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The Effectiveness of 5E Inquiry-Learning Model by Using Interactive Notebook on the Subject of Cell

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Info articles	Abstract

The purpose of this study was to discover and describe the effectiveness of 5E inquiry learning model by using the interactive notebook on the subject of the cell. It was a quantitative quasi-experimental research with nonequivalent control group design. The population of this study was the whole eleventh-grade science students of SMA Negeri 1 Magelang. The researchers used simple random sampling which took the students from Class Science 1 of eleventh grade as the experimental class and Class Science 3 of eleventh grade as the control class. In collecting the data, the researchers used the result of pre-test, post-test and the grades of students from experimental class (using an interactive notebook) then the assessment of control class students' laboratory work report performance. Normality test, homogeneity test, average difference test, the improvement of learning skill measurement, and classical completeness measurement were used for data analysis. The result showed that 5E Inquiry-Learning Model by Using Interactive Notebook on the Subject 'Cell' was effective. It was proved by the average of both of classes (experimental class and control class) was significantly different (t_{count} (7.36) > t_{table} (2.00)). The difference was supported by the fact that the improvement of the learning skill of experimental class students was better the control class students. For the experimental class, the improvement of student learning skill was categorized as medium (index gained 0.61) while control class' was low (index gained 0.29). In addition, the experimental class had reached the classical completeness rate (the percentage was 87.89%) while the control class had not reached it yet (around 27.27%).

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INTRODUCTION

SMA Negeri 1 Magelang, understandability rate about the subject of the cell on National Final Examination had been declined. Understandability rate in 2016 decrease by 0.36%, whereas in 2017 the decrease is much higher at 11.28%. The understandability rate on National Final Examination was affected by some factors. They are student's participation and the applied learning method (Yanuari, 2012). The systematical effort to fix this problem was needed. Improving the student self-confidence to actively participate in the learning process and changing the previous learning method could be the solution. The possible effort to make it happened was by implying 5E inquiry learning model with an interactive notebook.

Inquiry learning gave the chance to the student to actively participate in the learning process by investigating. A student who actively participates in the class achieves the great performance in learning (Ramlah, *et al*, 2014). Inquiry learning is able to increase the students' concept (Yager & Akcay, 2016). The concept mastery is vital to face the test or answer the question about the subject. If the concept of mastery is improved, it will give the same effect to the student's understanding about the subject on the national final examination. There is various kind of inquiry model. One of them is 5E which are engagement, exploration, explanation, elaboration, and evaluation (Bybee, *et al,* 2006). This model is expected to improve student's performance and defend the knowledge of student permanently (Tuna & Kacar, 2013).

The permanence of students' knowledge could be achieved by rehearsal activity. Rehearsal activity could improve a student's memorization (Wahidah, *et al,* 2011). Repetition could be implied by using an interactive notebook. Generally, it was the notebook owned by a student that divided into two part. One part was for writing the information came from the teacher's explanation, book, video, laboratory work etc. While another part was for writing what the student understood about the information. It contained concept map, table etc. The interactive notebook could develop the student's communication skill, cognitive organization skill and responsibility of their own mastery. Besides that, the interactive notebook was developed to involve the student in collaborative research and as the way to study some various contents of science (Marcarelli, 2010: xii).

RESEARCH METHOD

It was a quantitative Quasi-Experimental research with nonequivalent control group design. The population of this study was the whole eleventh-grade science students of SMA Negeri 1 Magelang. The researchers used simple random sampling which took the students from eleventh-grade science 1 as the experimental class and students of eleventh-grade science students 3 as the control class. In collecting the data, the researchers used the result of pre-test, post-test and the grades of students from experimental class (using an interactive notebook) then the assessment of control class students' laboratory work report performance. Normality test, homogeneity test, average difference, the improvement of learning skill measurement, and classical completeness measurement were used for data analysis.

RESULTS AND DISCUSSION

The table below showed the students' performance on the pre-test, post-test, grades of interactive notebook and laboratory work report. The students' performance came from experimental class were recapitulated on table 1 whereas the control class' showed on table 2.

Table 1 Learning outcomes of students from experimental class

Description	Pre-test Score	Post-test Score	Interactive Notebook Score
Average	49.33	80.97	82.27
Highest score	64	92	88
Lowest score	28	68	77

Table 2 Learning outcomes of students from the control class

Description	Pre-test Score	Post-test Score	Laboratory Work Report Score
Average	47.15	47.15	83.67
Highest score	64	64	89
Lowest score	28	28	80

The post-test scores were examined for their normality and homogeneity. The normality test was conducted by chi-square test while the homogeneity test was done by the *Levene* test. Chi-square formula was implied by Microsoft Excel 2010. From this measurement, the researchers found X^2_{count} (6.68) $\leq X^2_{table}$ (12.59) meant the data was normally distributed. Levene test was helped by using SPPS 22 which resulted in the significant value around 0.067. It meant that the sample had homogenous variance. The result of the homogeneity of post-test scores from both party (experimental and control class) was described on table 3.

Table 3 The Result of the Levene Test

Test of Homogeneity of Variances

The post-test score

Levene Statistic	df1	df2	Sig.
3.462	1	64	0.067

After finding the fact that the data were normal and homogeneous, the researchers conducted the hypothesis test contained by the average difference test, the improvement of learning skill measurement, and classical completeness measurement. The 5E inquiry learning model with the interactive notebook might be effective if there was the difference between the scoring average of experimental class and control class then the learning outcome of students from the experimental class was better than the students' from the control group. In addition, the experimental class had reached the classical completeness.

Derived from the average difference calculation, the researchers found that there was a significant diversification between experimental class and control class (t_{count} (7.36) $> t_{table}$ (2.00)). The result of Test-T was supported with the measurement of enrichment of score rate (the N-gain Test) and classical completeness measurement (proportion test π: one sided test). The N-gain test showed that the improvement of learning outcome of students from ethe xperimental class was categorized as medium (Index gain 0.61) and control class was low (Index gain 0.29). The proportion test was conducted on each party. From the discovery, the experimental class had reach the classical completeness with ta otal number of students who reached or passed the Minimum Mastery Criteria (KKM) was 29 (the percentage of mastery was 87.88%), while only 9 students of control class did (27.27%).

The difference happened because the experimental class used 5E inquiry learning model with an interactive notebook, while the control class used laboratory work and teacher's explanation that had been done for 5 years. 5E inquiry learning model with the interactive book made the change for students to directly participating in the learning process, investigating and understanding the subject deeper independently through their own interactive notebook.

Inquiry learning implied to the experimental class gave the chance to students in order to make them actively participated in the instructional process. A student who actively participates in the

class achieves the great performance in learning (Ramlah, *et al*, 2014). Inquiry learning led the student to be more understood about the subject which had been taught so it could improve the quality of student's learning mastery (Yager & Akcay, 2016). Inquiry learning is fun and relevant with science (Suduc, *et al*, 2014) was helped with 5E teaching model. Five step of learning in 5E teaching model helped students in understanding the material (Akar, 2005) and minimized the tendency of misconception (Taufiq, 2012). In conclusion, 5E teaching model could improve the rate of the student's outcome (Soeprodjo, *et al*, 2008).

The collaboration between inquiry learning and 5E teaching model was supported by the new teaching and learning methodology like an interactive notebook. It was not a usual notebook but expressed whole minding process and student's learning activity. It obligated the student to rewrite the things that they remembered on the output page. They wrote the material in the form of graph, table, resume or any form that they wanted. The activity could upgrade student's understanding of the concept of science (Lieberg, 2013). Besides that, interactive book activity was a rehearsal activity which could improve memorization skill of students (Wahidah, *et al*, 2011).

CONCLUSION

Based on the result of this study, the researchers pointed out the conclusion that 5E inquiry learning model with the interactive book was effective to be implied in teaching the subject of the cell. It was proved by the significant average difference between two class (experimental and control) and supported by the improvement of learning the outcome of students from an experimental class which was better than the control one. In addition, the experimental class had reached the classical completeness.

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