



The Effect of the E-Module-Assisted Guided Inquiry Model through Student Learning Outcomes in Substance Pressure Material

Rafiq Nurhidayah Hasibuan*

Natural Science Education Study Program, Universitas Negeri Medan,
North Sumatera, Indonesia

Ridwan Abdullah Sani

Natural Science Education Study Program, Universitas Negeri Medan,
North Sumatera, Indonesia

*Correspondence author: aqifar3@gmail.com

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Abstract:

This research aims to analyze the influence and increase in student learning outcomes using the guided inquiry model assisted by e-modules through the Professional Flip PDF application on substance pressure material. The research used a quasi-experimental method with a two-group pretest-posttest design. The sampling technique uses random cluster sampling. The research sample consisted of two classes, namely the VIII-4 experimental class with 31 students and the control class VIII-2 with 29 students. The research instrument uses a learning outcomes test instrument with 20 multiple-choice questions. The results of the pretest mean value of the experimental class were 47.41 with a standard deviation of 9.02, and the average value of the control class was 41.03 with a standard deviation of 8.80. The results of learning through hypothesis testing obtained $t_{count} > t_{table}$ ($6.59 < 1671$) so that H_a is accepted and rejects H_o . In conclusion, there is an influence of the assisted guided inquiry model e-module on student learning outcomes on material pressure material.

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Introduction

The world of education has always received a sharp spotlight related to guidance in producing human resources that can impact education. Quality human resources are expected to be able to keep abreast of current developments in science and technology. Development to improve the quality of education should have an impact related to education in a better direction. Education is the right of all children, so education is considered a human right, making it freely available to all children ([Adnyani et al., 2020](#)). The educational process of students is formed with their respective expertise, so educators are said to be successful if educational goals can be achieved through the teacher's role in the learning process.

Learning is a continuous effort that produces permanent changes in a person's abilities, behavior or attitudes resulting from experience and interaction with the outside world ([Abidin, 2014](#); [Mulyasa, 2006](#); [Sanjaya, 2014](#)). This definition explains several things, including the object of the learning process, namely students or students, and the learning process occurs because of the interaction of students with their environment. The educational process in junior high school one of the subjects in junior high school, is Natural Sciences (IPA). Science is related to how to find out about natural phenomena systematically ([Zubaidah, et al., 2017](#)), so science is not only mastering a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery.

According to [Leong et al \(2015\)](#) one of the materials that are difficult to learn is substance pressure, but the concept of substance pressure is very important to master. A lack of understanding of the concept pressure can affect students' understanding of other learning related to the concept of pressure, such as reaction rate and blood pressure. It generally occurs because the teaching method is only lecturing, rarely using various methods.

Based on information obtained from an interview conducted with a science teacher at SMP Negeri 2 Percut Sei Tuan Medan, the teaching and learning process still leads to being "teacher-centred" and has not emphasized the inquiry process. The learning material still uses conventional methods, so students only listen to explanations from the teacher. The limitations of teaching materials that students have yet to obtain fully are also not optimal. Also, the teaching materials available in schools in textbooks are not based on investigation and experience, which is contained more effectively and efficiently. In addition, students' interest in books is still relatively low, which can be seen from students who rarely repeat learning and read books. The facilities at the school are equipped with supporting facilities such as computers and internet networks that are not utilized; in fact, almost all students also have cellphones or laptops at their homes.

Learning is not emphasized based on the concept of investigation carried out by students through experiments in school laboratories, so students learn a lot from rote memorization ([Abriani & Nursalam, 2020](#)). Students have not been able to discover the concepts of learning on their own in teaching and learning activities, which also make up one of the factors for students' lack of interest in learning, affecting their learning outcomes, especially in the cognitive domain. The problem in learning outcomes, especially in the cognitive domain, said the teacher, is that students'

learning outcomes are classified as low, so they do not reach the Minimum Completeness Criteria (KKM), ≥ 75 . The data obtained proves that the test scores of students who met completeness only 60% and 40% did not meet completeness, so the science learning outcomes of Class VIII students of Junior High School (*Sekolah Menengah Pertama/SMP*) Negeri 23 Medan are still considered low.

In this research, the learning model used was guided inquiry. The inquiry learning model is a learning process that begins with formulating problems, developing hypotheses, gathering evidence, testing hypotheses, drawing temporary conclusions and copying these temporary conclusions to conclusions that are believed to be true ([Nurdyansyah & Eni, 2016](#)). Implementation of learning with the guided inquiry model will run well by requiring teaching materials; one of the teaching materials that can be used for science learning with the guided inquiry model is electronic module teaching materials. Electronic modules or E-Modules are a form of media presentation of independent learning teaching materials that are systematically arranged and presented electronically ([Daryanto, 2013](#); [Suryadie, 2014](#)). Each learning activity in the module is connected with navigation in the form of links so it becomes an interactive program. E-modules can be presented in multimedia formats such as adding images, video, audio and animation ([Kurniawan & Dedi, 2021](#); [Darmasasi et al., 2013](#)). The addition of these multimedia files can enrich students' learning experiences.

Based on relevant research, using e-module-assisted guided inquiry models can improve students' learning outcomes. It is based on the results of research conducted by [Budiarti et al. \(2016\)](#), namely the use of e-module-assisted guided inquiry models that can improve student learning outcomes. The difference in this research lies in critical thinking skills through the distribution of student response questionnaires. The research results by [Eko and Imam \(2013\)](#) also use the guided inquiry model to measure science process skills on student learning outcomes. The differences of the results of the two studies that function to train science process skills and later affect learning outcomes, while the research that will be conducted looks at learning outcomes from the cognitive, affective and psychomotor domains of students through administration of pre-test and post-test as well as observation.

The module on the pressure of matter and its application in everyday life is compiled based on physics. Science subjects are very closely related to everyday life. Starting from everyday life, which is then poured into a mathematical equation. The preparation of this module is based on the idea that students can relate to and analyze the things they encounter in the Substance Pressure material in class. From the ordinary things they often encounter, they can analyze and think critically and creatively according to the challenges of the times by utilizing technology ([Arifin, 2018](#)).

Based on the above problems, it is necessary to have a model that can attract students' interest in learning natural science to overcome them. The model must follow the learning objectives and the material being taught. Inaccurate use of learning models can lead to boredom, monotony, or even students' difficulty understanding the concepts being taught.

Research Method

This research used a quasi-experimental method with a two-group pretest-posttest design. The sampling technique uses random cluster sampling ([Arikunto, 2013](#)). The population in this research were all students in class VIII SMP Negeri 2 Percut Sei Tuan, which was divided into 10 classes in the 2022/2023 Academic Year with 30 students in each class

The research sample consisted of two classes, namely the experimental class in class VIII-4, which was taught using the e-module assisted guided inquiry model with a total of 31 students and the control class in class VIII-2, which was taught using the conventional model with a total of 29 students. The research instrument was a multiple-choice learning outcome test with 20 questions and a questionnaire student activity. In measuring the validity of the instrument, it used the validity test (Product Moment Correlation), reliability test, level of difficulty and differentiability

Data collection techniques are methods used by researchers in collecting data (information). In this research, there were 2 data collected :

1. Student's learning outcome

Assessment of learning outcomes test can be formulated :

$$\text{Score achieved} = \frac{\text{Total score achieved}}{\text{Maximum total score}} \times 100$$

2. Student's activity

Student activity during learning is observed by observers and analyzed using scores. The formula used to calculate the student activity presentations is:

$$\% \text{ activity} = \frac{\text{Total score achieved}}{15} \times 100$$

Data analysis techniques in this study used the data prerequisite test, namely the normality test (*Saphiro Wilk*) and the homogeneity test (*Levene's Test*). After the data is declared normal and homogeneous, a T-test (independent sample t-test) is performed. Student activities are processed using several criteria. Giving scores according to the type of answer and based on the orientation of the expected answers, as shown in Table 1.

Table 1. Category of Student's Activity

| Activity Percentage (%) | Description |
|-------------------------|--------------|
| 80 - 100 | Very active |
| 60 - 79 | Active |
| 40 -59 | Quite active |
| 21 - 39 | Less active |
| 0 - 20 | Not active |

([Arikunto, 2013](#))

Finding and Discussion

This research was conducted to find out whether there was an influence on student learning outcomes in classes using the e-module-assisted guided inquiry model and to find out how to increase student learning outcomes using the e-module-

assisted guided inquiry model on substance-pressure material. Table 2 is the use of the inquiry model syntax in the experimental class

Table 2. Guided Inquiry Learning Syntax

| No. | Guided inquiry phase | Teacher activity | Student activity |
|-----|--|---|---|
| 1. | Opening (Open-Inovitation to inquiry open minds stimulate coriusity) | Give curiosity and create an interest in students' knowledge before asking a few questions. | Listen and understand the questions given by the teacher. |
| 2. | Internalize (Immerse-Build background knowledge connected to content discoveri interesting ideas). | Build basic knowledge by teaching students to observe things related to the material being taught, such as reading books, watching videos, telling stories, and others. | Pay attention and analyze the matters relating to the material being taught. |
| 3. | Investigate (Ekspløre-Ekspløre interesting ideas lo around dip in). | Guiding students to collect information from various relevant sources and conduct investigations | Conduct investigations and gather as much information as possible from relevant sources. |
| 4. | Identificate (Identity-Pause and ponder identity inquiry question decided direction). | Consider students' thinking and ask questions that are under student investigation. | Memberikan pertanyaan ataupun pendapat perihal materi pelajaran yang dibahas dalam penyelidikan yang dilakukan peserta didik. |
| 5. | Gathering (Gather-Gather important information go broad go deep) | Provide questions or opinions regarding the subject matter discussed in the investigations carried out by students. | Guiding students to collect important and in-depth information from investigations. |
| 6. | Make a group investigation report (Creat-Reflect on learning go beyond facts to make meaning create to communication). | Guiding students to make reports containing their group investigations and facilitating each group to develop the results of their investigations. | Make a report on the investigation results based on the facts obtained and connect with the questions given by the teacher. |
| 7. | Sharing/ Presenting (Shared-Learn from each other shared learning tell your story). | Guiding students to convey (share) the results of their investigations and listen to their friends' investigations. | Presenting the results of the investigation and listening to the presentations of other groups, and then comparing the results of the investigations with each other. |
| 8. | Evaluate (Evaluate-evaluate achievement of learning goals reflect on content reflect on process). | Evaluating the contents of the learning process and drawing conclusions from investigators. | Drawing conclusions from the investigation and connecting with the questions given by the teacher. |

([Kartika et al., 2016](#)).

The Effect of The E-Module...

A pre-test was first carried out to test the research hypothesis in the experimental and control classes to see students' initial abilities. While the post-test is given to determine the level of students' abilities after being taught with the guided inquiry model assisted by the e-module in the experimental class and the conventional model in the control class. Data on student learning outcomes before and after being taught with the e-module-assisted guided inquiry model in the experimental class, and the conventional model or using the lecture method in the control class can be seen in Table 3.

Table 3. Student Pretest and Posttest Data

| Data | Pretest | | Posttest | |
|--------------------|--------------|---------|--------------|---------|
| | Experimental | Control | Experimental | Control |
| Number of student | 31 | 29 | 31 | 29 |
| Highest score | 65 | 55 | 100 | 85 |
| Lowest score | 30 | 20 | 80 | 75 |
| Average | 47,41 | 41,03 | 89,67 | 82,75 |
| Standard deviation | 9,02 | 8,80 | 4,64 | 3,42 |

The diagram of the experimental and control classes' pretest averages in detail can be seen in Figure 1 and Figure 2.

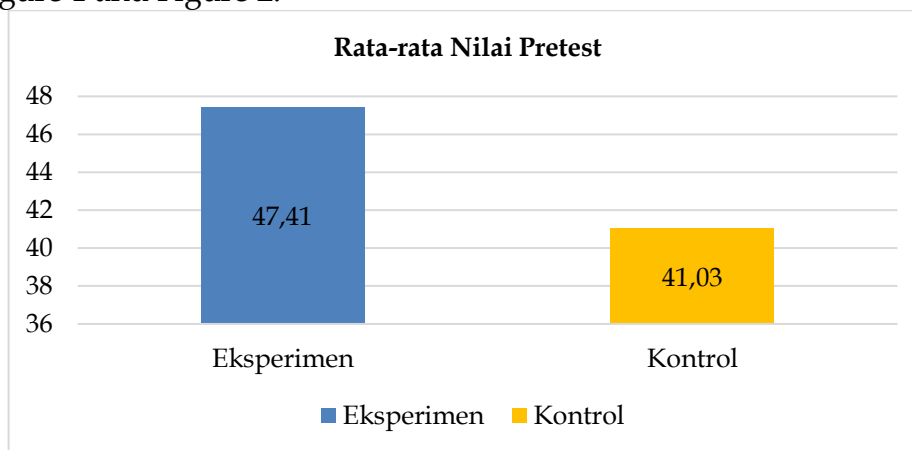


Figure 1. Diagram of Average Pre-test Score

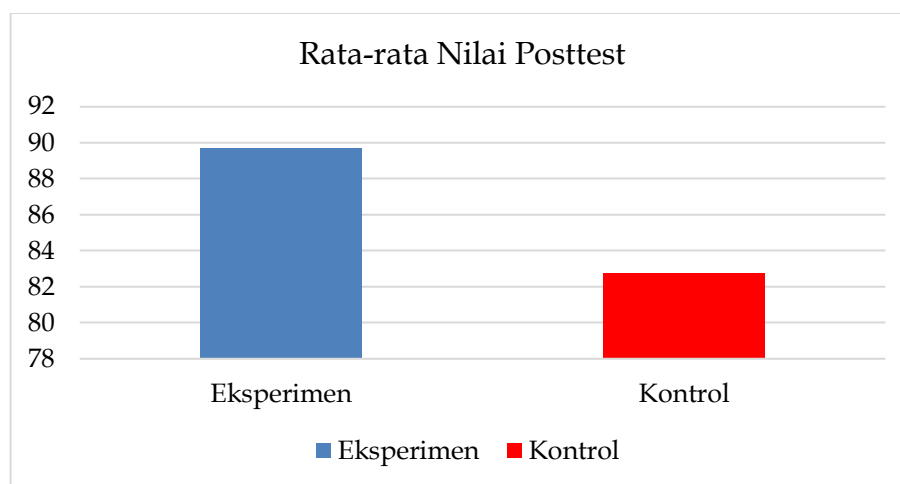


Figure 2. Diagram of Average Posttest Score

The average pre-test score for the control class was 41,73 with the highest score of 55 and the lowest score of 20, with a standard deviation of 8,80. The average post-test score for the control class was 82,75 with the highest score of 85 and the lowest score of 75 with a standard deviation of 3,42. Meanwhile, the average pre-test score for the experimental class was 47,41. with the highest score of 65 and the lowest score of 30, with a standard deviation of 9,02. The average post-test score for the experimental class was 89,67 with the highest score of 100 and the lowest score of 80, with a standard deviation of 4,64. Based on the data in Table 3, no student pre-test scores in the experimental and control classes reached minimum completeness criteria (*Kriteria Ketuntasan Minimal/KKM*) 75. From Table 3, it can also be seen that there were differences in student learning outcomes in the experimental and control classes where student learning outcomes were taught using the inquiry model guided assisted e-module on the material.

Prerequisite Test

Data prerequisite tests in both research classes include normality and homogeneity tests on learning outcomes data. The following results of the data prerequisite test for the two research classes are presented.

Normality test result

Data normality testing was carried out using the Lilifors test. The calculation of the normality test can be seen in Table 4 and Table 5.

Table 4. Result of Normality Pre-test

| Class | Pretest Data | | Hasil |
|--------------|---------------------|--------------------|--------|
| | L _{hitung} | L _{tabel} | |
| Experimental | -0,005 | 0,161 | Normal |
| Control | -0,026 | 0,161 | Normal |

Table 5. Result of Normality Posttest

| Class | Posttest Data | | Hasil |
|---------------|---------------------|--------------------|--------|
| | L _{hitung} | L _{tabel} | |
| Exsperimental | -0,013 | 0,161 | Normal |
| Control | -0,091 | 0,161 | Normal |

Based on the normality test for the experimental class, the value of $L_0 < L_{tabel}$ means that the pretest and posttest data for both classes are normally distributed.

Homogeneity Test Results

The homogeneity test determines whether the data from the two classes have a homogeneous variance, meaning whether the sample can represent the entire population. The F test carried out the homogeneity test. The homogeneity results can be seen in Table 6.

Table 6. Homogeneity Test Result

| Treatment | Deviation | F _{count} | F _{table} | α | Description |
|-----------|--|--------------------|--------------------|------|-------------|
| Pretest | S ₁ ² = (Experimental) | 1,05 | 1,87 | 0,05 | Homogen |
| | S ₂ ² = (Control) | | | | |
| Posttest | S ₁ ² = (Experimental) | 1,83 | | | |
| | S ₂ ² = (Control) | | | | |

Based on Table 6, the homogeneity results for the pre-test value are obtained at the $F_{\text{count}} 1,05$, while from the table of percentile values for the F distribution with a level of $\alpha=0,05$ and numerator dk is 30, dk the denominator is 28 ($F_{0,05}(30;28)$ the value F_{table} is obtained 1,87, because $F_{\text{count}} < F_{\text{table}}$ ($1,05 < 1,87$), it can be concluded that the *pretest* learning outcomes of students from the two samples come from homogeneous groups. Calculation of homogeneity results for the posttest value obtained $F_{\text{count}}=1,83$, while from the table of percentile values for the F distribution with a significant level $\alpha = 0,05$ dan $F_{\text{table}} = 1,87$, because $F_{\text{count}} < F_{\text{table}}$ ($1,83 < 1,87$) then it can be concluded that the *posttest* learning outcomes of the two sample students came from a homogeneous group.

Hypothesis Test Result

After the data meet the normality and homogeneity requirements, hypothesis testing is carried out by testing the differences in the experimental and control classes' posttest. The results of the t-test can be seen in Table 7.

Table 7. Calculation of Hypothesis Test

| No | Class | T_{count} | t_{table} | Conclusion |
|----|-----------------|--------------------|--------------------|---------------|
| 1. | <i>Pretest</i> | 2,79 | 1,671 | Has no impact |
| 2. | <i>Posttest</i> | 6,59 | 1,671 | Has impact |

Based on the results of the t-test on learning outcomes data as a result of the learning model, it was found that the learning outcomes of students who used the e-module guided inquiry model $89,67 \pm 21,55$. Significantly higher than the learning outcomes of students who use conventional learning models $82,75 \pm 11,76$ ($t_{\text{count}} = 6,59 > t_{\text{table}} = 1,671$). In conclusion H_a is accepted while simultaneously rejecting H_0 meaning that there is an effect of the guided inquiry model with the help of the e-module on students' learning outcomes on pressure material.

Gain Normality Test Result

The gain normality test was conducted to determine the increase in cognitive learning outcomes after being given a differential treatment. The gain normality test was carried out by calculating the total pretest and posttest values. The results of the gain normality test can be seen in Table 8.

Tabel 8. N- Gain Result

| No | Class | N-Gain | %N-Gain | Description |
|----|--------------|--------|---------|-------------|
| 1. | Experimental | 0,80 | 80% | High |
| 2. | Control | 0,70 | 70% | Average |

Table 7 shows that the experimental class has an n-gain value of 0,80 in the high category, while the control class has an n-gain value of 0,70 in the medium category. It also indicates that the experimental class has a higher increase of 80% compared to the control class, which only increased 70%.

Observation of Student Activities

The development of student activities in the experimental class experienced an increase as long as they received lessons with the guided inquiry model assisted by the e-module. The development of the activities of the experimental class students at meeting I, meeting II, meeting III, and meeting IV are in Table 9.

Table 8. Development of Experimental Class Student Activities

| Activity | Meeting I | Meeting II | Meeting III | Meeting IV |
|---------------------------|---------------|---------------|--------------|---------------|
| Identify the problem | 66,66 | 71,11 | 75,55 | 80 |
| Collect information | 54,44 | 64,44 | 68,88 | 72,22 |
| Collect experimental data | 51,11 | 56,66 | 76,66 | 80 |
| Analyze experimental data | 48,88 | 54,44 | 71,11 | 74,44 |
| Formulate conclusion | 48,88 | 57,77 | 70 | 72,22 |
| Total | 269,97 | 304,42 | 362,2 | 378,88 |
| Average | 53,994 | 60,884 | 72,44 | 75,776 |

Based on observations of the learning activities of the experimental class students shown in Table 8, the average activity of participants using guided inquiry on learning outcomes has increased from the first meeting to the fourth meeting.

Based on the test results, it was found that the learning outcomes of students who were taught with the e-module-assisted guided inquiry model were 89,67 or less 21,55. Significantly higher than the learning outcomes of students who are taught by conventional models 82,75 or less 11,76 ($t \text{ count} = 6,59 > t \text{ table} = 1,671$). In conclusion H_a is accepted while rejecting H_o , meaning that there is an influence of the guided inquiry model assisted by the e-modul on student learning outcomes in the matter of substance pressure. The difference in student learning outcomes between the experimental class and the control class each got an average pre-test score for the experimental class of 47,41, while the control class obtained an average pretest score 41,03. Then the post-test average score in the experimental class increased by 89,67, while in the control class, the average value of the post-test was 82,75. The results of the n- gain value in the experimental class were 0,80 which was in the high category. In contrast, the control class had an n-gain value of 0,70 which was in the medium category, indicating that the experimental class had a higher increase of 80% compared to the control class, which only increased 70 %.

The results of the research, which stated that applying the guided inquiry learning model could improve student learning outcomes, were in line with the research of [Hosnah, et al \(2017\)](#), which said that there was a significant influence from the guided inquiry learning model on learning outcomes and student learning activities in High school. [Nainggolan and Sinuraya \(2016\)](#); [Fitriani et al., \(2014\)](#) state that the guided inquiry learning model can improve learning outcomes and student learning activities compared to conventional learning. The results of research by [Hutahean and Siagian \(2016\)](#) showed that the average value of completeness in learning outcomes in the experimental class using the guided inquiry learning model was better than in the control class using the conventional model, and there was an increase in student activity at each meeting. The research results of [Wahyuni, et al \(2016\)](#); [Munawaroh, et al., \(2016\)](#); [Nurul \(2014\)](#) showed an effect of the guided inquiry learning model using the experimental model on student learning outcomes. The

increase in learning outcomes was higher in the experimental class using the guided inquiry model than in the control class with conventional learning. [Nuriyanti \(2016\)](#); [Sukma et al., \(2016\)](#) states that learning outcomes and student activities in the physics learning process using the guided inquiry learning model have increased

Conclusion

Based on the results of the research that has been done, the learning outcomes through hypothesis testing obtained $t_{count} > t_{tabel}$ ($6,59 < 1671$), then H_a is accepted and rejects H_o . In other words, the learning outcomes of students in the experimental class are better than those of students in the control class; the e-module-assisted guided inquiry model influences students' learning outcomes on substance pressure. Furthermore, student learning outcomes. Applying the guided inquiry model to the substance stress material, it experienced an increase from prior knowledge or pretest, which obtained a score of 47,41. After applying the guided inquiry model, the post-test result was 89,67.

Based on observations of the learning activities of the experimental class students, it was shown that the average activity of students using guided inquiry on learning outcomes increased from the first meeting to the fourth meeting. The advice is that the guided inquiry model can be an alternative in implementing science learning. It is better for future researchers when they experience problems with the lack of laboratory facilities to avoid making this an obstacle in carrying out experiments; researchers should continue to conduct experiments in or outside the classroom.

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The Effect of The E-Module...

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