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Development of Guided Inquiry Learning Tools Assisted by PhET Simulation to Improve Student's Learning Motivation in the Sub Material of Molecular Shapes

Eryna Dwi Trisviati, *Achmad Lutfi
Chemistry Education Department, Faculty of Mathematics and Science Education, Surabaya State University. Jl. Ketintang, Surabaya, Indonesia. Postal code: 60231
*Corresponding Author e-mail: achmadlutfi@unesa.ac.id

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Abstract

This research is purposed to obtain a PhET-assisted guided inquiry learning tools that is feasible to use in improving student learning outcomes and motivation in terms of validity, practicality, and effectiveness. A limited trial was held in SMA Khemala Bhayangkari 1 Surabaya. The instruments used were validation sheets, student response questionnaire sheets, student motivation questionnaire sheets, pretest and posttest. The development model used is 4D which is simplified into define, design, and develop. The learning tools was declared valid with a score of 3 as the minimum score to be included in the category of good. The practicality of learning tools is stated to be practical built upon the outcomes of response questionnaires done by students with a percentage of more 92.3% as greatly practical criteria. Learning tools is said to be effective based on the results of the student motivation questionnaire with a percentage of 84.6% as criteria of very high and learning outcomes gaining an N-Gain value in the category of high. So, it can be concluded that the guided inquiry learning tools assisted by PhET Simulation fulfills the effectiveness, practicality, and validity. The researcher hopes who want to develop learning tools to take advantage of these tools.

Keywords: Learning tools, guided inquiry, PhET Simulation, student's learning motivation, molecular shapes

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INTRODUCTION

In the world of education, the term "Education 4.0" appears. Education 4.0 is applied by experts in education field to represent several ways to combine technology both in not into studying and physically (Priatmoko, 2018). In Indonesia, the world of education has improved the quality of computer-based teaching media (Prima et al., 2018).

The quick growth in the world of both information and technology today can give educators some innovation in using various media for learning. A type of media that is popular today is a virtual simulation media based on a computer/smartphone (Syahri et al., 2017). Based on Kartini's research, (2020) students like learning using interactive media that utilizes technology with a percentage of student responses of 83.07% very good category (Kartini & Putra, 2020). For instance is Physics Education and Technology (PhET). Katherin Perkins and her colleagues in University of Colorado were the ones who developed such media of simulation. The simulation media created can be accessed through the website using a web browser. This PhET media can be accessed properly using a PC (Personal Computer) through the site http://phet.colorado.edu/en/get-phet/full-instal (Perkins, 2010).

PhET simulation media is effective when applied to learning with investigation approach since it is able to simplify students to learn in independent way (Rizaldi et al., 2020). Students can use PhET Simulation to discover and clarify the concepts being studied (Rizaldi et al., 2020). Based on the research of Kaukaba, (2022), the use of the PhET application can increase student's learning motivation with a percentage of 93% (Kaukaba et al., 2022).

The implementation of learning is also closely related to learning devices, namely lesson plans, syllabus, teaching materials, learning media, and student worksheets. Learning devices are plans and materials in learning activities that must be made by the teacher before entering the classroom so as to produce effective and meaningful learning (Daryanto et al., 2014). Learning tools contain a set of basic actions which should be carried out to fully comprehend in order to develop basic abilities according to indicators of accomplishment of results in learning that must be taken (Trianto et al., 2012). Learning activities must be designed so that the development of attitudes, knowledge, and skills in students occurs (Ibrahim et al., 2014).

Teachers must always design activities that refer to finding activities, regardless of the material being taught (Al Tabany et al., 2014). The matter of applying activities in learning which have not been faced to the students are able to be solved by conducting a model of inquiry learning which can make students involve more in doing several activities such as investigation, experimentation, and observation (Syahri et al., 2017).

Based on the research of Sumarauw, (2017), the guided inquiry learning device assisted by PhET simulation that was developed was effectively used (Sumarauw et al., 2017). PhET simulation is very appropriate to be used with the inquiry learning model because it has advantages, namely, (1) Students acknowledge better in ideas and primary concepts, (2) Help memorizing in the learning process, (3) Give students encouragement to think in intuitive way and create hypotheses by themselves, (4) Allow intrinsic satisfaction (5) The learning process is further interesting (Simbolon & --, 2015). Based on the results of pre-research conducted at SMA Kemala Bhayangkari 1 Surabaya, 72.8% of students felt that the material in molecular shapes was difficult, 70.4% of students felt that chemistry learning was boring, 92.5% of students wanted student-centered learning. In addition, 72.8% of students only use powerpoint and worksheets obtained from the teacher, 81.5% of students misunderstand the given materials using the previous media. According to the outcomes of the pre-research, 88.9% of students were interested in the PhET Simulation media. Prima, (2018), stated that the simulation of PhET allows students improving their and motivation with a correlation score of 0.46 in the medium category (Prima et al., 2018). Based on Sholikhah's research, (2021) the developed PhET-assisted learning media is feasible to use to improve student learning outcomes with a mastery percentage of 83.34% and obtain a positive feedback from students with more than 75% of the percentation (Sholikhah & Sucahyo, 2021).

According to the backround above, the purpose of this development study is to achieve a PhET Simulation-assisted inquiry learning tools that is suitable for use as a learning guide covering aspects of effectiveness, practicality, and validity. The learning tools developed in this research were in the form of a syllabus, lesson plans and student worksheets designed using a guided inquiry model. Research on the development of this learning tools is very much needed because current learning leads to student-oriented learning. One of the model is the guided inquiry learning model that can support student-centered learning and with the help of PhET media it can help students improve their learning outcomes. Based on research conducted by Purnamasari, (2021) the developed PhET virtual lab-assisted worksheets were effective in increasing students' enthusiasm for learning on acid-base materials (Purnamasari et al., 2021). So, this research develops a guided inquiry learning tool assisted by PhET simulation media to improve students' motivation and learning outcomes in the molecular shapes sub-material in class X.

METHOD

This study is a kind of research and development study which use research methods to develop learning tools, namely the *4D* designed by Thiagarajan, Semmel & Semmel (1974) for the improvement of learning devices. There are 4 stages of the research process, namely define, design, develop, and disseminate, however in this research, simplification was applied to define, design, and develop with a limited use trial process. The procedures carried out in this study include:

a. Define
   The define stage aims to analyze and determine the needs in the learning process. The needs of the learning process in question include the curriculum and field problems, especially in the sub-materials of molecular forms of chemistry subjects faced by students.
b. Design
   At the design stage activities that produce prototypes or initial designs of PhET Simulation-assisted learning devices are carried out. Learning devices are designed in the shape of syllabus, studying plans, also student worksheet on the molecular shape sub material. In addition, at this stage it was also used to design instruments used as data collection tools including, sheets of learning devices validation, sheets of questionnaire containing student feedbacks, sheets of questionnaire containing student motivation, sheets of pre-test and post-test.
c. Develop
   The develop stage is the stage where product improvement is produced. This stage aims to produce learning tools after going through revisions according to the evaluation of the validator/practitioner and data from the test outcomes. This stage has two steps, including; 1) assessment of validity by expert validators followed by revisions, 2) limited trial of learning tools developed for development. The validity was assessed by two lecturers of Chemistry Education, State University of Surabaya and one chemistry teacher at SMA Kemala Bhayangkari 1 Surabaya. The limited trial was conducted in class X SMA Kemala Bhayangkari 1 Surabaya with a total of 26 students. The limited trial was conducted using a one-group pretest-posttest design without a comparison group. Here is the schematic.

   $$O_1 \ X \ O_2$$

   Note:
   O_1 = Pretest
   X = Treatment, studying applying guided inquiry learning tools supported by PhET Simulation was developed
   O_2 = Posttest

The analysis used in this research is validity analysis, practicality analysis and effectiveness analysis. The steps taken in the validity analysis are to provide each component of the assessment on the sector of the feasibility of the content and build of the learning tools each component of the assessment is assessed by the validator. The outcomes from the validation of learning tools were analyzed quantitatively, namely by scoring in the form of numbers using a Likert scale presented in Table 1 (Riduwan, 2015). The validation results obtained were then analyzed and calculated using the mode score. From the validation results, it is said to be valid if a score reaches ≥3 (fairly good category).

Table 1. Likert Scale

Scale	Category
1	Very bad
2	Bad
3	Fairly good
4	Good
5	Very good

Practical analysis was carried out according to the outcomes of the student response questionnaire. The scoring process on the student response questionnaire to the use of learning tools developed by making several categories that are in accordance with the objectives. The questionnaire assessment was carried out using the Guttman scale presented in Table 2 (Sugiyono, 2015).

Table 2. Guttman Scale

Statement	Answer "Yes" Score	Answer "No" Score
Positive	1	0
Negative	0	1

According to the outcomes of the assessment obtained, it is then calculated and converted into a percentage using the formula.

$$P(\%) = \frac{Scores\ obtained}{Total\ number\ of\ students}\ x\ 100\%$$

Based on the percentage of student responses obtained, then interpreted in the Guttman scale criteria in Table 3 below (Utomo, 2009).

Table 3. Guttman Scale Interpretation Criteria

Percentage (%)	Category
85-100	Very practical
70-84	Practical
55-69	Quite practical
40-54	Less practical
0-39	Not practical

The learning tools developed are declared practical if a percentage of 70% is obtained and is declared practical. There are two implementation criteria yes and no. Student responses are stated to assist the feasibility of the learning devices developed if they get a percentage of 70%.

The effectiveness analysis was carried out according to the outcomes of the student motivation questionnaire and the value of learning outcomes. Student learning outcomes are obtained by holding a pretest and posttest. On the test sheet there are 10 multiple choice questions and one description question with cognitive levels C1 to C4. The value achieved from the test is counted using formula as follows:

$$Value = \frac{\substack{Total\ the\ number\ of\ multiple\ choice\ scores \\ and\ descriptions\ obtained}}{30}\ \text{x}\ 100$$

The value obtained will then be tested for normality using IBM SPSS Statistics 23 and if it is normally distributed with a significant value ≥0.05 then it is continued with the Paired Sample T-Test on SPSS (Kumala et al., 2022). In the T-test, if the result of the sig value (2-

tailed) obtained is less than 0.05, then it can be summarized that the different between the pre-test and post-test values is significant (Kurniawan & Rohmani, 2019). Data from oucomes of student learning were analyzed using the N-Gain Test. This calculation is intended to decide the growth in outcomes of student learning using the following formula.

$$N - Gain\ Score = \frac{Posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

The obtained N-Gain criteria are shown in Table 4 (Hakke, 1999). Furthermore, the interpretation of the effectiveness of N-Gain can be seen in Table 5 (Hakke, 1999).

Table 4. N-Gain Criteria

N-Gain	Category
G>0,7	High
0,3≤G≤0,7	Medium
G<0,3	Low

Table 5. Effectiveness Of N-Gain Interpretation

Percentage (%)	Category
< 40	Ineffective
40-55	Less effective
56-75	Quite effective
>76	Effective

The learning tools developed are said to be effective if students experience an increase in learning outcomes as measured by the formula for obtaining an N-Gain score in the medium category or more than 0.3.

Students' learning outcomes are said to have completed their studies in terms of classical completeness from the posttest that reached KKM 78. The Ministry of Education and Culture (2014) said that classical mastery obtained a minimum score of 85%. According to Trianto, (2012), only a class with 85% of students who have finished their learning can be said to have completed their learning (classical completeness) (Trianto et al., 2012).

The scoring process on the student motivation questionnaire for the use of learning tools was developed by making several categories that were in accordance with the objectives. The questionnaire assessment was carried out using the Guttman scale presented in Table 6 (Sugiyono, 2015).

Table 6. Guttman Scale

Statement	"Yes" Answer Score	"No" Answer Score
Positive	1	0
Negative	0	1

Based on the results of the assessment obtained, then it is calculated and converted into a percentage using the formula.

$$P(\%) = \frac{Scores\ obtained}{Total\ number\ of\ students}\ x\ 100\%$$

Based on the percentage obtained, it is then interpreted in the Guttman scale criteria in Table 7 (Utomo, 2009).

Table 7. Guttman Scale Interpretation Criteria

Percentage (%)	Category
85-100	Very effective
70-84	Effective
55-69	Quite effective
40-54	Less effective
0-39	Not effective

Students' learning motivation is stated to support the effectiveness of the learning tools developed if they get a percentage ≥70%.

RESULTS AND DISCUSSION

This part is the result and discussion of study on the development of guided inquiry learning tools supported by PhET Simulation to gain learning outcomes and student motivation in the molecular shape sub-material. In this development research, learning devices are said to be feasible if they obtain three aspects, practicality, effectiveness, and validity. 4D procedures carried out in this study include:

1. Define

This define stage aims to analyze and determine the needs in the learning process. In this part, there are four steps carried out, namely the first is the initial analysis. The purpose at this stage is to analyze the problems faced in the learning process including curriculum and field problems, especially in the molecular shape of chemistry subjects. The outcomes of the analysis of this stage are in the form of descriptions and alternative solutions to problems in the options of models and learning media developed.

The second stage, student analysis purposes to analyze students' characteristics. In addition, this stage also purposes to discover the appropriate learning media so that it helps in the learning process. Third, task analysis is a collection of procedures for determining content in RPP by detailing the task of teaching material content in outline from Core Competencies (KI) and Basic Competencies (KD) in accordance with the 2013 Curriculum. molecular shape. Concept analysis is the stage of systematically compiling the main concepts used as teaching materials and detailing relevant concepts. The material for molecular shape that will be taught refers to KD 3.5, which is applying the theory of valence shell electron pairs (VSEPR) and Electron Domain theory in determining the shape of the molecule and KD 4.5, which is making a model of the shape of a molecule using materials from the surrounding area or computer software. According to the analysis conducted, educators need learning that is able to motivate students in the molecular shapes sub-material by using fun learning tools.

Based on research conducted by Purnamasari, (2021) at the define stage the results obtained from the analysis in the form of detailed concepts to design learning content by determining the tasks given, the materials needed, the media to be used and the learning objectives (Purnamasari et al., 2021).

2. Design

At the design stage activity is done which produces a prototype or initial design of a PhET Simulation-assisted learning tools. Learning tools are designed in the form of syllabus, studying plans and student worksheet on the molecular shape sub material. Based on research conducted by Purnamasari, (2021) at the design stage, the results obtained in the form of student worksheet designs assisted by the PhET virtual lab and also the design of the instruments used in collecting research data (Purnamasari et al., 2021).

There are four steps carried out at this stage. First, the instrument preparation stage where the instruments arranged are learning instruments and data retrieval instruments. The learning instruments are syllabus, lesson plans and student worksheet, while the data collection instruments are in the shape of validation sheets, student response questionnaire sheets for the use of student worksheet, pre-test/post-test evaluation sheets, and student motivation questionnaire sheets.

The second stage is media selection, according to the outcomes of the analysis in the define stage, the relevant media is used, namely student worksheet assisted by PhET Simulation. PhET simulation can be accessed via a web browser. The third, format selection stage is carried out to organize and design the contents of the syllabus, lesson plans and student worksheet and make designs on the student worksheet including layout, writing and pictures. student worksheet assisted by PhET Simulation is designed using Canva. The last stage, the initial design stage, compiles and designs learning devices which will be built prior to product testing. The following is the result of the design of the developed learning tools.

Figure 1. Worksheet Cover Design

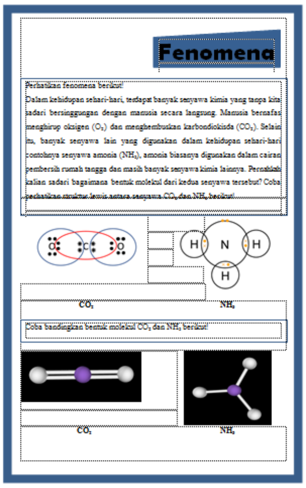

Figure 2. Phenomena on Inquiry Activities

3. Develop

The develop stage is the stage where product improvement is produced. This stage aims to produce learning tools after going through revisions based on validators/practitioners and test data. This stage has two steps, including; 1) validity assessment by expert validators followed by revisions, 2) development trials.

Validation by experts is carried out to meet the requirements for the validity of the learning tools developed and their instruments. The validity was assessed by two lecturers of Chemistry Education, State University of Surabaya and one chemistry teacher at SMA Kemala Bhayangkari 1 Surabaya. The validation outcomes and given comments are used to improve learning tools. Learning devices and instruments that have been validated are then improved so that revision I products are produced.

The revised I products are then tested on students. Students are class X who were chosen randomly with heterogeneous abilities with a total of 26 students. With this trial, it is known the weaknesses and shortcomings of the learning tools which are then repaired so as to produce a revised II product that is better and can be used for extensive testing.

The validity of the learning tools was reviewed based on the validity criteria of Niveen & Plomp (2010), stating that the product criteria were seen from the content validity and construct validity including language, writing and presentation used in the developed learning tools (Niveen & Plomp, 2010). The validation outcomes is achieved from the three validators are summarized in Table 8 below.

Table 8. Learning Tool Validation Results

Types of Learning Tools		Score	Percentage	Category
Syllabus	Content validity	3	20%	Valid
		4	80%	
	Construct validity	3	12,5%	Valid
		4	75%	
		5	12,5%	
Lesson Plans	Content validity	3	12,5%	Valid
		4	75%	
		5	12,5%	
	Construct validity	3	14,2%	Valid
		4	85,8%	
Student Worksheet	Content validity	3	10%	Valid
		4	90%	
	Construct validity	3	20%	Valid
		4	80%	

According to the data from the validation results presented above, it is summarized that the guided inquiry learning tool supported by PhET simulation on the molecular shape sub-material consisting of the syllabus, lesson plans, and student worksheet fulfills both content and construct validity and can be used for a limited trial at SMA Kemala Bhayangkari 1 Surabaya.

a. Practicality of Learning Tools

From the results of student response data to student worksheet developed through a response questionnaire consisting of 10 aspects with the aim of knowing the level of ease of use of guided inquiry worksheets supported by PhET Simulation as a learning medium for molecular shape material , percentages start from 92.3% to 100% with categories very good. This means that guided inquiry learning tools assisted by PhET Simulation are easy to use as a media for learning material in molecular shape.

In the second objective, to determine the level of interest of students in guided inquiry worksheets supported by PhET Simulation as a learning media for molecular shape material consisting of 5 aspects, the average percentage is obtained from 96.2% to 100% in the very good category. This means that students' interest in guided inquiry learning tools assisted by PhET Simulation has been fulfilled as a media for learning material in molecular shape.

Student responses can be declared practical if the learning tools developed get a percentage of 70%. This means that the developed PhET Simulation-assisted LKPD can be stated to be very practical. Based on the research of Kaukaba, (2022) stated that learning using PhET simulation media is highly practical with an average percentage of student responses of 96% on acid-base material (Kaukaba et al., 2022). In another reserach which was done by Purnamasari (2021), using PhET-assisted media was very practical with a percentage of more than 98.1% (Purnamasari et al., 2021).

b. Effectiveness of Learning Tools

The effectiveness of the developed learning devices is seen from the motivation questionnaire on the use of PhET Simulation-assisted learning tools and test scores on the material in molecular shape.

1) Students' Learning Outcomes

The effectiveness of learning devices is seen from the test scores. The test was conducted twice including, pretest and posttest. The pretest was carried out before the use of the learning tool to determine the students' initial understanding of the molecular shape material. The posttest was heldt after using learning tools to decide the final understanding of students on the material of molecular shape. The results of the tests carried out are presented in Figure 1 below.

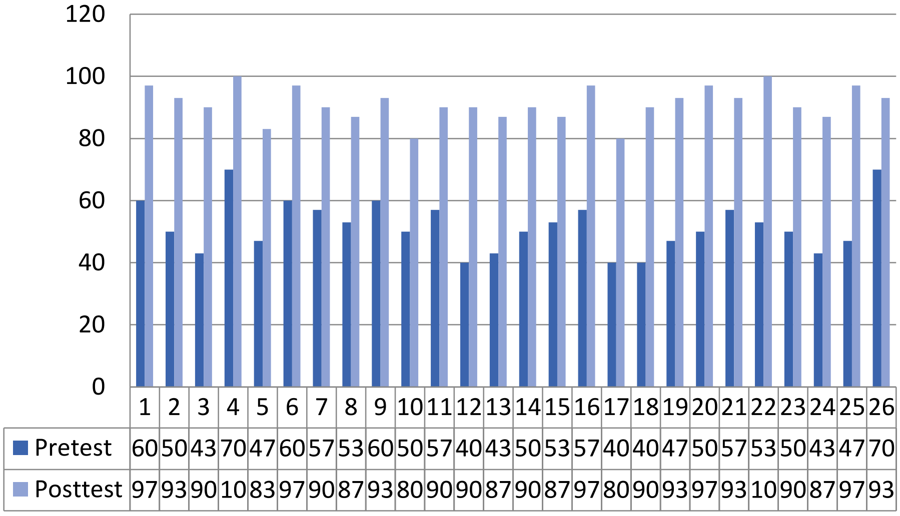

Figure 3. The Results of Students' Test Score

Based on the graph above, it is shown that the pre-test score did not meet classical completeness because the number of students who scored above the KKM (78) was 0%. The Ministry of Education and Culture (2014), said that classical completeness obtained a minimum percentage of 85%. According to Trianto (2009), only a class with 85% of students who have finished their learning can be said to have completed their learning (classical completeness) (Trianto et al., 2009).

Meanwhile, the students' posttest scores met classical completeness because the percentage of students who scored above the KKM was more than 85%, that is, 26 students scored more than 78.

The test scores were then analyzed using IBM SPSS Statistics 23. Test for normality on the pretest scores. and the posttest used is Shapiro-Wilk (Nora & Lutfi, 2022). The outcomes of the normality test applying Shapiro-Wilk is shown in Table 9 below.

Table 9. The Results of The Normality Test Shapiro-Wilk

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PreTest	.125	26	.200*	.941	26	.144
PostTest	.144	26	.176	.942	26	.148

a. Lilliefors Significance Correction

According to the outcomes of the normality test in Table 9 above, the values of the pretest and posttest were normally distributed. This can be found from the significant value of Shapiro-Wilk on the pre-test 0.144 and the value of Sig. Shapiro-

Wilk on post-test 0.148. Both students' test scores were normally distributed with a significant value ≥ 0.05.

Furthermore, the Paired Sample T-Test test using IBM SPSS Statistics 23, the significant value (2-tailed) obtained is <0.05, this shows that the difference between the pre-test and post-test is significant (Yuliati et al., 2018). The outcomes of the Paired Sample T-Test are presented in Table 10 below.

Table 10. The results of the Paired Sample T-Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PreTest - PostTest	-39.38462	7.13345	1.39899	-42.26588	-36.50335	-28.152	26	.000

According to the outcomes of the T test in Table 10, it is presented that the value of Sig. (2-tailed) pretest and posttest obtained 0.000. The value is < 0.05. That is, H1 is. accepted and Ho is rejected. Based on the hypothesis on the Paired Sample T-Test that, Ho, the change in pre-test and pos-test is not significant. While H1 significant change in the pretest and posttest scores. Learning using guided inquiry learning tools supported by PhET simulation which was developed can improve student learning outcomes seen from the significant difference in pre-test and post-test scores. According to the research of Yuliati, (2018) learning using PhET simulation can gain results in student learning (Yuliati et al., 2018). So, this can be summarized that learning using guided inquiry learning tools supported by PhET simulation is effective in improving learning outcomes in molecular shape sub-materials.

Then N-Gain is used in analyzing the test scores. The N-Gain outcomes obtained are presented in Table 11 below.

Table 11. The N-Gain Results

N-Gain	Category	Number of Students	Percentage
g>0,7	High	23	88,46%
0,3≤g≤0,7	Medium	3	11,54%
g<0,3	Low	0	0%

From the outcomes of the N-gain score data that has been obtained, an average of 0.8224 with a percentage of 82.24%,that means it includes in category of high. The learning device built is said to be effective if students experience an increase in learning outcomes as measured by the formula for obtaining an N-Gain score ≥0.3. Based on the outcomes of the N-Gain with the high category obtained a percentage of 88.46% and the medium category of 11.54%. This means that the learning tools developed can be an improvement of outomes in learning measured using the N-Gain Score. Based on research conducted by Purnamasari, (2021) student worksheet assisted by PhET Lab-Virtual which was developed to improve student learning outcomes with a large percentage of 80% (Purnamasari et al., 2021). Based on Kohar's research, (2017) the device development is feasible to be used, this is indicated by an increase in N-Gain of 0.73 and students are interested in guided inquiry-based learning using the PhET simulation program on dynamic electricity material (Kohar & Jatmiko, 2017).

2) Students' Learning Motivation

The effectiveness of the developed learning devices is seen from the motivational questionnaire sheet on the use of PhET Simulation-assisted learning tools. The student motivation questionnaire consists of 15 statements including negative and positive statements. The motivation questionnaire includes 5 indicators, specifically: 1) There is desire to be successful in students 2) There is an interest in learning in students 3) There is an encouragement to learn 4) There is hope in the future for students 5) There is a conducive learning environment. The outcomes of the student learning motivation questionnaire achieved are summarized in Table 12 below.

Table 12. The Outcomes Of The Student Learning Motivation Questionnaire

No.	Indicator	Percentage (%)	Category
1	There is desire to be successful in students	96,2 - 100	Very effective
2	There is an interest in learning in students	92,3 - 100	Very effective
3	There is an encouragement to learn	92,3 - 100	Very effective
4	There is hope in the future for students	92,3 - 100	Very effective
5	There is a conducive learning environment	84,6 – 100	Effective to very effective

From the results of the motivation questionnaire data obtained, the percentage for the purpose of knowing the students' desire to succeed after using guided inquiry learning tools assisted by PhET Simualation is 96.2% to 100% which consists of 3 aspects. This means that using guided inquiry learning tools supported by PhET Simulation may provide motivation to succeed in molecular form materials. Based on Purnamasari's research (2021), the use of PhET Lab-Virtual media is able to increase students' enthusiasm for learning with a percentage obtained of 99% (Purnamasari et al., 2021).

In aim to find out the existence of hope in the future, a percentage of 92.3% to 100% is obtained which consists of 3 aspects. That is, by using the learning tools developed, students have hope that in the future they will be able to be successfull in the material molecular shape. Based on Kaukaba's research, (2022) learning using PhET media is able to foster dreams of success in the future in students with a percentage of 98% (Kaukaba et al., 2022).

In the third aim, which is to find out if there is interest in learning, the percentage is 92.3% to 100% which consists of 4 aspects. That is, applying learning tools developed may foster student excitement in learning material in molecular shape. Based on Kaukaba's research, (2022) learning using PhET media increases interest in learning in students with a percentage of 92% (Kaukaba et al., 2022).

Meanwhile, in the aim to determine the existence of a conducive learning environment, a percentage of 84.6% to 100% is obtained which consists of 3 aspects, meaning that the use of this developed learning tools provides an appropriate learning environment that is fun and conducive. Based on Kaukaba's research, (2022) learning using PhET media fosters supportive learning conditions with a percentage of 94% (Kaukaba et al., 2022).

For the purpose of knowing there is an encouragement to learn, it is obtained a percentage of 92.3% to 100% which consists of 2 aspects. That is, the use of this developed learning device can encourage students to learn the material of molecular form. Research conducted by Prima et al. shows that applying media of stimulation named PhET as a learning medium can gain students' learning motivation (Prima et al., 2018). So, the guided inquiry learning tool supported by PhET simulation on the molecular shape sub-material that was developed meets the category in increasing students' learning motivation.

CONCLUSION

According to the outcomes of the analysis and discussion in this study, it is summarized that the guided inquiry learning device assisted by PhET Simulation on the molecular shape sub-material developed was declared feasible to use. This can be seen from the results of the effectiveness, practicality, and validity of guided inquiry learning tools assisted by PhET Simulation. Guided inquiry learning tools supported by PhET simulation is able to sharpen learning outcomes and student motivation and also help educators as well as students in the learning process on the molecular form sub-material.

RECOMMENDATION

Researchers hope that teachers take advantage of learning tools developed in learning activities at schools. The development of learning devices and learning media is very much needed by educators in today's modern era. Future research is expected to increase the use of current technology in the development of learning tools that are fun for students. The researcher also hopes for other researchers who want to develop learning tools to take advantage of the development of these tools to become even better learning tools.

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