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The Effect of LC 5E Learning Model Combined with Make a Match on the Cognitive Learning Outcomes of High School Students on Acid Base Materials

Hafiz Radyastuti, Endang Budiasih*, Dedek Sukarianingsih
Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang, Indonesia

Abstract – Materi kimia menuntut siswa untuk banyak menghafal dan memahami konsep-konsep yang ada. Salah satu upaya untuk mengatasi kesulitan siswa dalam mempelajari materi asam basa adalah merubah proses pembelajaran satu arah menjadi dua arah yang berfokus kepada siswa (student centered) dengan mengacu pada pendekatan kontruktivistik. Model pembelajaran yang bersifat student centered serta mengacu pada pendekatan konstruktivistik adalah LC-5E dan model pembelajaran kooperatif Make a Match. Penelitian ini dilaksanakan dengan tujuan: (1) mendeskripsikan keterlaksanaan model pembelajaran LC 5E-Make a Match, (2) mengetahui perbedaan hasil belajar kognitif siswa yang dibelajarkan dengan LC 5E-Make a Match dan siswa yang dibelajarkan dengan LC 5E pada materi asam basa. Rancangan yang digunakan dalam penelitian ini adalah rancangan eksperimen semu (quasy experimental design). Penelitian ini dilakukan pada dua kelas dengan diberikan materi yang sama akan tetapi model pembelajaran berbeda. Hasil penelitian menunjukkan bahwa, rata-rata hasil belajar siswa yang dibelajarkan dengan model pembelajaran LC 5E-Make a Match (=84,06) lebih tinggi daripada siswa yang dibelajarkan dengan model pembelajaran LC 5E saja (=79,89).

Kata kunci: *hasil belajar, LC 5E-Make a Match, Asam-Basa*

Abstract – Chemistry materials required that students must memorize and understand all of the concepts. Acid base is one of chemistry materials which is considered difficult. One solution to overcome the difficulty in learning acid base materials is change the learning method from one way to two ways that more focus on student (student centered) with reference to the constructivist approach LC 5E and cooperative learning Make a Match. Therefore, this research was conducted with the aim to: (1) describe the feasibility of students who learned acid-base materials use the LC 5E-Make a Match learning model,(2)determine differences in students cognitive learning outcomes that learned using the LC 5E-Make a Match learning model and that learned to use the LC 5E learning model in acid-base materials. This research used a quasi-experimental design with design models of two groups. The two classes were given same acid-base materials with different learning model. The average of student cognitive learning outcomes that learned using the LC 5E-Make a Match learning model (=84,06) was higher than students that using the LC 5E (79,89).

Keywords: learning outcomes, LC 5E-Make a Match, acid-base

INTRODUCTION

Burns' research, as cited in Damanhuri (2016:9) confirmed that acid base materials are challenging to learn. The study is comparable with the results of an interview with one of the chemistry teachers in high school, contending that the percentage of students completing the

*Corresponding author: Jurusan Kimia, Universitas Negeri Malang, Malang 65145, Indonesia.

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acid-base material was 40%. Anchored by the small percentage of student completeness, it is necessary to innovate and improve students' understanding and level of completeness on acid-base material. Acid-base matter is material that is abstract in nature, so it can only be imagined and symbolized. As an example of an acid-base according to Arrhenius, an acid is defined as a substance which when dissolved in water will produce a hydrogen ion which is symbolized as H+. In contrast, a base is defined as a substance which when dissolved in water will produce a hydroxide ion symbolized as OH-. The definition of acid and base according to Arrhenius cannot be seen clearly, so students are encouraged to imagine the reaction of these substances in water and how H + or OH- ions are produced.

The LC 5E learning model should be put forward since this learning model is in accordance with Piaget's constructivism-based learning theory (Fajaroh & Dasna, 2007). The LC 5E learning model can improve student learning outcomes and increase students' curiosity about chemistry, so they become more active, full of curiosity, and enthusiasm in receiving material (Jack, 2017). Learning with the LC 5E model requires group activities, but these activities do not have a certain pattern so that to obtain optimal learning outcomes, it is necessary to carry out an innovation. An innovation that has been made by several researchers is combining LC 5E with cooperative learning models. One type of cooperative learning model is Make a Match. Make a Match is a learning model that gives students the opportunity to work together between friends in a fun atmosphere (Anita, 2008).

In acid base learning carried out using traditional lecture methods, teachers commonly start the learning by using existing facilities such as an LCD to display power points and several demonstration videos about acid base, but the learning process is much done one-way (teacher-centered) since teachers are positioned as the only source of knowledge (Nana, 2014). Teachers also teach the material directly and take full control of the learning process. Although this traditional teaching method leads to a shorter learning period, but students become less active and passive listeners. The inactivity of students leads their knowledge to be meaningless and their level of understanding is low. As a consequence, it impacts on student low learning outcomes.

The characteristics of the revised 2013 curriculum require students to be more active in the learning process. Therefore, it is necessary to improve the learning process that focuses on students (student-centered) and refers to a constructivist approach. Learning based on a constructivist approach emphasizes the understanding of students actively, creatively, and productively through a meaningful learning process. Central to this issue, the present study was conducted to (1) explore the feasibility of the LC 5E-Make a Match learning model and (2) examine the differences in cognitive learning outcomes of students who were taught with LC 5E-Make a Match and students who were taught with LC 5E on acid-base material.

METHOD

The design used in this study was a quasi-experimental design. This study involved two classes as the research sample. One class is used as the experimental class (XI MIPA 3) and one class is used as the control class (XI MIPA 4). The experimental class was given treatment in the form of the LC 5E-Make a Match learning model and the control class was given treatment in the form of the LC 5E learning model only. Both classes were given the same material, namely acid base material with different learning models. The instruments used in this study include the syllabus, lesson plans, UKBM, and Pair Cards, tests, and observation sheets for the implementation of the learning process. The data obtained in the form of an assessment of the implementation of the learning process and learning outcomes from the test. Data analysis was performed using t-test at significance $\alpha = 0.05$ with the help of SPSS 16.0 for windows.

RESULTS AND DISCUSSION

A. Learning Implementation

This study observed the implementation of the learning process enacted by students who were taught the LC 5E-Make a Match learning model in accordance with the research objectives. The implementation of the learning process in the control class was not observed because there was no change in the stages in the LC 5E learning model, so it is assumed that the learning process in the control class has been carried out in accordance with the 5 stages in LC 5E. The data on the average results of the implementation of the learning process for each meeting for students who are taught with the 5E Learning Cycle learning model combined with Make a Match can be seen in Table 1.

Table 1. Data on the Average Results of the Learning Process Implementation in Each Meeting for Students Taught with the 5E Learning Cycle Model Combined with Make a Match

Lesson Plan	Implementation Percentage (%)
Meeting 1	96.00
Meeting 2	97.91
Meeting 3	91.67
Meeting 4	95.83
Meeting 5	97.91
Average	**95.86**

B. Cognitive Learning Outcomes

Student cognitive learning outcomes were obtained from the test after all material was presented. The acid-base material test questions consisted of twenty-five multiple choice questions with five alternative answer choices, namely, A, B, C, D, and E. Description of the cognitive learning outcomes of the experimental class students (LC 5E - Make a Match) and the control class (Learning Cycle 5E) can be seen in Table 2.

Table 2. Description of Student Learning Outcomes for Experiment Class (LC 5E - Make a Match) and Control Class (Learning Cycle 5E)

Class	Number of Students	Lowest Score	Highest Score	Average	Standard Deviation
LC 5E – Make a Match	36	70	96	84.06	5.59
LC 5E	36	68	92	79.89	5.43

The frequency distribution of the cognitive learning outcomes of the experimental class students (LC 5E - Make a Match) and the control class (Learning Cycle 5E) can be seen in Table 3.The graph of the frequency distribution of the cognitive learning outcomes of the experimental class students (Learning Cycle 5E - Make a Match) and the control class (Learning Cycle 5E) can be seen in Figure 1.

Table 3. Frequency Distribution of Cognitive Learning Outcomes of Students in Experiment Class (LC 5E - Make a Match) and Control Class (Learning Cycle 5E)

Score Range	Number of Students	
	Class ***LC 5E – Make a Match***	Class ***LC 5E***
61.00 – 70.00	1	3
71.00 – 80.00	11	20
81.00 – 90.00	22	12
91.00 – 100.00	3	1

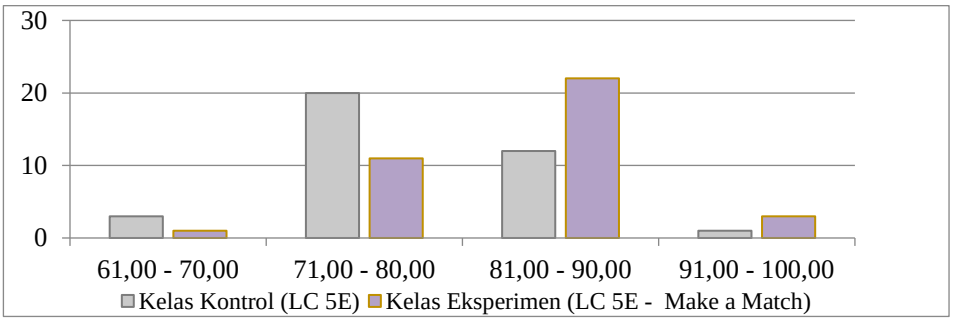

Figure 1. Graph of Frequency Distribution Value of Students' Cognitive Learning Outcomes in Experiment Class (LC 5E - Make a Match) and Control Class (Learning Cycle 5E)

Hypothesis testing was carried out after obtaining data on student cognitive learning outcomes that are normally distributed and have the same data variant (homogeneous). This test used the independent sample t test with the help of the SPSS 16.0 for windows program. The results of the hypothesis test on the cognitive learning outcomes of students in the experimental class (LC 5E - Make a Match) and the control class (Learning Cycle 5E) can be seen in Table 4.

Table 4. Hypothesis Test Results Cognitive Learning Outcomes of Experimental Class Students (LC 5E - Make a Match) and Control Class (Learning Cycle 5E)

Class	Average Score	Significant Value	Conclusion
LC 5E – Make a Match	84.06	0.002	H_0 rejected
LC 5E	79.89		

DISCUSSION

A. Learning Implementation

The learning process for students who are taught with the LC 5E-Make a Match learning model requires good time management so that there is no slackness from the time planned in the Learning Implementation Plan (RPP). The percentage of the implementation of the learning process from the five meetings has generally increased, due to improvements from the previous meeting. Non-implementation at each meeting does not interfere with the planned learning process. The average percentage of the implementation of the learning process in students who are taught with the 5E Learning Cycle learning model combined with Make a Match is classified as very well. The implementation of the learning process plays an important role in student learning outcomes. A well-executed learning process shows that learning activities have been carried out in accordance with the planned stages. Each stage in the learning model used will have an influence on student learning outcomes, for example in the elaboration stage - make a match card game. At this stage, students are given a new problem in the form of a card with questions related to the acid-base material and students will try to find their partner. At this stage students learn in a fun atmosphere because there is a card game. The learning stages in a pleasant atmosphere will make it easier for students to understand the material being studied so that student learning outcomes will be better.

B. Cognitive Learning Outcomes

The cognitive learning outcomes of students who are taught with the 5E Learning Cycle learning model combined with *Make a Match* (= 84.06) are higher than students who are taught with the 5E Learning Cycle (= 79.89). Previous research by Megaleti (2017) showed that in the redox reaction material the average value of learning outcomes in classes taught with the TSTS cooperative learning model combined with *Make a Match* (= 80.4) is higher than students who are taught using cooperative type TSTS only (= 74.9). This study provides a real picture that the *Make a Match* learning model combined with other learning models can improve student cognitive learning outcomes because of the element of learning in a fun atmosphere.

Learning in a pleasant atmosphere will provide good learning experience for students. According to constructivist learning theory, the emotional level of students in constructing the material being studied will affect students' motivation to learn. Learning in a fun atmosphere makes students feel more comfortable and not easily bored. The existence of a play element makes students able to understand the concept of acid-base material well. Paired card games in the elaboration-make a match and evaluation-make a match phases require students to be actively involved in learning. Students' participation during the learning process will foster students' desire to learn independently without coercion so that students have stronger memory and provide better cognitive learning outcomes.

CONCLUSION AND SUGGESTION

The implementation of the learning process in students who are taught with the LC 5E-Make a Match learning model as a whole goes very well. There are differences in cognitive learning outcomes between students who are taught with the LC 5E-Make a Match learning model and students who are taught with the 5E Learning Cycle learning model. This is indicated by the average value of cognitive learning outcomes in students who are taught with the LC 5E-Make a Match learning model (= 84.06) is higher than students who are taught with the 5E Learning Cycle learning model only (79.89). The card game in the Make a Match learning model should be done more than once in the elaboration and evaluation stages, so that each student gets a card with more variations.

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