

The Effectiveness of Learning Cycle 5E Model toward Students' Science Process Skills in Natural Science Subject

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Abstract:

The Objective to be achieved is to determine the effectiveness of using the Learning Cycle 5E Model in natural science lessons in grade V of MIS Darussalam by looking at the ability of students' science process skills in the learning and the outcomes. This study used the field research method with a one-group pre-test-post-test model. The population of this study was grade V MIS Darussalam with the sample taken from grade V A which amounted to 15 students. The data collection techniques used were tests, observation, documentation, and interviews. After all the data were collected, then the *N-Gain Score* test was conducted to see the level of learning effectiveness. The result obtained in this study showed that the Learning Cycle 5E model was effectively used in science subjects with the ability of students' science process skills reaching 77% in the good category and the student learning outcomes using the Cycle 5E learning model \geq KKM reached 80% percentage and the result of the *N-Gain score* obtained a value of 0.6131 which indicates that the effectiveness level of using Learning Cycle 5E model is in the Moderate category.

Keywords:

Effectiveness, Learning Cycle 5E, Science Process Skill

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Introduction

Education is an effort to humanize humans by bringing out the talents in each person to become an ideal human being in accordance with the ideals and human character based on Pancasila and has cognitive, affective, and psychomotor knowledge. Murti states that education today is called 21st-century education which is required to be able to ensure students have the ability to learn and create new things, the ability to use information medium, technology, and skills to work and survive in everyday life. The skills needed now are called 21st-century skills (Andrian, 2019; 15).

These 21st-century competencies have been incorporated into Indonesian education through the 2013 curriculum. The 2013 curriculum education requires students to have two abilities at once, namely academic skills (hard skills) and experiential skills (soft skills). This curriculum requires students to be active and master all domains of education, namely cognitive (knowledge), affective (attitude), and psychomotor (skills). Education using the 2013 curriculum in terms of the realm of knowledge, requires students to have many skills, including thinking skills which are divided into several parts of thinking skills, namely creative thinking, critical thinking, problem-solving thinking, and making decisions on an issue (Ramdani & Badriah, 2018; 38).

Thinking skills are closely related to science process skills. Students must first have science process skills in themselves to have thinking skills. The higher the science process skills students have, the higher their thinking skills will be (Khotimah et al., 2021; 327). Thinking skills and science processes are aspects that must be empowered through the learning process. Science process skills are considered very important in learning, especially in science learning to integrate students' experiences into learning (Aprilia et al., 2021; 12).

Science is an important learning in education because this learning will be an asset for students to be able to pass future challenges. In elementary schools, science learning prioritizes knowledge that is factual, conceptual, procedural, and metacognition designed through learning that directly provides experience to students through assignments.

Learning science is actually not enough just by listening to the teacher's explanation of the concept and then memorizing the meaningful words contained in it, but through experiences and phenomena that are seen directly through the student's own senses (Hidayati, 2017: 144). A lesson must involve students directly in learning activities so that they are able to arrive at the process aspect. Their involvement in learning activities will make students think about problems that will then be observed or researched by students to answer the problems found. That way students will experience an increase in the ability to find and solve problems (2016; 47).

A teacher can never be a person who always provides facts and theories to students, so it is necessary for them to have skills in themselves to assist in understanding learning. That skill is students' science process skills. The existence of such skills is expected to train students to ask questions and think critically. Students' science process skills can be improved through direct instruction for students to find and solve existing problems so that they have a high understanding of the learning material. In achieving high process skills by students, it is required to use a learning model when implementing learning (Saiful et al., 2021; 72).

The findings of the interviews and observations at MIS Darussalam in Balangan Regency showed that students' ability in science process skills was still considered low, when observed at the time they were asked or instructed to find a problem related to the learning material and find a solution, many of them were still confused and unable to answer it. The lack of student activeness in learning activities will affect students' science process skills.

The teachers of grade V at MIS Darussalam still frequently use conventional learning models, where the teacher plays a more active role in learning. Students are only occasionally requested to be active, such as when being asked to answer the teacher's questions or are invited to ask questions if they find something unclear. The types of learning models used in this school are lectures and assignments. The learning conducted by the teacher discusses more about the concept in general so that when students get questions or problems that are different from the teacher's explanation, they tend to have difficulty

in answering and solving these problems. In addition to this, the observation results also revealed that the science process skills of students at MIS Darussalam School have not been given much attention by the teachers. Teachers are more likely to focus on student learning outcomes without considering how students' skills during learning are conducted.

Due to the above problems, the implementation of learning must involve active students in every learning process. The teacher's task here is to optimize the learning process and improve students' science process skills. The use of a student-centered learning model is a way to make students' science process skills improve. The Learning Cycle 5E model as a learning model is considered capable of providing interesting and meaningful learning for students and being able to activate students in learning activities.

The Learning Cycle 5E model is a procedure in learning where students are allowed to develop their own learning and logical thinking skills. There are 5 stages carried out in the process of using the Learning Cycle 5E model, namely engagement (the stage of growing students' interest in learning), exploration (providing opportunities for students to utilize the surrounding environment for literature activities), explanation (students reveal the knowledge they know during discussion activities with the group), elaboration (inviting students to apply different concepts by solving several questions) and evaluation (giving tests to determine the student's understanding) (Noviantari, 2015; 162).

The Learning Cycle 5E model can provide opportunities for students to explain the knowledge they already have and is associated with the new knowledge they get (Zuraida & Cut Nurul Asma, 2018; 806). The use of this model in science learning can train and develop students' science process skills based on each phase in the model. The phase of the model that is the main key to critical thinking skills lies in the exploration phase, students are asked to observe and record the knowledge gained while observing an event. The exploration phase will develop students' science process skills.

Bybee et al in the research journal the selection of learning models must refer to their effectiveness because if the model to be used is effective, the learning objectives will be easily achieved (Melouka & Hayat, 2022; 192; Rahmawati & Sholeh, 2021; Sholeh dkk., 2021). This is in accordance with Bella Tania and Murni's research findings which explain that the application of the Learning Cycle 5E model can improve students' science process skills (Tania, 2017; 77). It is different from the study that researchers will do because researchers not only pay attention to the improvement of students' science process skills but also observe how students' learning outcomes when using the Learning Cycle 5E model.

Fuji Astuti Aprilia et al. also stated in their research that the Learning Cycle 5E model will affect students' science process skills (Aprilia et al., 2021; 16). Nurlaila also explained in her research that the Learning Cycle 5E model can improve students' science process skills (Nurlaila, 2020; 52). The study conducted by these researchers is different from the previous studies because it not only examines the effect of using the Learning Cycle 5E model but also explores how effective the usage of the Learning Cycle 5E model is on students' science process skills.

From this discussion, researchers are interested in conducting experimental studies entitled *The Effectiveness of the Learning Cycle 5E Model on Students' Science Process Skills in Science Subjects*, with the aim of knowing the effectiveness of the Learning Cycle 5E model on science process skills in natural science subjects.

Research Method

This study is field research using a quantitative approach, which is an approach that is carried out by collecting data containing numbers and then analyzed in order to obtain information. The method used is pre-experiment research using the one-group pre-test post-test model. The population taken in this study was MIS Darussalam fifth-grade students totalling 31 people with the sample taken was class V A which amounted to 15 people. Sampling was done by using a random sampling technique. The research was conducted in the odd semester of the 2022-2023 school year.

The instruments used to obtain data in this study were tests in multiple-choice questions form and observation sheets to see students' science process skills. The data collection techniques used were tests, observations, documentation, and interviews.

Data analysis was conducted to determine the effectiveness of the Learning Cycle 5E model on science process skills in science classes in V grade. The data analyzed in this study are the outcomes of learning data and the ability of students' science process skills. Students learning outcomes are analyzed by examining the students' learning completeness scores, which are \geq KKM determined by the school, which is 70, observing the difference between the scores before and after the learning conducted and looking at the N-Gain Score value. The N-Gain Score test aims to determine the effectiveness of learning after treatment using the Learning Cycle 5E model. This test aims to determine the effectiveness of learning after treatment using the Learning Cycle 5E model.

The criteria for the N-Gain value by Meltzer (Ramdhani et al., 2020; 164) can be seen in the following table:

Table 1. N-Gain Index Criteria

Gain Score	Criteria
$0,70 \leq n \leq 1,00$	High
$0,30 \leq n < 0,70$	Medium
$0,00 \leq n < 0,30$	Low

While the ability of science process skills can be viewed from the calculation of the score obtained from the student's science process skills indicator divided by the maximum score of the science process skills indicator. After getting the results of the percentage calculation of students' science process skills, a decision will then be made using the science process skills category which can be seen in the following table:

Table 2. Student Science Process Skill Category

Percentage	Category
81% - 100 %	Excellent
61% - 80%	Good
41% - 60%	Fair
21% - 40%	Poor
<21%	Very Poor

Results and Discussion

The research conducted shows that the Learning Cycle 5E model is effective to be used for the student's science process skills in natural science lessons on the animals' and humans' respiratory systems at MIS Darussalam. The effectiveness of using this model is measured from student scores and through observations of students' science process skills when the learning takes place. Learning is considered effective if student learning outcomes have reached the KKM \geq 75% of all students in the class who achieve a score of \geq 70 and refer to the effectiveness of the N-Gain value.

From the research that has been carried out, the pre-test and post-test scores of grade V students of MIS Darussalam can be found in the following table:

Table 3. Pre-test – Post-test Score

Score	Pre-test		Post-test		Description
	Frequency	Percentage	Frequency	Percentage	
85-100	0	0%	4	26,67%	Excellent
70-84	0	0%	8	53,33%	Good
55-69	2	13,3%	2	13,33%	Fair
40-54	3	20%	1	6,67%	Poor
0-39	10	66,67%	0	0%	Very poor

Based on Table 3, it is known that the results of the completeness of the pre-test and post-test scores in grade V A are:

Table 4. Students Score Completion Result

KKM	Completion	Pre-test		Post-test	
		Frequency	Percentage	Frequency	Percentage
≥ 70	Completed	0 Student	0%	3 Siswa	20%
< 70	Incomplete	15 Students	100%	12 Siswa	80%

From Table 4, the results show that out of the 15 students in the class, none students on the pre-test scored ≥ KKM, and 15 students scored < KKM. The average pre-test score of students at MIS Darussalam reached the score of 37.333 which qualified as very poor. While the students' scores on the post-test there were 12 students who scored ≥ KKM and 3 other students who scored < KKM. The average student post-test score reached 75.547 and qualified as Good. Trisona Agustina and Febi Sanjaya mentioned in their research that learning will be considered to be effective if student learning outcomes have reached ≥ KKM by 75% (Agustina & Sanjaya, t.t; 2). This is in accordance with the results of research conducted by researchers, namely as many as 80% of students scored ≥75. This indicates that the learning is claimed to be effective.

After obtaining these results, the N-Gain Score test will then be carried out using the SPSS Version 22 Application, and the following results are obtained:

Table 5. N-Gain Score Test Calculation Results

N-Gain Score	Mean	Minimum	Maximum
	0,6131	0,18	0,90

From the table above, the mean value of the N-Gain Score reaches 0.6131, qualifying as the Medium category, with a minimum value of 0.18 and a maximum value of 0.90. This shows that the use of the Learning Cycle 5E model is effective in learning with moderate qualifications.

Choosing the right learning model will affect student learning outcomes. Learning outcomes are defined as the effects of using learning models in the learning process (Suhartono & Indramawan, 2021; 125). If the learning outcomes achieved by students increase, then it can be ascertained that the chosen learning model is appropriate to be applied to learning.

The Learning Cycle 5E model is considered as a learning model that is capable to develop students' performance to constantly improve their own knowledge in learning, the teacher merely serves as a facilitator and not as information (Sapartini, 2017; 129). Through this learning model, students will be asked to play a more active role in the learning process that uses several stages. The stages in the Learning Cycle 5E model are able to foster students' science process skills. This is in line with research conducted by Fuji Astuti Aprilia, et al that the Learning Cycle 5E model is considered to have an effect on students' science process skills because it is able to encourage students to be active through interrelated stages so that they can apply their basic science process skills (Aprilia et al., 2021; 15).

The results of research conducted by Aini et al. stated that the application of the Learning Cycle 5E model in learning yielded student science process skills higher than only using conventional learning models because it was able to attract students to be more enthusiastic in learning (Aini et al., 2019; 39). Rahmawati et al. also mentioned in the results of their research that the Learning Cycle 5E model is effective in developing students' attitudes, thinking, and processing skills, generating enthusiasm for learning, motivating students to be active, and developing their experiences. Direct student involvement in every lesson will have an impact on their metacognition (Rahmawati et al., 2018; 288).

Based on the research conducted, it was found that students' science process skills were seen from the observation result obtained by the researcher directly by filling out the science process skills

observation sheet. The science process skills measured here are the basic skills of students consisting of observation, classification, communication, prediction, and drawing conclusions. The results of the students' science process skills in grade V MIS Darussalam can be viewed in the following table:

Table 6. Results of Students' Science Process Skills

No	Indicator	Meeting			Percentage
		1	2	3	
1	Observation	46	43	48	76,11%
2	Classification	46	44	48	72,78%
		43	39	42	
3	Communication	50	41	46	76,11%
		52	43	42	
4	Prediction	60	49	41	83,33%
5	Conclution	50	46	48	80%
Activity Percentage		83%	73%	75%	77%

From Table 6, it is known that students' science process skills in natural science lessons on animal and human respiratory systems show a percentage of 77% which qualified as Good category, with the percentage of KPS in the first meeting of 83%, the second meeting of 73%, and in the third meeting worth 75%. The percentage of indicators of each student's science process skills is in the 76.11% observation aspect, 72.78% classification aspect, 76.11% communication aspect, 83.33% prediction aspect, and 80% conclusion drawing aspect. While the percentage of students' overall science process skills is 77%, which qualified as Good category. This is because the Learning Cycle 5E model requires students to be more active in the learning process so that students are able to understand the science process and be able to apply it themselves. This is in accordance with the research of Fuji Astuti Aprilia (Aprilia et al., 2021; 15) which states that the Learning Cycle 5E model can improve the ability of science process skills so that it gets a very good average percentage value.

Science process skills will affect students' cognitive characteristics. The factors in question are clear perception, good memory, well-preparedness, and good intelligence. These factors will allow students to be more prepared when faced with questions. That's why student learning outcomes increase and are good. Rahayu said that science process skills can improve student learning outcomes. Involving students in the learning process will prevent students from passively receiving knowledge, instead, they will try to discover new concepts through the concepts they observe (Rahayu et al., 2011; 108).

The Learning Cycle 5E model is one of the models that involve students actively in the learning process. Active student involvement in the learning process will make students' science process skills improve. When students' science process skills are good, the learning outcomes obtained by students will also increase and reach the predetermined KKM. If the students' science process skills are high, the learning outcomes they get will be high. And vice versa if the students' science process skills are low then the learning outcomes that students get will be low too (Sari et al., 2017; 264). In this study, student learning outcomes have increased after receiving the treatment. The increase obtained was 38.214.

Conclusion

So, it can be concluded that the Learning Cycle 5E model in natural science lesson material on the respiratory system of animals and humans in Grade V MIS Darussalam is effectively used. It is known from the result that the Learning Cycle 5E model is effective to be used on students' science process skills. The usage of Learning Cycle 5E model in natural science lessons is effectively used on students' science process skills. This can be measured from the percentage of student learning outcomes that have reached the criteria for effectiveness, namely $\geq 75\%$ as much as 80%, and the N-gain score obtained a value of 0.6131. The ability of students' science process skills in this study reached 77% which qualified as good category.

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