The Effect of Picture Storybook Based on Scientific Approach through Inquiry Method toward Student’s Inference Skill

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ABSTRACT

Many recent studies have reported that picture storybook plays a very important to make a meaningful learning. However, there is lack of the picture storybook that supports the learning process using a scientific approach. Thus, the student's scientific process skill will not develop optimally if the presentation of the material is less interesting and the students are not directly involved in the learning process. This study aimed to examine the difference of students’ inference skill after they were taught using picture storybook based on scientific approach through inquiry method and using textbook of curriculum 2013. The used research design was quasi-experiment with the model of pre-test and post-test control group design. The population of research used in this research was grade 5 students of the elementary school in Bantul, Yogyakarta. The sample of research consisted of 47 students, 23 students as experiment class using picture storybook based on scientific approach through inquiry method, whereas 24 students as control class using textbook of curriculum 2013. The result of research showed that there was a significant difference in learning student’s inference skill using picture storybook based on scientific approach through inquiry method and using textbook of curriculum 2013. It could be seen from the significance value (Sig.) lower than the significance level (α), (0,01 < 0,05). The implication of this research is the learning design will be more creative, innovative, and comprehensive.

Keywords: inference skill; inquiry method; picture storybook; scientific approach.

INTRODUCTION

The process of teaching science in elementary schools emphasizes the provision of direct learning experiences through the use and development of process skills and scientific attitudes (Subali & Mariyam, 2013). Students are expected to have the process skills to investigate the natural surroundings, solve problems, and make decisions by applying scientific process skills. So that student thinking ability can be developed. Therefore, one of the most important things in the success of science learning is the realization of student literacy skills. One of the keys to
realize student literacy skills is improving student inference skills. Meanwhile, inference skills can be used in the science subject (Froschauer, 2013: 27).

The inference skill is essential for students because it includes one of the higher-order thinking skills (HOTS) that must be developed (Kopitski, 2007). Moreover, the inference skill is a powerful way of thinking and an important 21st-century skill for all students to use and develop across the curriculum (Bintz, Moran, Brendt, Ritz, Skilton & Bircher, 2012: 16-24). The inference skill is a popular but nebulous term because it has been defined in many ways. Among others, it has been defined as making predictions, drawing conclusions, using context clues, activating background knowledge, filling gaps, creating interpretations, visualizing meaning, and dealing with ambiguity. These definitions share two important understandings about inference which are “the heart of meaning construction for learners of all ages” (Anderson & Pearson, 1984: 107) and “involving the ability to read between the lines” (Harvey & Goudvis, 2007).

Several studies indicated that inference skills can be improved through organizing learning steps (Rosnawati, 2012), repetition of the material core into the subject, giving questions relevant to the material, making the mapping or the subject matter map (Purnama, 2016) and use of innovative learning methods (Purwaningsih, 2014; Putri, 2016; Utami, Fatmaryanti & Sriyono, 2017). Thus, the student inference skills will not develop optimally if the presentation of the material is less interesting and the students are not directly involved in the learning process (Froschauer, 2013: 27).

In Indonesia, the change of the 2013 Curriculum is one of the constructive efforts to improve the quality of education and teaching. The 2013 Curriculum primarily changes the learning process which is implemented through the application of integrative and scientific thematic approach. The scientific approach to learning adopts the steps of science in building scientific knowledge. Meanwhile, integrative thematic learning is a learning approach that integrates the various competencies from various subjects into lesson themes (Kemendikbud, 2013).

In relation to the implementation of the 2013 Curriculum, teachers are among the stakeholders who are the determinants of the success of every educational effort (Arini, Syahrudin & Sudatha, 2013). Teachers should be sensitive to changes that occur especially in education and teaching. In addition, Anam (2016: 11) argued that one of the keys to the success of the learning process is to position students as an important part of the learning process and invite them to be actively involved in every learning process. Since, the actual learning process has not been optimized that prioritizes student activity, it affects the low learning outcomes of the science subject. In general, low student learning outcomes in the science subject is also reported in many previous studies (Arini, Syahrudin & Sudatha, 2013; Subarjo, Sudhita & Suarjana, 2014; Neka, Marhaeni & Suastra, 2015; Winantara & Jayanta, 2017).

Problems of low student learning outcomes encourage researchers to investigate further into the ongoing learning process. After further investigation, it is found that there are materials that are not in accordance with the concept and there are some errors in the textbook of curriculum 2013. Therefore, it must be addressed by the correction of concepts in order to avoid misconceptions in students. In addition, the distribution of textbooks of curriculum 2013 is often late. As a result, the learning process becomes impeded and the students must be willing to answer the problems in other paper (Krissandi & Rusmawan, 2015).

Another weakness is the time management in the textbook of curriculum 2013 is not balanced (the material does not match the time allocation) (Putri, Jalm & Marpaung, 2015). The teacher's lack of understanding of the 2013 curriculum also becomes one of the weaknesses (Zulkarnain, Setyowati & Mahanal, 2014). Teachers are not involved in the curriculum
development process. So, teachers are unfamiliar and confused. In practice, some teachers have difficulty in coordinating several lessons on one theme, and teachers find it difficult to understand the learning model offered in the Curriculum 2013. Whereas, textbooks have an important role in the learning process.

Presentation of quality textbooks will greatly assist students in acquiring knowledge and understanding the material (Prihatina, 2016). The field observation results show that the learning resources used in most primary schools are limited to 2013 Curriculum textbooks. In addition, teachers also complained about incomplete 2013 Curriculum textbook materials and very limited book illustrations. Thus, the students are less interested in reading them. The limited illustration impeded the student imagination to understand the taught concepts.

Whereas, according to the level of cognitive development, elementary students are in the concrete operational stage (Baharuddin & Wahyuni, 2015: 174). This means elementary students are in enormous need of books that feature many pictures.

Empirically, students tend to like picture books that are colorful and contain realistic images or cartoon (Kustiawan, 2016: 32). Through picture storybook based on scientific approach, students are helped to remember the term and understand the meaning in the book by looking at the picture. Moreover, characteristics of scientific approach according to Daryanto (2014: 53) and Hosnan (2014: 36) include: (1) student-centered; (2) involve the skills of the process of science in constructing concepts, laws or principles; (3) involves potential cognitive processes in stimulating the development of the intellect, especially the students' high-order thinking; and (4) can develop student character. This means that learning that applies a scientific approach will encourage students to become active learners, opens opportunities for students to find sources of learning from the environment. Students are accustomed to learn not only by listening, but by using all five senses, and learning is not only seen from the learning but also from activity in the learning process.

The limited textbooks that support the scientific-based learning process and the lack of teacher innovation in designing the learning process have a negative impact on passive students which leads to the low science literacy skills. Empirically, the low science learning outcomes are proven by studies in several years (Arini, Syahrudin & Sudatha, 2013; Subarjo, Sudhita & Suarjana, 2014; Neka, Marhaeni & Suastra, 2015; prasetyo & Prasojo, 2016; Winantara & Jayanta, 2017). Therefore, it needs a supplement book as teaching materials and the application of teaching methods that support the learning process to be more interesting, which is expected to improve students’ inference skills. The study aimed to test the effectiveness of a supplement book which was a picture storybook based on a scientific approach with inquiry method. The application of the storybook was expected to improve the students’ inference skills.

**METHOD**

**a) Procedure**

This study used quasi-experimental methods with a non-equivalent quantitative design of pre-post control group design. The research conducted of two classes, one class as the control class and the other as the experimental class which were selected randomly. The students in both experimental and control classes were given pretest and posttest before and after treatment. At the beginning of the lesson, a set of pre-tests were given to the control and experimental class. The experimental class was taught using picture storybook based on scientific approach.
through inquiry method, whereas the control group was taught using Curriculum 2013 textbooks. The design of this research can be seen in below (Table 1):

Table 1. Design of quasi-experimental research

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test</th>
<th>Treatment</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>O₁</td>
<td>X</td>
<td>O₂</td>
</tr>
<tr>
<td>Control</td>
<td>O₃</td>
<td>-</td>
<td>O₄</td>
</tr>
</tbody>
</table>


The learning of using picture storybook based on scientific approach through inquiry method has several stages in its application. The stages in the inquiry method consist of Engage, Explore, Explain, Elaborate and Evaluate or known as 5E model (Moore, 2015). The summary of implementation picture storybook based on scientific approach through inquiry method is illustrated in Table 2.

Table 2. Stages of 5E learning model

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activity in learning</th>
<th>Implementation in picture storybook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engage</td>
<td>Students find and identify problems</td>
<td>Read the story and discover the problems of the character encounters through the conversation in the story and the invitation to find out through the activity of “Ayo Amati (Let’s Observe)!”</td>
</tr>
<tr>
<td>Explore</td>
<td>Students are directly involved into phenomena and learning resources</td>
<td>The invitation of a character to find answers based on the information presented by the figure through the activity of “Tahukah Kalian (do you Know)?” and “Ayo Cari Tahu (Let’s Find Out)!”</td>
</tr>
<tr>
<td>Explain</td>
<td>Students analyze their exploration results by placing the abstract experience into a</td>
<td>The invitation to cultivate understanding becomes a form that can be communicated through questions about the conceptual understanding through activity of “Aku Tahu (I Know)!?” and “Ayo Lakukan (Let’s Do It)!”</td>
</tr>
<tr>
<td>Elaborate</td>
<td>Students present the findings or what they understand</td>
<td>A call to express what is understood through activities of “Ayo Simpulkan (Let’s Conclude)!”</td>
</tr>
<tr>
<td>Evaluate</td>
<td>The teacher evaluates and determines whether the student has reached an understanding</td>
<td>Presentation of concept comprehension evaluation through activity of “Latihan (Practice)”</td>
</tr>
<tr>
<td></td>
<td>of concepts and knowledge</td>
<td></td>
</tr>
</tbody>
</table>
b) Participants
A total of 47 students were involved in this study with 23 students in the experimental group and 24 students in control group. The demographics of the research sample presents in Table 3.

Table 3. The demographics of the research samples and treatments

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Number of Students (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>taught using picture storybook</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>based on scientific approach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>through inquiry method</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>taught using Curriculum 2013</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>textbooks</td>
<td></td>
</tr>
</tbody>
</table>

c) Data Collection
The technique of collecting data used in this study is testing techniques. The instrument used in data collection is in the form of test description which amounted to 15 questions to measure the student’s inference skills. Each question has a range of 0-3. If the students answered correctly and complete, then got score of 3. If the students answered correctly but not complete, then got score of 2. If the student answered wrong, then got score of 1. If the student did not answer at all, then got a score of 0. The value of student inference skills is obtained through percentage of the score obtained by students in answering questions about inference.

d) Data Analysis
The first data analysis performed was descriptive analysis to determine the average value, standard deviation, minimum value, and maximum value. Furthermore, the increase in pretest and posttest results of student’s inference skill was analyzed using a gain score. The data analysis technique in this study was ANOVA technique at significance level of 0.05. However, before ANOVA test, the prerequisite test is performed in the form of normality test and homogeneity test. The normality test is used to find out whether the data come from the normally distributed population or not and the homogeneity test is used to determine whether the population of both groups is homogeneous or not.

RESULT

a) Descriptive Analysis
The results of the pre-test and post-test descriptive analysis are shown in Table 4.

Table 4. The results of descriptive analysis of pretest and posttest on the inference skill

<table>
<thead>
<tr>
<th>Description</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td>The number of the subjects</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Highest score</td>
<td>66.67</td>
<td>100</td>
</tr>
<tr>
<td>Lowest score</td>
<td>26.67</td>
<td>53.33</td>
</tr>
<tr>
<td>Average</td>
<td>48.40</td>
<td>72.40</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.62</td>
<td>2.56</td>
</tr>
</tbody>
</table>
b) Improvement of Inference Skill
Data of inference skill from control and experimental class included pretest and posttest data. The increased inference skill of students was shown in gain value from each group and it can be seen on Figure 1.

![Figure 1. Improvement of the gain value of inference skill](image)

Table 5. The normality test results

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>The Pretest Data of Inference Skill</th>
<th>Sig.</th>
<th>Result</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment Group</td>
<td></td>
<td>0.289</td>
<td>H₀ is accepted</td>
<td>Normal</td>
</tr>
<tr>
<td>Control Group</td>
<td></td>
<td>0.625</td>
<td>H₀ is accepted</td>
<td>Normal</td>
</tr>
</tbody>
</table>

The homogeneity test was performed using Levene’s test in SPSS 21. The homogeneity test was performed using Levene’s test in SPSS 21. The results show that the data were homogeneous as H₀ is accepted with > α at a 0.05 significance level. The homogeneity test results are presented in Table 6.

Table 6. The homogeneity test results

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>The Pretest Data of Inference Skill</th>
<th>Sig.</th>
<th>Result</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inference Skill</td>
<td></td>
<td>0.348</td>
<td>H₀ is accepted</td>
<td>Homogen</td>
</tr>
</tbody>
</table>

d) Influence of Picture Storybook based on Scientific Approach through Inquiry Method to Inference Skill
As the homogeneity test showed that the data were homogeneous, an ANOVA test then could be performed. The results of the ANOVA test on post-test data of inference skills are presented in Table 7.
Table 7. The result of ANOVA Test

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>The Posttest Data of Inference Skill</th>
<th>Sig.</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inference Skill</td>
<td></td>
<td>0.001</td>
<td>H₀ is rejected</td>
</tr>
</tbody>
</table>

DISCUSSION

Based on figure 1, the results display that student’s inference skill in the experiment group was higher than the control group. This increase was due to the direct student interaction with the picture storybook based on a scientific approach with inquiry method which improved the students’ inference skills. Students were motivated to learn since the science learning process was more interactive, and the subject was better understood by the students. It is in line with the opinion of Loh (2016), which stated that the use of picture storybooks creates a relaxed learning environment. Narrative and illustration of picture books reduce cognitive loads. So, the students have a fun of learning process (Hadi, 2013; Kelemen, Emmons, Seston & Ganea, 2014; Loh, 2016). The statement is also supported with Gönen, Durmuşoğlu & Severcan (2009) and Handayani (2010) who explained that picture storybooks enrich a concept and provide students with information.

As present in table 7, it can be concluded that the data for pre-test and post-test between the experiment group and control group also statistically significant difference in inference skill. Thus, a picture storybook based on a scientific approach with inquiry method (which consist of 5E model) affected the inference skill of fifth-grade elementary school students. This is caused by the fact that the student experience is one of the important factors affecting the inference process. This is supported by Kopitski (2007), Froschauer (2013) and Rafferty, Lamar & Griffiths (2012) which stated that the inference process occurs when students combine clues with knowledge that they already have, based on observations of objects or events that have occurred and can also be based on material that students have understood during the learning process. Therefore, the results of this study are highly relevant to the experts’ opinions. Kispal (2008) stated that the key to being able to inquire is to read. The picture storybook based on a scientific approach with inquiry method facilitates students to obtain knowledge through reading activities and provide experience through activities existing in the storybook to make an inference based on existing knowledge and experience.

The use of picture storybook based on a scientific approach with inquiry method provides a meaningful student learning experience. This learning experience equips students with the knowledge, which relates to the observed facts or information to form an inference. The study results support the theory proposed by Martin (2012) and Froschauer (2013). According to them, inference skills can be obtained through a series of mechanisms or procedures used to test knowledge in a systematic way that includes answering questions, solving problems, and making a decision in a predetermined object, or it can be said that inference is one of the best explanations for the question "why does something happen?".

The picture storybook based on a scientific approach with inquiry method (which consist of 5E model) answers the challenge because there is a series of scientific approach process, which includes observing, asking, reasoning, trying, and networking in the storybook. In the presentation of the narrative, there are steps of inquiry methods illustrated in each scene.
CONCLUSION

Based on the results of the research and discussion above, it can be concluded that picture storybooks based on scientific approach through inquiry method influenced the inference skills of fifth graders in elementary school. This effect is indicated by a significance of 0.01 (significance <0.05). It means, by using picture storybooks based on scientific approach through inquiry method become more active in the learning process, so that students' science literacy become more honed and student inference skills can be improved.

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APENDIX

Picture Storybook Based on Scientific Approach through Inquiry Method

1. Cover and introduction of characters

2. Story
3. Steps of Inquiry Method in The Book

For example, in a solar panel, the process starts with the identification of the problem. The next step is to define the scope and develop the research questions. This is followed by the formulation of the hypothesis, which is then tested through experiments. The results are analyzed, and conclusions are drawn based on the data collected. The final step is to communicate the findings, either through a report or a presentation.