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The Effect of 7E Learning Cycle Assisted by Monopoly Physics Games toward Students' Learning Activities and Learning Outcomes in Kinetic Theory of Gases

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Abstract: The Effect of 7E Learning Cycle Assisted by Monopoly Physics Games toward Students' Learning Activities and Learning Outcomes in Kinetic Theory of Gases. **Objective**: the current study aimed to understand the effect of the Learning Cycle 7E assisted by monopoly physics games toward learning activities and learning outcomes of high school students in kinetics theory of gases. **Methods:** Using quasi-experimental research with a quantitative approach and posttest-only control group design. The population is class XI IPA SMA Muhammadiyah 3 Jember and the sample is class XI IPA 1 (control) using the discussion and question and answer method then XI IPA 3 (experiment) using the 7E Learning Cycle model assisted by a monopoly physics game. **Finding:** The results of the activity t-test and student learning outcomes at SMA Muhammadiyah 3 Genteng obtained sig. (2-tailed) smaller than 0.05. **Conclusion:** The Learning Cycle 7E learning model assisted by the monopoly physics game influences the activities and results of high school students physics learning on the subject of gas kinetic theory.

Keywords: 7E learning cycle, monopoly physics games, learning activities, learning outcomes.

Abstrak: Pengaruh Model Pembelajaran Learning Cycle 7E berbantuan Permainan Monopoli Fisika terhadap Aktivitas dan Hasil Belajar Fisika Siswa pada Materi Teori Kinetika Gas. ***Tujuan****: Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran Learning Cycle 7E berbantuan permainan monopoli fisika terhadap aktivitas dan hasil belajar siswa SMA.* ***Metode****: Penelitian quasi eksperimen ini menerapkan desain posttest only control design. Siswa kelas XI IPA SMA Muhammadiyah 3 Jember sebagai populasi sedangkan kelas XI IPA 1 (kelas kontrol) dan XI IPA 3 (kelas eksperimen) dipilih sebagai sampel. Kelas kontrol menerapkan metode diskusi dan tanya jawab sedangkan kelas eksperimen dengan Learning Cycle 7E berbantuan permainan monopoli fisika.* ***Temuan****: Perbandingan aktivitas dan hasil belajar terhadap dua kelompok penelitian diperoleh informasi nilai sig. (2-tailed) lebih kecil dari 0,05.* ***Kesimpulan****: Model pembelajaran Learning Cycle 7E berbantuan permainan monopoli fisika berpengaruh signifikan terhadap aktivitas dan hasil belajar fisika siswa SMA pada pokok bahasan teori kinetik gas.*

Kata kunci: *learning cycle 7E, permainan monopoli fisika, aktivitas belajar, hasil belajar.*

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INTRODUCTION

Education is the most important thing in one's life. Education can improve a person's personal qualities to become more intelligent and have character (Alpian et al., 2019; Panjaitan et al., 2020). One level of education that obtains quality human resources and has high competitiveness is SMA. One of the subjects that can support the potential of students is physics lessons. Physics subjects are often interpreted as subjects that are difficult and difficult for students to understand, so they become bored and not very interested in the subject (Peranti et al., 2019).

Students' disinterest in physics lessons can be seen from the lack of learning activities in class such as not being ready to take part in lessons, not writing notes, having fun playing with friends, and only passively listening to the teacher without any response to asking questions or opinions (Nuraini et al., 2018). In addition, they are not used to having discussions in groups because learning is still centered on educators (Anggara and Rakimahwati, 2021).

Lack of active participation in learning has an impact on the understanding and achievement of learning objectives so learning outcomes will be low. Low physics learning outcomes especially often occur in gas kinetic theory material because it contains abstract concepts (Harizah et al., 2016). This material is related to objects that are not visible, so it is difficult to learn without the support of media that can help students understand the material (Putri et al., 2020). Based on the results of interviews with teachers at Muhammadiyah 3 Jember High School, information was obtained on the results of the repetition of gas kinetic theory material in previous years, many of which did not meet the KKM standards, for example, the results of the test results for class XI in the odd semester of the 2019/2020 academic year where out of 36 students,

Problems regarding activity and low learning outcomes occur due to the use of inappropriate teaching models. A teacher is too inclined to teach in a monotonous and less varied manner (Charli et al., 2019). Teachers teach without paying attention to students' abilities (Peranginangin et al., 2020). Teachers have not been able to create a learning plan that makes students active in the learning process (Setiawan et al., 2017). In addition, the teacher also dominates the learning process which causes the tendency of students to be more passive so that involvement in the learning process tends to be low (Andaru et al., 2019). Based on the problems that occur, an interesting learning model is needed so that it can increase student activity and learning outcomes.

The right model to use in learning is to use the learning cycle model or the 7E Learning Cycle model. The 7E Learning Cycle model is a constructivist-based model where learning is more student-centered (Nabilah et al., 2019). This model is a model that has a series of stages of activities that are organized in such a way that students can master the competencies that must be achieved in learning by playing an active role (Ngalimun, 2012: 145). The seven phases or stages consist of elicit (recalling prior knowledge), engage (generating ideas or experiences), explore (conducting investigations), explain (explaining the results of the investigation, elaborate (applying the results), evaluate (evaluate), extended (expanding the results) understanding) (Marfilinda et al., 2020).

The 7E Learning Cycle model is a renewal of the 5E Learning Cycle model, where the difference in the 7E Learning Cycle model lies at the beginning and end of the phase (Balta & Sarac, 2016). The 7E Learning cycle model emphasizes checking previous knowledge before learning new content, otherwise known as the elicit phase. Then apply the knowledge that has been obtained in a new context or known as the extended phase. The advantages of the Learning Cycle 7E model

are (1) it can stimulate students to remember previous material, (2) it can improve student learning outcomes in a better direction because this model prioritizes student experience, (3) it can make students more active, critical and creative, (4) can motivate students to be more active and increase curiosity, (5) can train students to learn concepts through experimental activities, etc. (Marfilinda et al., 2020)

Research related to the Learning Cycle 7E learning model shows that this model has a positive influence on learning. This is reinforced by research conducted by Maulina et al (2018) showing that by using the 7E Learning Cycle model there is an increase in a learning activity to 3.4 in the high category. In addition, learning completeness was obtained by 84% from the previous 39%. Research conducted by Septian et al (2017) shows an average score of 78.4 with an average score percentage of 93% which is in the very good category range. The results of another study also conducted by Rafiqah et al (2019) showed a significant average score, from 57.54 initially to 73.54.

The Learning Cycle 7E learning model has a weakness where students need a long time to explore their knowledge (Maskur et al., 2019). To minimize these weaknesses, careful preparation is needed and a supporting tool is needed that can assist students in exploring this knowledge. As well as needed media that can help the learning process. With the existence of media, it can be used as a tool in conveying information, materials, and messages conveyed by educators to their students (Jayusman and Shavab, 2020). Learning media that can be used in interesting learning is educational game media, one of which is the monopoly game (Kurniawati, 2021).

The monopoly physics game media is a monopoly game in general, but the contents are modified again with a design in such a way that it can be used as a learning medium(Ardhani et al., 2021).In monopoly games, the material is presented in various forms of animated images, simple experiments, and virtual simulations (Tani and Ekawati, 2017). In addition, it is equipped with several types of cards in which formulas related to the material are already contained. And the use of this media has challenge cards that require students to answer various kinds of questions in it (Purwanto and Annisa, 2016). So that students can act actively in understanding learning. Active activities make students activities easy to understand the material, so learning outcomes will be better.

This is reinforced by previous research, namely the research of Ariiq et al. (2019) showed that using monopoly media resulted in a greater average score of 88 while those who did not use the media produced a smaller average score than the experimental class, which was 80. In another study conducted by Suryani et al. (2019), there are differences in learning outcomes using monopoly games and conventional learning, where when using monopoly media produces good learning outcomes, students look more active and relaxed and are responsible for themselves and their groups.

Learning activities are important components that must exist during the teaching and learning process. A learning activity is an activity carried out by students in the process of making them learn (Mirdanda, 2019). Changes in behavior in learning activities are relatively fixed but intentional by presenting learning strategies that encourage the creation of learning activities (Hidayati and Utsman, 2019). The activity becomes a driving force that ensures the continuity of learning activities so that the desired goals can be fulfilled (Ariaten et al., 2019). Learning activities include writing, looking, reading, remembering, thinking, practicing or practicing, and so on (Rahayu et al., 2019).

The learning process in learning will give results to someone who does the process.

Learning outcomes are learning outcomes between students and the environment that actively interact with each other to produce something positive (Nurrita, 2018). Learning outcomes are abilities possessed by students after receiving a learning process or learning experience (Bektiarso et al., 2020). In other words, learning outcomes are interpreted as an achievement achieved by students when completing several subject matter (Sinar, 2018: 20). Learning outcomes themselves have an important role in the learning process because they can provide information to teachers about student progress in achieving learning goals through the process of further teaching and learning activities (Nabillah and Abadi, 2019).

Based on the description above, it is necessary to conduct research related to the use of the Learning Cycle 7E model assisted by monopoly games on learning activities and outcomes. Therefore, here the researcher is interested in conducting research with the title "The Influence of the 7E Learning Cycle Model Assisted by Monopoly Physics Game on the Activities and Results of Physics Learning for High School Students on the Subject of Gas Kinetic Theory".

METHODS

Participants

The participants in this study were 46 students who were taken from the population of class XI IPA students at SMA Muhammadiyah 3 Jember in Jember Regency. The sampling technique in this study used a purposive sampling technique. Purposive sampling is a technique for determining and taking samples determined by researchers with certain considerations (Puspitawati and Herawati, 2018). The samples taken were class XI IPA 1 totaling 23 students and XI IPA 3 totaling 23 students at SMA Muhammadiyah 3 Jember.

Research Design and Procedures

This research is a type of quasi-experimental research (quasi-experiment) with a quantitative approach. Quasi-experimental research is research that explains cause and effect which requires a control group and an experimental group with the selection of two groups not using a random technique (Hermawan and Rahayu, 2020). The experimental group in the study used the Learning Cycle 7E model treatment assisted by the monopoly physics game while the\ control group used the method that the teacher did before, namely the discussion and question and answer method. The research design used is a design *posttest*-only control design. Research design *posttest* only controls design can be seen in Table 1.

Table 1. Research design *posttest* only control design

E	X	O_2
K	-	O_4

Information:

E : Experiment class

K : Control group

X : The Learning Cycle 7E learning model is assisted by the monopoly physics game media

O_2 : *Posttest*control class

O_4 : *Posttest*experimental class (Arikunto, 2016: 125-126).

Instruments

The instruments in this study were used to test and non-test instruments. The non-test instrument is in the form of observation. Observations were made during the learning process to find out how students' learning activities were during learning. Observations were carried out by four observers using the observation sheets that had been made. Observations were made based on indicators

found in learning activities. The observation indicators in this study are adjusted to the activity aspects written by Usman (2011), namely visual activities, oral activities, listening activities, writing activities, and metric activities. Each aspect has indicators that need to be considered by observers, such as indicators paying attention to teacher explanations, answering questions orally, asking teachers or friends, listening to teacher explanations, listening to friends' presentations, having discussions with friends, copying material, writing answers on paper, and conducting experiments during learning. The criteria for scoring scores on activities are determined by how appropriate the student's behavior is in the specified indicators. If very appropriate (score 4), if appropriate (score 3), if not appropriate (score 2), and if not appropriate (score 1). The score will be added up to the number of indicators that have been determined.

The second instrument is a test in the form of posttest questions to find out student learning outcomes after obtaining learning. The post-test questions in this study were in the form of multiple choices. In making the test questions, the researcher used material from the kinetic theory of gases. The posttest questions each consist of 5 multiple choice questions with the choice of questions consisting of C3-C5. The score of the question is determined by the scoring rubric, where if students understand the problem by writing down what is known and asked in the question (score 4), students write the formula for the question (score 4), students enter variables into the formula (score 5), students correct Back answers with correct results (score 4), and if students only answer the choices correctly but are not accompanied by methods (score 3). When totaled, one question will get a score of 20.

Data analysis

This study uses descriptive statistical data techniques and inferential statistical data. Descriptive statistical data consists of 2 dependent variables. The first variable is a learning activity. Learning activity data is calculated using Microsoft Excel software, where the results of the percentage of learning activities will be qualified by the category of interpretation of learning activities. Categories of interpretation of learning activities can be seen in table 2 below.

Table 2. Category interpretation of learning activities

Score Range	Information
80% 100%≤ $P \leq$	Very good
60% 80%≤ $P \leq$	Good
$< 60\%$	Not enough

The second variable is learning outcomes that are qualified by the criteria of completeness of student learning outcomes. The completeness criteria for student learning outcomes can be seen in table 3 below.

Table 3. Criteria for mastery of student learning outcomes

Mark	Criteria
$80\% \leq skor \leq 100\%$	Very well
$70\% \leq skor \leq 79\%$	Good
$60\% \leq skor \leq 69\%$	Enough
$skor$ 60%	Not enough

Inferential statistics consist of prerequisite analysis including the normality test (Shapiro Wilk). The hypothesis was tested using the t-test, namely the Independent Sample T-test through the SPSS 23 for windows program. Statistical analysis is used to test the hypothesis in this study. The hypothesis in this study consists of the null hypothesis (H_0): "the average value of learning activities in the experimental class is the same as learning activities in the control class". While the alternative hypothesis (: "the average value of learning activities in the experimental class is better than learning activities in the control class".

RESULTS AND DISCUSSION

The results of this study are data on learning activities and student learning outcomes on the use of the Learning Cycle 7E model assisted by the monopoly physics game.

Student Learning Activities

The data from observations of student learning activities in the experimental and control groups are presented in Table 4.

Table 4. Student learning activities in experimental and control group

No	Aspect	Indicator	Control Class		Experiment Class		Average value	
			pert. 1	pert. 2	pert. 1	pert. 2	Control Class	Experiment Class
1	Visual Activity	Pay attention to the teacher's explanation	84.8%	85.9%	92.4%	97.8%	85.4%	95.1%
2	Oral Activity	Answer questions orally	54.4%	53.3%	79.3%	84.8%	53.9%	82.1%
		Ask a teacher or friend	55.4%	58.7%	84.8%	79.3%	57.1%	82.1%
3	Listening Activity	Listen to the teacher's explanation when describing the material	84.8%	84.8%	92.4%	96.7%	84.8%	94.6%
		Listen as a friend presents their answer	70.7%	69.6%	85.9%	92.4%	70.2%	89.2%
		Have discussions with friends	53.3%	64.1%	83.7%	84.8%	58.7%	84.3%
4	Writing Activity	Copy materials	68.5%	65.2%	88.0%	81.5%	66.9%	84.8%
		Write your answers on the paper provided	64.1%	59.8%	83.7%	85.9%	62%	84.8%
5	Metric Activity	Conduct experiments during the learning	25%	25%	89.1%	88.0%	25%	88.6%
Average per meeting			62.3%	62.9%	86.6%	87.9%	62.7%	87.3%

Based on Table 4. it can be seen that the percentage of student activity in the experimental class is higher than in the control class. In the experimental class using the Learning Cycle 7E model assisted by the monopoly physics game, the data obtained on average were very good during the learning activities. The highest average percentage for each meeting was in the 2nd

meeting, which was 87.9%. With an average value of the experimental class of 87.3%, where the highest point is in the aspect of visual activity on the indicator paying attention to the teacher's explanation of 95.1% while the lowest is in the aspect of oral activity on the indicator of answering questions orally and asking the teacher or friends by 82.1%. Likewise, with the control class using the conventional learning model the average percentage for each meeting was at the second meeting at 62.9%. With an average value of the control class of 62.7% where the highest point is in the visual activity aspect of the indicator paying attention to the teacher's explanation of 85.9% while the lowest is in the activity metric aspect of the indicator conducting experiments at during learning by 25%.

Test Analysis of learning activity data using the Independent Sample T-test. Before testing the hypothesis, it is necessary to test the normality first as a prerequisite for testing the hypothesis. The results of the normality test can be seen in table 5 below.

Table 5. Results of the normality test of student learning activities

Tests of Normality							
		Kolmogorov-Smirnova			Shapiro-Wilk		
	Class	Statistics	Df	Sig.	Statistics	Df	Sig.
Physics learning activity	Experiment	.143	23	.200*	.934	23	.131
	Control	.117	23	.200*	.957	23	.411

Based on the results of the normality test using Shapiro-Wilk, it is known that the significance value of the experimental class is 0.131 and that of the control class is 0.411. The significance value above is greater than the significance level of the normality test so it can be said that the data is normally distributed. After the data is normally distributed, it is continued with the Independent Sample T-Test. The results of the Independent Sample T-Test test can be seen in table 6 below.

Table 6. hypothesis test results

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	Q	Df	Sig. (2-tailed)	Mean Differences	std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Learning Activity Results	Equal variances assumed	15.102	.000	15,368	47	.000	24,810	1614	21,562	28,058
	Equal variances not assumed			14,854	33,030	.000	24,810	1,670	21,412	28,208

Based on table 6. the results of the learning activity hypothesis test using the Independent Samples T-test hypothesis test obtained a significance value (sig. (2-tailed)) of 0.000. This value is smaller than the significant level value of 0.05. So that according to the decision-making guidelines, it is rejected accepted, namely the average value of the experimental class student learning activity is significantly better than the control class. From this, it can be concluded that there is an influence of the Learning Cycle 7E model assisted by the monopoly physics game on student learning activities.$H_0 H_a$

This can happen because the learning cycle in the Learning Cycle 7E model according to Robert Karplus has three stages, namely exploration, the introduction of concepts, and application of concepts Learning Cycle 7E is learning that has conceptualized stages to make student activities active in learning. learning process. The stages of learning in the Learning Cycle 7E model such as elicit, engage, explore, explain, elaborate, evaluate, and extend can trigger students' knowledge to keep thinking to make the participants' activities active in learning. Especially at the explore stage, it can make students able to work together with group mates in solving the problems that have been given.

Relevant research related to the Learning Cycle 7E model makes good learning activities carried out by Maulina et al., (2018) shows that by using the Learning Cycle 7E model student learning activities increase with an average score of 3.4 in the high category. Hasanah et al., (2019) the use of the 7E Learning Cycle model in addition to being able to develop a scientific attitude, can also increase student activity in learning so that they more easily understand the material being discussed.

In addition to using the Learning Cycle 7E model, the help of monopoly physics game media can make students play an active role. With the monopoly physics game, students will actively search for information related to the material in question so that students can easily remember what they have found. Besides that, in the monopoly physics game, there are also several important concepts related to material that is easily understood by students. The learning process by applying this model can involve students directly so that there will be active student activity during learning.

The physics monopoly game in this study consists of several plots, namely the challenging plot, the library plot, the book house plot, and the only pass plot, and contains pictures related to the concept of gas kinetic theory material. The challenge plot serves to provide questions that are then answered by the players, the library compartment functions to reopen material, and the book house plot contains cards for getting questions, paying taxes, and others as is usually the case with general fund cards in ordinary monopoly. Cards in monopoly make students feel challenged to be able to get more so they can win in the game. So from feeling challenged to continue playing, working on questions, and so on,

Relevant research related to the use of monopoly physics game media for learning activities is the research of Ramadhani et al., (2016) that learning activities while using monopoly educational game media are categorized as a very active attitude with a percentage of 92.25%.

Student learning outcomes

Data on student learning outcomes were obtained from the results of the pretest and posttest which were carried out in the control class and the experimental class. From these data, the highest score, lowest score, average, and percentage of classical completeness in the experimental class are presented in Table 7.

Table 7. Descriptive information of learning outcomes

	N	Minimum	Maximum	Means	std. Deviation
Posttest experiment	23	76	96	84.26	5.319
Posttest control	26	40	80	62.35	11,569

Based on the above learning outcomes obtained the average value of the control class posttest was 62.35 while the posttest average value of the experimental class was 84.26. Based on the completeness criteria of learning outcomes in Table 3, the average posttest score for the experimental class is included in the very good category, while the posttest average score for the control class is included in the moderate category. Based on the results of these average values, it can be concluded that the experimental class got a higher average score than the control class. So that the use of the Learning Cycle 7E model assisted by the monopoly physics game is very influential on student learning outcomes.

Average results based on descriptive analysis cannot be used as a decision making, for this reason, it is necessary to carry out further analysis to be able to see the significant results. The following is a normality test of learning outcomes which can be seen in Table 8 below.

Table 8. Normality test results of student learning outcomes

Tests of Normality							
	Class	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistics	Df	Sig.	Statistics	Df	Sig.
Physics Learning Outcomes	Experiment	.172	23	.077*	.944	23	.244
	Control	.185	23	.040*	.941	23	.191

Based on the Shapiro-Wilk normality test, it is known that the significance value is more than 0.05, which means that the data is normally distributed. Furthermore, a hypothesis test is carried out to see the significant value of the learning outcomes. Test the learning outcomes hypothesis can be seen in Table 9.

Based on table 9. the results of the Independent Sample T-test on learning outcomes show the Asymp Sig value. (2-tailed) of 0.000. Then it was rejected and accepted the average value of the experimental class student learning outcomes was significantly better than the control class, so it can be concluded that there was an influence of the 7E Learning Cycle model assisted by the physics monopoly on student learning outcomes.

The use of the 7E Learning Cycle model assisted by the physics monopoly influences student learning outcomes because learning using the 7E Learning Cycle model requires students to play a very important role in learning. With this model, students can construct their knowledge, so that if the knowledge construction process occurs properly they will be able to easily understand the lesson being studied. With the

Table 9. Results of hypothesis testing on learning outcomes

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Differences	std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Learning Activity Results	Equal variances assumed	19,522	.000	8,970	44	.000	23,435	2,613	18,169	28,700
	Equal variances not assumed			8,970	31,227	.000	23,435	2,613	18.108	28,762

Learning Cycle model, there are active student activities in each phase, so with these activities, students can form their knowledge which will be remembered longer because they can participate directly in the learning.

Integrated with the help of the physics monopoly game can improve student learning outcomes. With the help of monopoly physics learning media, students will not feel bored and bored, because, with the help of monopoly games, students can understand the material while playing. With the help of each plot in the physics monopoly game, students will easily understand the material being taught. In addition, the use of various cards in monopoly can add to students' insight regarding the material being studied. The ability to play components in monopoly games such as pawns and dice will make the psychomotor aspects more optimal so that learning achievement becomes more complex.

Relevant research related to learning outcomes was conducted by Zuhra et al., (2017); Sulastri et al., (2018) where the Learning Cycle 7E learning model can improve learning outcomes, this can be seen from the increase in students' average scores during the pretest and posttest. Candra and Achmadi's research (2017) shows that learning using the 7E Learning Cycle model can improve student learning outcomes in the high category. Ariiq et al., (2019) the monopoly physics game media has a significant effect on improving student learning outcomes in high school, this is evidenced by statistical tests using the independent Sample T-test which shows a significance value of 0.000. Mardiah's research (2021) student learning outcomes using monopoly board media always increase in each cycle, < 0,05

■ CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that there is a significant influence from the use of the Learning Cycle 7E model assisted by the monopoly physics game on the physics learning activities of high school students on the subject of gas kinetic theory and there is a significant influence from the use of the Learning Cycle 7E model assisted by the monopoly game physics on the physics learning outcomes of high school students on the subject of the kinetic theory of gases. Based on the research that has been done,

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