal maximum score + ideal minimum score)

sb$i$ = $\frac{1}{6}$ (ideal maximum score – ideal minimum score)

Ideal maximum score = $\sum$ (assessment items x highest score)

Ideal minimum score = $\sum$ (assessment item x lowest score)

X = empirical score

The quantitative analysis was also conducted to the data from the questionnaire of product readability response provided by the students and the teachers and the product users. The classification of qualitative category for the product readability response was based on the following formula (Widoyoko, 2013, p. 238).

Table 2. Score Range and Category of Learning Instrument Readability Response Quality

No.	Quantitative Range Score (*i*)	Qualitative Category
1.	$X > (\overline{Xi} + 1{,}8\ sbi)$	Very Positive
2.	$(\overline{Xi} + 0{,}6\ sbi) < X \leq (\overline{Xi} + 1{,}8\ sbi)$	Positive
3.	$(\overline{Xi} - 0{,}6\ sbi) < X \leq (\overline{Xi} + 0{,}6\ sbi)$	Moderately Positive
4.	$(\overline{Xi} - 1{,}8\ sbi) < X \leq (\overline{Xi} - 0{,}6\ sbi)$	Less Positive
5.	$X \leq (\overline{Xi} - 1{,}8\ sbi)$	Negative

Note: (Look at the Note in Table 1)

The quantitative analysis was also conducted toward the data from the results of critical thinking skills and environment-caring characters observation. The classification of critical thinking skills and environment-caring characters for each student was based on the mean score of each student's observation score. Therefore, the researcher employed the formula in Table 1.

The data from the pretest-posttest scores (critical thinking skills) and also the pre-questionnaire and the post-questionnaire (environment-caring characters) were analyzed

using the inferential statistics. In order to test the significance of mean differential from the pretest and the posttest results and the mean score of pre-questionnaire and post-questionnaire between the experimental class and the control class the researcher employed the t-test. The analysis of the t-test results was conducted using SPSS 16.00.

Results and Discussions

In this study, there are four validators who assess the feasibility of the product draft that has been developed and these validators are curriculum expert, learning expert, material expert, and evaluation expert. Each draft that has been developed is validated by two different experts. The drafts of syllabus and of lesson plan are validated by the curriculum expert and the learning expert. The drafts of teaching book and of student's worksheet are validated by the material expert and the learning expert. The draft of assessment instrument is validated by the evaluation expert and the learning expert.

The results of data analysis from the syllabus validation show that the mean score on the aspect of syllabus components is 8.00, the mean score on the aspect of learning indicators is 7.00, the mean score on the aspect of time allocation and of learning source is 3.50 and 8.00 respectively, and the mean score on the aspect of learning activities and of assessment is 7.00 and 7.50 respectively. Based on the results of conversion into the qualitative assessment, each aspect of syllabus assessment belongs to the "Very Good" category. In addition to per-aspect analysis, the results of analysis toward the syllabus assessment show that the overall mean score is 44.50. Based on the conversion results, this mean score belongs to the "Very Good" category. Thereby, the researcher might conclude that the syllabus draft is very feasible to be implemented in the learning process.

Then, the results of data analysis from the lesson plan validation show that the mean score on the aspect of lesson plan components and of learning indicators is 8.00 and 7.00 respectively, the mean score on the aspect of learning materials and of learning activities is 14.50 and 15.00 respectively, and also the mean score on the aspect of learning assessment and of learning source is 14.00 and 15.50 respectively. The results of the conversion into the qualitative assessment show that the mean score for each aspect of lesson plan assessment belongs to the "Very Good" category. From the results of analysis as well, the researcher has found that the overall mean score is 74.00 and such mean score belongs to the "Very Good" category. Thereby, the lesson plan is feasible to be implemented in the learning process.

The teaching book feasibility is assessed in terms of three aspects namely material standards, presentation standards, and language standards. In the aspect of material standards, the score of the teaching is 17.00 and belongs to the "Good" category. In the aspect of presentation standards, the score is 29.50 and belongs to the "Very Good" category. In the aspect of language standards, the score is 10.00 and belong to the "Good" category. From the overall assessment toward the teaching book, the total mean score is 56.05 and belongs to the "Very Good" category. As a result, this teaching book is feasible for implementation in the learning process.

The student's worksheet feasibility is assessed in terms of five aspects namely components, construction, substance, presentation, and language. Based on the assessment by the material expert and the learning expert, the mean score on the aspect of component is 8.00, on the aspect of construction is 7.50, on the aspect of substance is 11.00, on the aspect of presentation is 3.50, and on the aspect of language is 3.50. From the overall student's worksheet assessment, the total mean score is 33.50 and belongs to the "Very Good" category. Therefore, this student's worksheet is feasible for implementation in the learning process.

Next, there are four aspects with six items/statements in the assessment of assessment instrument feasibility. The four aspects are language (whose mean score is 3.50), construction (whose mean score is 6.50), substance/materials (whose mean score is 4.00), and technique (whose mean score is 7.00). The mean scores for all aspects of assessment instrument feasibility belong to the "Very Good" category except for the construction; the mean score of construction belongs to the "Good" category. The results of assessment instrument feasibility in overall show that the total mean score is 21 and belongs to the "Very Good" category. Therefore, the assessment instrument is feasible for implementation in the learning activities.

Table 3. Results of Data Analysis for the Product Validation

No.	Learning Instrument	Total Mean Score	Category
1.	Syllabus	44.50	Very Good
2.	Lesson Plan	74.00	Very Good
3.	Teaching Book	56.50	Very Good
4.	Student's Worksheet	33.50	Very Good
5.	Assessment Instrument	21.00	Very Good

Results of Limited Experiment

The limited experiment is conducted in order to measure the teacher's and the student's response toward the readability of the learning instrument draft that has been developed. The product readability is measured using three key indicators namely easy to read, interesting to read, and easy to understand.

The teachers who become the respondents in this limited experiment are two Grade IV teachers from SDN Serayu. Based on the responses that the teachers have provided using the questionnaire, the total mean score for the syllabus is 13.50, for the lesson plan is 14.00, for the teaching book is 23.00, for the student's worksheet is 13.50, and for the assessment instrument is 17.00. As respondents, all of the teachers' responses toward the readability of the product components belong to the "Positive" category except for the lesson plan; the response to the lesson plan belongs to the "Very Positive" category. These findings imply that the five components of the integrative thematic learning instrument are easy to read, interesting to read, and easy to understand for the teachers.

Table 4. Results of Data Analysis from the Questionnaire on the Teacher's Response toward the Product Readability in the Limited Experiment

No.	Components of Product Draft	Teacher's Response	
		Mean Score	Category
1.	Syllabus	13.50	Positive
2.	Lesson Plan	14.00	Very Positive
3.	Teaching Book	23.00	Positive
4.	Student's Worksheet	13.50	Positive
5.	Assessment Instrument	17.00	Positive

In addition to measuring the teacher's response, the researcher has also measured the student's response toward the instrument readability especially for the teaching book and the student's worksheet. Therefore, the learning instrument is distributed to the students as the respondents in order to be read and be observed; the number of the students in this limited experiment is 9 people. Then, the students are asked to complete the questionnaire on the product readability.

From the responses that the students have provided in the questionnaire, the total mean scores of the teaching book readability is 20.33 and of the student's worksheet readability is 13.55; both mean scores belong to the "Positive" category. These findings imply that both the teaching book and the student's worksheet are easy to read, interesting in terms of presentation, and easy to understand for the students.

Table 5. Results of Data Analysis from the Questionnaire on the Students' Response toward the Product Readability in the Limited Experiment

No.	Components of Product Draft	Student's Response	
		Mean Score	Category
1.	Teaching book	20.33	Positive
2.	Student's worksheet	13.55	Positive

Results of Expanded Experiment

The expanded experiment is conducted in order to identify the teacher's and the student's response toward the readability of the product in the form of PBL-based integrative thematic learning instrument. From the questionnaire on the teacher's response, the teacher's total mean score for the syllabus is 15.33, for the lesson plan is 15.33, toward the teaching book is 26.00, for the student's worksheet is 14.67, and for the assessment instrument is 19.00; all of the mean scores belong to the "Very Positive" category. These findings imply that the learning instrument that has been developed is easy to read, interesting, and easy to understand for the teachers in terms of substance and presentation.

The data from the student's response toward the readability of the teaching and the student's worksheet are gathered using questionnaire. From the results of the analysis toward the questionnaire on the student's response, the student's total mean score for the teaching book is 22.50 and for the student's worksheet is 14.78. Both mean scores belong to the "Very Positive" category. These findings imply that both the teaching book and the student's worksheet are easy to read, interesting,

and easy to understand for the students. The summary on the analysis results can be found in Table 7.

Table 6. Results of Data Analysis from the Questionnaire on the Teacher's Response toward the Product Readability in the Expanded Experiment

No.	Components of Product Draft	Teacher's Response	
		Mean Score	Category
1.	Syllabus	15.33	Very Positive
2.	Lesson Plan	15.33	Very Positive
3.	Teaching Book	26.00	Very Positive
4.	Student's Worksheet	14.67	Very Positive
5.	Assessment Instrument	19.00	Very Positive

Table 7. Results of Data Analysis from the Questionnaire on the Student's Response toward the Product Readability in the Expanded Experiment

No.	Components of Product Draft	Student's Response	
		Mean Score	Category
1.	Teaching book	22.50	Very Positive
2.	Student's worksheet	14.78	Very Positive

Results of Effectiveness Test from the Aspect of Critical Thinking Skills

Prior to performing learning activities using the learning instrument that has been developed, the researcher conducts a pretest both to the experimental group (Grade IVA and IVC) and to the control group (Grade IVB) in order to measure the preliminary critical thinking skills of each group. From the pretest data, the researcher performs independent t-test for both groups using SPSS 16. Through the differential test, the researcher has found that the t-count value in the differential test results between the control group IVB and the experimental group IVA with their identical variants is -0.3999 with degree of freedom 52.00; meanwhile, the results of differential test between the experimental group IVC and the control group IVB show that the two-tailed significance is on 0.691. These findings imply that there is no significant difference in terms of preliminary critical thinking skills between the students who are treated using the PBL-based integrative thematic learning instrument and the students who use the learning instrument designed by the Center of 2013 Curriculum.

After the learning activities using the PBL-based integrative thematic learning instrument have been applied to the experimental group and the learning activities using the Center of 2013 Curriculum-designed learning instrument have been applied to the control group, the researcher performs the posttest. Following the posttest, the researcher performs the independent t-test to both the experimental and the control group using SPSS 16.00 in order to measure the final effectiveness of the final product that will be resulted from this research and development-type study.

The posttest average scores of differential test results between the control group IVB and the experimental group IVA display that the t-count score is 6.685 with degree of freedom 52.00 and the two-tailed significance 0.000.m For the differential test results between the control group IVB and the experimental group IVC, the t-count is 7.186 with degree of freedom 52.00 and two-tailed significance is 0.000. These findings imply that there is significant difference in terms of critical thinking skills between the students who have been treated using the PBL-based integrative thematic learning instrument and the students who have been treated using the Centre of 2013 Curriculum-designed learning instrument. The difference is specifically apparent on the posttest mean scores that reflect the students' critical thinking skills. The students who have been treated using the PBL-based integrative thematic learning instrument display higher critical thinking skills in comparison to those who have been treated using the Centre of 2013 Curriculum-designed learning instrument.

Table 8. Results of Product Effectiveness Test from the Aspect of Critical Thinking Skills

No.	Differential Test	t-count		Sig.(2-tailed)	
		IVA x IVB	IVC x IVB	IVA x IVB	IVC x IVB
1.	Pretest	-0.399	-0.554	0.691	0.582
2.	Posttest	6.685	7.186	0.000	0.000

The results of the analysis from the posttest of critical thinking skills are supported by the data of observation results toward the critical thinking skills. The critical thinking skills are observed in terms of five indicators namely: (a) capacity to focus on problems/

questions; (b) capacity to ask and answer questions, clarification, and challenges; (c) capacity to perform and assess and observation; (d) capacity to draw and assess inductive conclusions; and (e) capacity to decide actions.

The results of data analysis from the observation toward the critical thinking skills display that 11.11% students in the experimental group IVA and IVC belongs to the "Very Good" category and 62.96% and also 66.67% students belong to the "Good" category. This percentage is completely different from that of the control group IVB; in this control group, 0.00% students belong to the "Very Good" category and 40.00% students belong to the "Good" category. Thereby, the researcher can conclude that the critical thinking skills of the students who have been treated using the PBL-based integrative thematic learning instrument is better than those of the students who have been treated using the Centre of 2013 Curriculum-designed learning instrument.

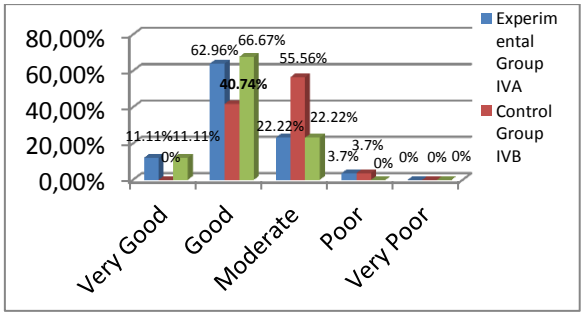

Figure 1. Results of Data Analysis from the Observation toward the Students' Critical Thinking Skills

The findings in this study show that the PBL-based integrative thematic learning is effective in improving the critical thinking skills of Grade IV students from SDN Serayu in 2015/2016 Academic Year. This effectiveness might be achieved due to the fact that the PBL-based thematic integrative learning instrument makes use of PBL as the organizer of students' activities and organizations. These findings are also supported by the results of a study by Anindyta & Suwarjo (2014, p. 109).

There are four matters that enable the effectiveness of PBL model in improving the students' critical thinking skills. First, the PBL model turns problems into the learning starting points and also the main learning source. The problems that become the main learning source in PBL are the ones related to the context of real-life situations which have been authentic, have been unstructured, and have had open solutions (Arends, 2012, p. 397). Such problems will encourage and develop flexible and critical curiosity, inquiry, and learning process (Erceg, Aviani, & Meši, 2013, p. 65).

The authentic problems that become the centre of students' learning experiences organization within the PBL-based integrative thematic learning instrument are the ones of withered and ill-maintained plants around the school gardens, of garbage around the school environment, of cleanliness in the school cafeteria. The students are facilitated in identifying the causes of these problems and they are also asked to deal with these problems. In addition, they are asked to provide ideas or resolutions in front of the stakeholders in order to deal with these problems.

Second, in the PBL model the problem solving activities are conducted through investigation process. In such learning process, the students are conditioned to be actively involved in the cognitive, affective, and psychomotor aspects. The reason is that the objective that will be achieved throughout the learning process is not learning new concept or information but, instead, is investigating the authentic problems in order to find the solutions. PBL emphasizes authentic learning experiences through problem solving activities using investigation process by raising questions, holding discussions, gathering information, observing, performing experiment, drawing conclusion, and communicating the investigation results by submitting the investigation report. In this process, the students are actively involved in integrating their skills and concepts from multiple learning materials in order to find multiple solutions or resolutions that might be derived from the problems. Such process trains and develops the students' critical thinking skills.

In investigating the authentic problems, the students encounter multiple learning experiences. For example, in gathering information the students may perform observation or interview with new learning sources. In order to define the solutions, the students may hold discussions and share their ideas with their peers in order to find solutions that might be derived from a problem. Such multiple learning experiences stimulate new thinking process especially the critical thinking one (Loes, Pascarella, & Umbach, 2012, p. 1).

Third, in the PBL model such learning is conducted collaboratively. Such learning

enables the occurrence of opinion sharing among the students in relation to their understanding toward the problems, the ways to solve the problems, and even the solutions that might be taken toward solving the problems. The collaborative learning process that occurs through idea sharing activities will encourage the critical thinking process (Osborne, Kriese, Tobey, & Johnson Students, 2009, p. 49). The results of the field study also show that the role of peer tutors and small collaborative groups is very important in the group and in improving the effectiveness of PBL model implementation (Chng, Yew, & Schmidt, 2011, p. 291).

In this PBL-based integrative thematic learning instrument, the students are organized to learn collaboratively through small groups that consist of 5-6 people. The background of each group member is heterogeneous in terms of gender, academic capacity, and social capacity. Each group member has the same responsibility in accomplishing the group assignment, especially in finding solutions for the authentic problems that they are investigating.

Fourth, in the PBL model, the role of teachers as a facilitator is very vital. Without teachers' facilitation, the investigation process will not run in accordance with the expected learning objectives. Therefore, Arends (2012, p. 396) states that teacher has a very vital role in implementing the PBL model within the learning process. The intended role is that teachers should provide scaffolding (assistance) or supportive framework. In concrete manner, the provision of scaffolding can be performed by providing authentic or contextual problems around the students' life, by asking, by wondering, by facilitating dialogues and investigations, and by motivating the students. In relation to this PBL-based integrative thematic learning instrument, the facilitation toward the students' learning process can be performed by developing the student's worksheet systematically that will guide the students in observing, taking notes during the observation, interviewing, drawing conclusions, and submitting the investigation report.

The role of facilitator, especially in providing scaffolding, encourages the establishment of inquiry learning environment or the community of inquiry (Canuto, 2015, p. 2). Such learning environment is appropriate and supports the PBL implementation. Hmelo-Silver & Barrows (2006, p. 99) through their review toward the results of multiple studies also show that the effectiveness of PBL model in improving the academic skills and the soft skills is also determined by the scaffolding that teachers or facilitators provide. Learning by performing collaborative investigation toward the ill-structured problems using the teacher's facilitation can explain the reality that the critical thinking skills of the students who learn using the PBL model are better than the students who learn using the Center of 2013 Curriculum-designed learning model.

Results of Effectiveness Testing from the Aspects of Environment-Caring Characters

The equality among the students' environment-caring characters prior to the treatment is measured through the pre-questionnaire distribution activities. The data analysis toward the pre-questionnaire distribution results shows that the t-count value in the differential test between the control group IVB and the experimental group IVA is 1.196 with degree of freedom 52.00 and two-tailed significance 0.237 and that the t-count value in the differential test between the control group IV and the experimental group IVC is 0.689 with degree of freedom 52.00 and two-tailed significance is 0.494. From these results, the researcher might conclude that there are not any differences in the preliminary environment-caring characters between the students who will be treated using the PBL-based integrative thematic learning instrument and the students who will be treated using the Center of 2013 Curriculum-designed learning instrument.

The product effectiveness toward improving the students' environment-caring characters is measured using the post-questionnaire distribution activities. The data analysis toward the post-questionnaire distribution results using the SPSS software shows that the t-count value in the differential test between the control group IVB and the experimental group IVA is 8.038 with degree of freedom 52.00 and two-tailed significance 0.000 and that the t-count value in the differential test between the control group IVB and the experimental group IVA is 5.536 with degree of freedom 52.00 and two-tailed significance 0.000. Based on these results, the researcher might conclude that there are significant differences in the environment-caring characters between the students who have been treated using the PBL-based integrative thematic learning instrument and the students who have been treated using the Center of 2013

Curriculum-designed learning instrument. In this case, the students whose learning makes use of the PBL-based integrative thematic learning instrument have better environment-caring characters than the students whose learning makes use of Center of 2013 Curriculum-designed learning instrument.

Table 9. Results of Product Effectiveness Test from the Aspects of Environment-Caring Characters

No.	Differential Test	t-count		Sig.(2-tailed)	
		IVA x IVB	IVC x IVB	IVA x IVB	IVC x IVB
1.	Pretest	1.196	0.689	0.237	0.494
2.	Posttest	8.038	5.536	0.000	0.000

The results of data analysis from the observation toward the environment-caring characters display the percentage of both the students in the experimental group and the students in the control group; the experimental group-students belong to the "High" and even the "Very High" category in comparison to the control-group students. 11.11% students from the experimental group IVA and 18.52% students from the experimental group IVC belong to the "Very High" category, whereas 3.70% students from the control group IVB belong to the "Very High" category. On the other hand, 70.37% students from the experimental group IVA and 62.96% students from the experimental group IVC belong to the "Good" category whereas 51.85% students from the control group IVB belong to the "Good" category. Thereby, the researcher might conclude that the environment-caring characters of the students whose learning makes use of the PBL-based integrative thematic learning instrument are better than the students whose learning makes use of the center of 2013 Curriculum-designed learning instrument.

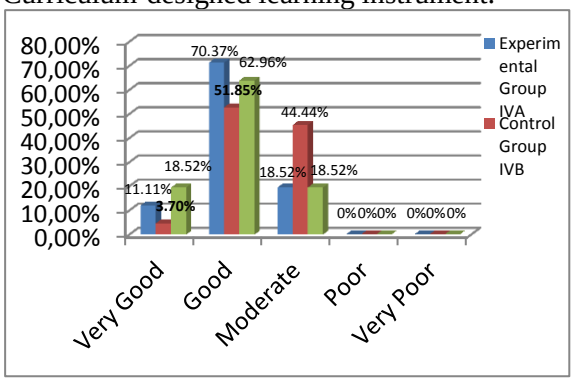

Figure 2. Results of Data Analysis from the Observation toward the Environment-Caring Characters

The results of this study also show that the PBL-based integrative thematic learning instrument is effective in improving the environment-caring characters of the students from SDN Serayu in 2015/2016 Academic Year. The effectiveness of the learning instrument in improving the students' environment-caring characters is achieved because the PBL model that has been integrated into the learning instrument is able to encourage the students to learn actively using the problem-solving activities. Torp & Sage (2002, p. 15) argue that in the PBL model the students' learning environment is designed in such a way that they should be involved actively both in the aspects of minds-on and the aspects of hands-on in order to investigate and to find resolutions toward the real-life problems. The learning orientation should not be mastering knowledge or information but, instead, it should be investigating the authentic problems in order to find the solutions. Within this process, the students are actively involved in integrating the skills and the concepts from multiple contents of learning materials in order to find multiple solutions or resolutions that might be derived from those problems. Thereby, not only the aspect of cognitive competencies but also that of affective competencies and of psychomotor competencies will develop.

Developing the aspects of the three competencies using the PBL model is certainly correlated to developing the characters. Lickona (1991, p. 51) argues that the character development occurs through knowing the good, desiring the good, and doing the good. In specific, the reinforcement of the environment-caring characters occurs because the problems will be turned into the main learning sources within the PBL-based integrative thematic learning instrument. These problems are authentic, real, and contextual around the students' life. Through the PBL model implementation, the students perform investigation collaboratively in order to deal with these problems and this investigation starts from knowing and realizing the presence of environmental problems in their surrounding environment (knowing the good), realizing the importance of taking actions to solve these environmental problems (desiring the good), and executing the actions in order to find solutions or resolutions to the problems (doing the good).

Conclusions

The results of the study show that the product that has been developed is feasible for implementation and the feasibility evidence is as follows: the mean score of syllabus feasibility is 44.50, of lesson plan feasibility is 74.00, of teaching book is 56.50, of student's worksheet is 33.50, and of assessment instrument is 21.00; all of the mean scores belong to the "Very Good" category. Then, the product that has been developed is also effective in developing the students' critical thinking skills with sig. value 0.000 for the differential test between the control group and the experimental group. Last but not the least, the product that has been developed is effective in improving the students' environment-caring characters with sig. value 0.000 for the differential test between the control group and the experimental group.

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