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Implementation of Hydrocarbon Teaching Materials Integrated with Spiritual Values Using the POGIL Model to Improve Learning Outcomes of Grade XI Students Viewed from Learning Interest

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Abstract: Implementation of Hydrocarbon Teaching Materials Integrated with Spiritual Values Using the POGIL Model to Improve Learning Outcomes of Grade XI Students Viewed from Learning Interest . This research aims to evaluate the effect of hydrocarbon teaching materials based on spiritual values on student learning outcomes, differences in spiritual attitudes before and after learning, and the effect of learning interest on learning outcomes. The study used a quasi-experimental method with a quantitative approach and involved two randomly selected classes. The instruments used included multiple-choice tests to evaluate learning outcomes and non-test questionnaires to measure students' spiritual attitudes and learning interests. Data analysis was carried out by testing normality, homogeneity, linearity, and hypothesis testing using independent t-tests, paired t-tests, and simple linear regression. The results showed that teaching materials based on spiritual values with the POGIL model had a significant effect on student learning outcomes (sig. 0.001 ≤ α 0.05). There was a significant difference in spiritual attitudes before and after learning (sig. 0.000 ≤ α 0.05). In addition, learning interest influences learning outcomes, with a contribution of 25% in the experimental class (sig. 0.002 ≤ α 0.05) and 39.4% in the control class (sig. 0.000 ≤ α 0.05).

Keywords: Teaching materials, spiritual attitudes, learning outcomes, learning interests

Abstrak: Implementasi Bahan Ajar Hidrokarbon Terintegrasi Nilai Spiritual dengan Model POGIL untuk Meningkatkan Hasil Belajar Siswa Kelas XI Ditinjau dari Minat Belajar. *Penelitian ini bertujuan mengevaluasi pengaruh bahan ajar hidrokarbon berbasis nilai spiritual terhadap hasil belajar siswa, perbedaan sikap spiritual sebelum dan sesudah pembelajaran, serta pengaruh minat belajar terhadap hasil belajar. Penelitian menggunakan metode eksperimen semu dengan pendekatan kuantitatif* dan *melibatkan dua kelas yang dipilih secara acak. Instrumen yang digunakan meliputi tes pilihan ganda untuk evaluasi hasil belajar dan angket non-tes untuk mengukur sikap spiritual serta minat belajar siswa. Analisis data dilakukan dengan uji normalitas, homogenitas, linearitas, serta uji hipotesis menggunakan t-test independen, t-test berpasangan, dan regresi linier sederhana. Hasil penelitian menunjukkan bahwa bahan ajar berbasis nilai-nilai spiritual dengan model POGIL memiliki pengaruh signifikan terhadap hasil belajar siswa (sig. 0,001 ≤ α 0,05). Terdapat perbedaan signifikan sikap spiritual sebelum dan sesudah pembelajaran (sig. 0,000 ≤ α 0,05). Selain itu, minat belajar berpengaruh terhadap hasil belajar, dengan kontribusi 25% pada kelas eksperimen (sig. 0,002 ≤ α 0,05) dan 39,4% pada kelas kontrol (sig. 0,000 ≤ α 0,05).*

Kata kunci: *Bahan ajar, nilai spiritual, hasil belajar, minat belajar*

- **INTRODUCTION**

Education in Indonesia is often a topic of discussion. As a very crucial basic element, education holds a vital role in shaping the course of an individual's life. Its main goal is to help someone improve their quality of life through the learning process and experiences generated from various disciplines (Renna, 2022). Education holds a crucial role in character development and morals of individuals, which then become the foundation for the success of a society. The main elements of social ethics and morals, such as values, are basic beliefs that shape how students view the world. This includes principles such as honesty, integrity, empathy, fairness, and responsibility. These values help society determine what is considered good or bad in their social relationships (Kamaruddin et al., 2023).

Along with the advancement of technology and science in the 21st century, innovation in learning approaches has become a necessity. Changes in educational paradigms, such as curriculum updates and the use of media and technology, are now the main characteristics of the modern education system. In this era, deep cognitive skills are needed to understand increasingly complex life. The 21st century learning model focuses on a learner-oriented approach, in line with Indonesia's educational goals to produce a generation that is Prepared to confront the challenges of the industrial era 4.0. The concept of "4C" in 21st century learning, This encompasses skills such as communication, teamwork, analytical thinking, problem-solving, as well as creativity and innovation, is the main pillar. Learners are expected to be able to communicate effectively, work together in teams, demonstrate leadership, have adaptability, and appreciate diversity, they are also required to think critically, analyze situations, and solve problems independently with structured logic (Rahayu et al., 2022).

To face the challenges of change at the local, national, and global scales, the national education system must be able to guarantee fair access to education, improve quality, and manage education with relevance and efficiency. Therefore, educational reform needs to be carried out continuously, in a structured and intentional approach, in line with the provisions outlined in the 1945 Constitution of the Republic of Indonesia, including Articles 20, 21, 28C paragraph (1), 31, and 32, which are implemented through Law Number 20 of 2003 on the National Education System, the objective of national education is to cultivate students with spiritual strength and independence, intelligence, noble morals, and skills that are useful for their own well-being, as well as for society, the nation, and the state, grounded in Pancasila and the 1945 Constitution, and deeply rooted in national religious and cultural principles (Hermanto, 2020).

Education in Indonesia still faces major challenges in its implementation. Although the government has revised the curriculum several times in the last decade, the learning process is often too oriented towards mastering science, while social, moral, and spiritual aspects tend to be neglected. Based on the analysis of teacher needs for textbooks, it was found that 22% of teachers had not integrated verses from the Qur'an in chemistry learning. This indicates a gap in the application of spiritual values in education (Mujala et al., 2022). This indicates that, despite efforts to prepare a superior generation in the 21st century, there is still a great opportunity to improve the quality of holistic education, which includes intellectual, emotional, moral and spiritual aspects (Iberahim et al., 2017). This gap highlights the need for a more integrated approach that addresses both the cognitive and spiritual dimensions of education.

If we look more closely, of all the educational goals, faith and piety to God Almighty occupy the most important position and become the basis for achieving other goals. This is reflected in the order mentioned earlier in the law. In addition, the values of faith and piety have a great influence on individual behavior. Faith and piety can only develop through the right educational process. Without both, achieving other educational goals will not provide true benefits to humanity, both in this world and in the hereafter. In fact, noble character can only be formed if faith and piety to God Almighty are realized (Rifai & Rusdiati, 2021).

The level of achievement of national education goals in accordance with the mandate of the law is still far from expectations, especially in terms of developing skilled, intelligent, and expert human resources. In fact, when measured through indicators of faith, piety, and noble character, there is still a fairly large gap. Several cases of moral decadence that have occurred reveal a mismatch between intellectual and spiritual progress, as well as between cognitive abilities and the values of faith, piety, and noble character. This is likely caused by the gap between religion and science, where both are often seen as two separate things. In fact, if these two aspects can be integrated well, education can form individuals who are not only intellectually intelligent but also strong in morals and spirituality (Darmana et al., 2013).

In the world of education, the study of integration between science and Islamic knowledge is very relevant, because the integration will produce general education that also contains religious values. The integration of Islamic education and spiritual values in the teaching and learning process must be carried out without separating the two. Currently, many people still think that general knowledge and religious knowledge are not closely related (Fajrin & Muqowim, 2020).

The education system in Indonesia has so far emphasized more on developing students' cognitive knowledge that can be measured through exams, without paying attention to spiritual aspects such as faith and piety. Many teachers today are more focused on teaching tasks, while aspects of educating and training character values are often neglected (Zakaria et al., 2020). In the learning process, spiritual perspectives are often ignored, resulting in students not being able to optimize their full potential. As a result, character value development is often neglected in the educational environment. Therefore, greater attention is needed to the spiritual and character aspects of students, so that education can provide a more comprehensive and sustainable impact on future generations (Darmansyah, 2014).

Chemistry is a crucial subject for students as it enhances cognitive abilities and encourages the development of creative thinking patterns. Effective chemistry learning allows students to understand the scientific process well and experience meaningful learning experiences. To achieve this goal, teachers need to do two main things during the learning process: connecting chemical concepts to everyday life and encouraging students to independently understand what they are learning (Cahyaningsih et al., 2021). However, many students face difficulties in understanding chemistry lessons. This difficulty is caused by chemical concepts that are very abstract and complex, and require deep understanding. In addition, many students do not like chemistry because it is considered difficult and boring (Prayunisa, 2022).

Some of the difficulties faced by students in learning chemistry include a lack of good understanding of chemistry learning methods, difficulty in connecting various concepts, and the need for logic, mathematics, and language skills, which often cause students to experience obstacles when learning chemistry (Priliyanti et al., 2021). To

achieve the desired basic competencies in the classroom learning process, it is very important to have adequate learning resources. These resources include teachers, textbooks, and facilities and infrastructure. However, in practice, problems often arise, especially related to textbooks. The role of teachers has transformed from being a source of learning to being more of a facilitator. Therefore, guidebooks and teaching materials are very necessary to overcome the limitations of teachers in managing classroom learning and the limitations in students' absorption (Wulantina, 2020).

In the field of chemistry, there are many materials that discuss order and beauty that ultimately lead to respect for the Creator. If we can dig deeper into the meaning behind the chemical phenomena, we will find many religious values that are important for students as provisions in their lives. Integrating spiritual values into teaching materials will not reduce the scientific essence of science itself. On the contrary, this is the right step because it restores the unity between sharia and nature. By applying religious values in chemistry learning, especially in the concept of Hydrocarbons, it is hoped that it can instill the value of faith in students and connect it with science and technology, thus forming a positive attitude in their daily lives. If t he spiritual dimension of religion is included in the study of chemistry or science, this will not reduce its scientific validity, but will complement and strengthen each other, and become a means to achieve faith and piety (Darmana A, 2016). Integration of spiritual values in chemistry learning can be done by designing teaching materials that specifically include spiritual values in them. These teaching materials make it easier for students to follow lessons more easily and effectively. Educators need these teaching materials to guide their students in the learning process (Zakaria et al., 2020).

The selection of an interesting learning model also plays an important role in the success of the learning process. One model that can improve learning outcomes is Process Oriented Guided Inquiry Learning (POGIL). This model is based on the theory of constructivism, which encourages students to actively seek meaning and develop knowledge through their own experiences. POGIL emphasizes critical and analytical thinking skills, so that students can seek and find solutions to problems independently (Ardhana, 2020). POGIL is designed to increase active participation of students, making them the center of learning, and helping them develop their problem-solving thinking skills. This model consists of five structured and directed stages, To ensure that learning is more impactful and streamlined. In stages such as exploration and discovery of concepts, students are expected to be able to recognize and process information until they find the intended concept. Research shows that the application of this model can improve students' cognitive learning outcomes and have a positive impact on the learning process (Putri & Gazali, 2021).

Research conducted by Memah shows that the POGIL learning model has a positive impact on student learning outcomes in acid-base titration material. Based on the comparison of pretest and posttest results, there was a significant increase in student learning outcomes after the implementation of the POGIL model. The average posttest the results of students in the experimental class reached 81.80, higher than the average posttest score of students in the control class which was only 71.53. These results indicate that the implementation of the POGIL model is effective in improving student understanding and learning outcomes in acid-base titration material (Anita et al., 2020).

There are two factors that influence the learning process, namely internal and external factors. Internal factors include physical aspects, such as health, and

psychological aspects, such as talent, interest, intelligence, and readiness. One important psychological component is interest. Someone who is not interested in a subject may have difficulty learning well. Interest is a psychic expression that shows deep interest in a subject topic that is considered interesting. Interest in learning is a strong drive that influences the way a person learns, depending on the individual's abilities. Concentration in learning is also important, because when students have great interest, they tend to be more motivated to learn intensely (Zega & Darmana, 2019).

This research is important to answer the challenges of education that still faces gaps in integrating spiritual values with science, especially in chemistry learning. Although various approaches and learning models have been applied, the spiritual aspect is often neglected, so that learning tends to focus on the cognitive aspect only. This causes less than optimal character formation of students, such as self-confidence, perseverance, and ethics that are balanced with intellectual abilities. The knowledge gap can be seen from the still low application of chemistry teaching materials based on spiritual values, even though the potential for integration is great in building students' understanding of the relationship between science, technology, and faith. In addition, students' interest in learning chemistry is also still low, which has an impact on suboptimal learning outcomes.

Based on interviews with chemistry teachers at SMA Negeri 1 Percut Sei Tuan, the results of chemistry learning showed relatively low scores because not all students achieved scores above the KKM. Hydrocarbon learning at the school uses textbooks as teaching materials, but the books are inadequate because they only cover carbon compound test material. As a result, teachers need to find additional teaching materials to teach hydrocarbon material. In addition, the existing teaching materials are not effective in improving student learning outcomes, interests, and motivation. In chemistry learning, teachers have used various models, such as project-based learning, technology, and collaborative learning, but many students are still less interested in chemistry subjects. This can be influenced by the spiritual attitude of students who easily get bored and give up when facing difficulties, as well as the lack of politeness in interacting with teachers. However, teachers still try not to force certain methods and continue to provide motivation so that students remain enthusiastic in participating in learning. Based on the background explained above, research needs to be conducted to answer the challenges of education that still faces gaps in integrating spiritual values with science, especially in chemistry learning. This study aims to advance knowledge through the development of hydrocarbon teaching materials based on spiritual values applied using the Process-Oriented Guided Inquiry Learning (POGIL) learning model. This approach is not only focused on improving cognitive learning outcomes, but is also designed to strengthen students' spiritual aspects, so that learning becomes more holistic and meaningful. In addition, this study will explore how students' learning interests influence the success of implementing these teaching materials, so that they can provide new contributions to the design of chemistry learning that is more effective and relevant to the needs of students in the modern era.

• METHOD

This research was conducted at SMA Negeri 1 Percut Sei Tuan. This research was conducted in the odd semester of the 2024/2025 academic year. The subjects of this study were students of class XI IPA in the 2024/2025 academic year. The type of research used was a quasi-experiment that aims to reveal causal relationships by involving control and experimental groups (Abraham & Supriyati, 2022). Sampling was carried out using a

random sampling technique, namely and selected class XI Mantalfor as the experimental class and class XI Matlansos as the control class, each consisting of 35 students. The research variables include both independent and dependent variables. The independent variables in this study are integrated hydrocarbon teaching materials, spiritual values and learning interests (X) while the dependent variables are hydrocarbon learning outcomes and students' spiritual attitudes (Y). The test instrument is a tool to measure student learning outcomes (Azizah et al., 2023). Before the questions were tested, the questions were first tested on 35 students of class XI Matlanraf to determine the extent to which the instrument had met the requirements in terms of difficulty level, discriminatory power, validity, distractors, and reliability.

Research Design

This research employs the Nonequivalent Control Group Design model, which includes two sample groups: the experimental group and the control group.

Table 1. Research Design 1

Group	Pre-tes	Treatment	Postest
Experiment	T1	X1	T2
Control	T1	X2	T2

Description:
T1: Giving an initial test (Pretest)
T2: Giving a final test (Posttest)
X1: Learning using integrated spiritual value textbooks with the POGIL model.
X2: Learning using SMA/MA textbooks for students with the POGIL learning model.

Table 2. Research Design 2

Kelompok	Before	After
Experiment	T1	T2

Description:
T1Students' spiritual attitudes before the implementation of hydrocarbon teaching materials based on spiritual values through the POGIL learning model.
T2: The spiritual attitudes of students follow the application of hydrocarbon teaching materials that integrate spiritual values through the POGIL learning model.

Table 3. Research Design 3

Learning Interest	X
Learning Outcome	Y

Description:
X : Learning Interest
Y : Learning Outcome

Research Instrumens

The research instruments used include a hydrocarbon learning outcome test totaling 40 test items and a non-test instrument in the form of a spiritual attitude questionnaire totaling 20 statement items, and a learning interest questionnaire totaling 15 statement items. The learning outcome test was first validated by an expert validator and tested on class XII Matlanraf students, while the spiritual attitude questionnaire and learning interest questionnaire were validated by an expert validator, namely a lecturer before being used. The learning outcome test was conducted twice, namely pre-test and post-test. The spiritual attitude questionnaire was given to the experimental class before and after learning, while the learning interest questionnaire was given before learning began in the experimental and control classes.

- **RESULT AND DISCUSSION**

RESULT

1. Research Instrument Analysis

The research instrument consists of an objective test instrument of 40 multiple-choice questions with five answer choices, a non-test instrument of a student's spiritual attitude questionnaire, and a Likert-scale-based learning interest questionnaire. The objective test includes indicators related to hydrocarbon material, while the questionnaire includes indicators of spiritual attitude and learning interest. This instrument was validated by a chemistry lecturer at UNIMED, then the test instrument was tested in class XII Matlanraf SMAN 1 Percut Sei Tuan to measure the level of difficulty, discrimination, validity, constructors, and reliability.

Difficulty Level

The analysis of difficulty level helps in evaluating the appropriateness of the questions in terms of their difficulty. The majority of questions being easy aligns with a well-crafted test, ensuring accessibility for students (Smith et al., 2018). Questions that are considered good are those that are neither too easy nor too difficult. Based on the difficulty level test of 40 questions, the results showed that 6 questions were classified as medium, 30 questions were easy, and 4 questions were difficult.

Discriminatory power

Discriminatory power refers to the ability of questions to distinguish between students with high and low levels of ability (Gheyssens et al., 2022). An analysis of 40 questions revealed that 35 of them met the criteria for discriminatory power, while 5 questions (numbers 11, 14, 24, 33, and 34) did not meet the criteria. In terms of discriminatory power, 6 questions were classified as very good, 20 questions were good, 9 questions were sufficient, and 5 questions were not good.

Test Validity

The validity of test items refers to the extent to which the test can measure precisely and accurately according to the objectives to be measured, where each test item must provide results that are in accordance with these objectives (Saputra et al., 2022). The analysis of the validity of the test items was carried out using the product moment correlation with a total of 35 students and a significance level of 5% ($\alpha = 0.05$), which

produced an rtable of 0.334. The results of the analysis showed that 28 of the 40 test items were declared valid because the calculated r value was > 0.334.

Distractor

Distractors are answer choices other than the correct answer. Based on the analysis of 40 questions with five answer choices (a, b, c, d, e), there were several questions that were accepted and rejected. The majority of answer choices were declared accepted, indicating that most of the answer choices functioned well as both correct answers and distractors. However, several answer choices were rejected, namely option C in questions 1, 31, and 40, which showed weakness as a distractor. Option D was also rejected in questions 1, 2, 37, and 40, indicating the ineffectiveness of this option as a distractor. In addition, option E was rejected in questions 2, 22, and 37, indicating that this option was also ineffective as a distractor.

Test Reliability

Reliability refers to how consistently a measuring instrument produces the same results. To test reliability, Microsoft Excel and the Kuder-Richardson (KR-20) method were used. The calculation produced an r11 value of 0.84, with a significance level of $\alpha = 0.05$ and an rtable of 0.334, indicating that the test instrument is reliable and possesses high reliability. With all met requirements, this test instrument is suitable for data collection in research. The study used 20 questions, specifically questions numbered 3, 4, 5, 6, 8, 10, 12, 16, 17, 18, 20, 21, 22, 23, 25, 27, 30, 32, 38, and 39.

2. Data On Student Learning Outcomes, Spiritual Attitudes, and Learning Interests

The research data were obtained through learning outcome tests, spiritual attitude measurements, and students' learning interests in Hydrocarbon material. Before the learning began, a pre-test was conducted in the experiment class and the control class, and both classes were also given a learning interest questionnaire to measure the extent of students' interest in chemistry subjects. Furthermore, each class received distinct treatments throughout the learning process. At the conclusion of the lesson, a post-test was given to both classes to evaluate students' learning outcomes. In addition, in the experiment class, spiritual attitudes were measured using questionnaires before and after learning.

Student Learning Outcomes

Table 4. Description of Learning Outcome Statistics

Class	Treatment		%N-Gain
	Pre-test	Post-test	
Experiment	44,14	89.71	81,24%
Control	31,71	82.57	74,23%

According to Table 4, the average pre-test and post-test scores in the experimental class were 44.14 and 89.71, respectively, reflecting an improvement in student learning outcomes following the use of hydrocarbon teaching materials integrated with spiritual

values. In contrast, the average pre-test and post-test scores in the control class were 31.71 and 82.57, which also showed an increase although not as large as that in the experimental class. The results of the N-Gain calculation revealed that the average N-Gain score in the experiment class reached 0.8124 or 81.24%, which is included in the high category, while in the control class the average N-gain score was 0.7423 or 74.23%, which is also included in the high category.

Figure 1 illustrates the disparity in the average learning outcomes between the experimental class and the control class.

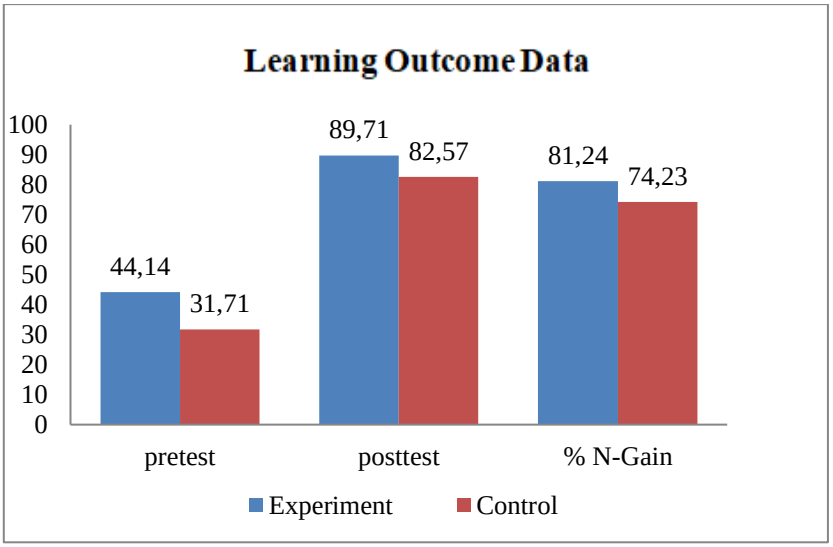

Figure 1. Diagram of students' learning outcomes

Spiritual Attitudes

In the experiment class, before being given treatment, students first filled out a questionnaire to measure their spiritual attitudes before learning began. After learning was completed, the same questionnaire was given back to students to measure their spiritual attitudes after treatment. Furthermore, the results of the questionnaire were scored and the average was calculated to obtain an overview of changes in students' spiritual attitudes. The following is a description of the data regarding students' spiritual attitudes in the experimental class.

Table 5. Description of Spiritual Attitudes Statistics

Class	Treatment	Average
Eksperiment	Before	81,18
	After	88,46
	Improvement	40,54%

Based on the data description in Table 5, the experimental class that uses integrated hydrocarbon teaching materials with spiritual values shows an average value of students' spiritual attitudes before learning of 81.18, while after learning it increases to 88.46. The increase in students' spiritual attitudes in this experimental class reached 0.4054, which is included in the moderate category. This shows an increase in the average spiritual attitude of students after the learning process took place.

The diagram of the Average Spiritual Attitude of Students before and after learning can be seen in Figure 2.

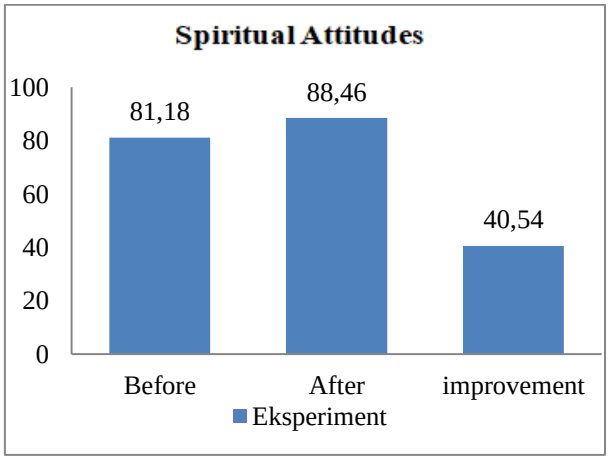

Figure 2. Diagram of Students' Average Spiritual Attitudes

Learning Interests

Students' interest in learning chemistry was measured before learning using a questionnaire to determine their level of interest in learning. The questionnaire was then assessed and the average score was calculated.

Table 6. Description of Learning Interests Statistics

Class	Average	Category
Eksperiment	74,066	High interest
Control	69,606	High interest

Based on the data description in Table 6, the average learning interest of students in the experimental class reached 74.066, which shows that students in this class generally have a high interest in learning chemistry. On the other hand, the average learning interest of students in the control class was 69.606, which also shows a high interest in learning chemistry. The comparison of the average learning interest values between students in the experimental class and the control class is shown in Figure 3.

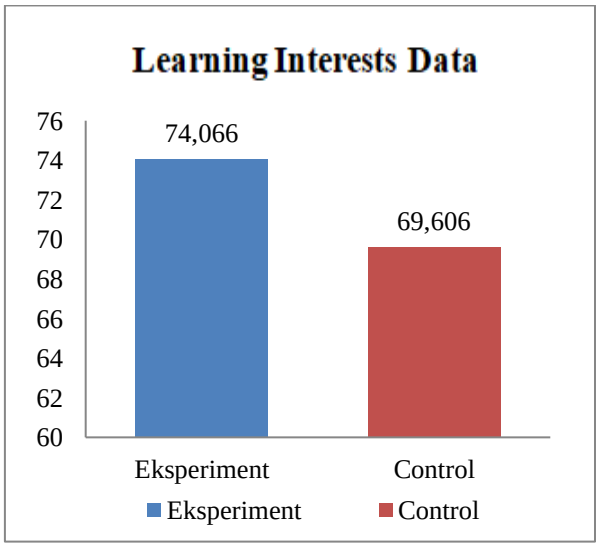

Figure 2. Diagram of Students' Average Learning Interest

3. Normality Test

The normality test aims to determine whether the data obtained has a normal distribution and comes from the same population. The test was conducted using the IBM SPSS Statistics 21 For Windows program with the Shapiro-Wilk method at a significance level of 0.05. Data is considered normally distributed if the significance value (sig) is >0.05. Conversely, if the significance value (sig) ≤ 0.05, then the data is not normally distributed.

Normality Test of Student Learning Outcomes

The data from the normality test for improving learning outcomes in the experiment and control classes can be seen in Table 7.

Table 7. Results of Normality Test on Student Learning Outcomes Improvement

Class	Teaching Materials	Data Source	Shapiro-Wilk (Sig)	Description
Eksperiment	Integrated hydrocarbon teaching materials spiritual values	N-Gain	0,580	Normal
Control	High school student handbook	N-Gain	0,259	Normal

Based on Table 7, the results of the analysis show that the significance value of the increase in learning outcomes in the experimental class is 0.580, while in the control class it is 0.259. Both significance values of the pre-test and post-test data, both in the experimental and control classes, are greater than 0.05. This indicates that the data is normally distributed.

Normality Test of Students' Spiritual Attitudes

The data from the results of the normality test of the spiritual attitudes of students in the experimental class can be seen in Table 8.

Table 8. Results of Normality Test on Increasing Students' Spiritual Attitudes

Class	Shapiro-Wilk				
	Data Source	Statistic	df	Sig.	Description
Eksperiment	Before	0,974	35	0,575	Normal
	After	0,944	35	0,074	Normal
	Improvement	0,971	35	0,473	Normal

Based on Table 8, the significance value before learning is 0.575, while after learning is 0.074. In addition, the significance value of increasing spiritual attitudes was recorded at 0.473. Because the significance value of spiritual attitudes in the experimental class, both before and after learning, and their increase, is greater than 0.05, this indicates that the data is normally distributed.

Normality Test of Student Learning Interests

The data from the normality test of learning interest in the experimental class and control class can be seen in Table 9.

Table 9. Results of Normality Test on Students' Learning Interest

Class	Shapiro-Wilk				
	Data Source	**Statistic**	**df**	**Sig.**	**Description**
Eksperiment	Before	0,961	35	0,252	Normal
Control	Before	0,985	35	0,902	Normal

Based on Table 9, the results show that the significance value of learning interest in the experimental class is 0.961, while in the control class it is 0.902. Because the significance value of students' learning interest before learning in both classes is greater than 0.05, this indicates that the data is normally distributed.

4. Homogenity Test

Homogeneity test is conducted to determine whether the data has homogeneous variation or not. In this study, homogeneity test was conducted using SPSS software version 21 with Levene statistical test method at a significance level of 0.05. Decision-making criteria are based on the test results: if the significance value (sig) > 0.05, then the data is considered homogeneous, while if sig < 0.05, the data is declared non-homogeneous. The test results are presented in Table 10.

Table 10. Results of the Homogeneity Test of Student Learning Outcomes

Data Source	Levene statistik	df1	df2	Sig.	**Description**
N-Gain	1,682	1	68	0,199	Homogeneous

Table 10 shows that the significance value of the data on the increase in learning outcomes between the experimental class and the control class is 0.199, which is greater than 0.05. This indicates that the data has a homogeneous nature.

5. Linearity Test

The linearity test aims to determine whether there is a linear relationship between the dependent variable and the independent variable. In this study, the data linearity test was carried out using SPSS version 21 with a significance level of 0.05. The criteria used are if the significance value in Deviation from Linearity > 0.05, then it can be concluded that there is a significant linear relationship between the two variables.

Linearity Test of Learning Interest with Learning Outcomes

The data from the results of the linearity test of learning interest with learning outcomes can be seen in Table 11.

Table 11. Results of Linearity Test Analysis of Interest with Learning Outcomes

Class	**F Calculate**	**F Table**	**Sig. *Deviation from Linearity***	**Description**

Eksperiment	0,611	2,27	0,830	Linear
Control	0,314	2,63	0,990	Linear

Based on Table 11, in the experimental class, the calculated F value of 0.611 is smaller than the F table of 2.27, which indicates a linear relationship between learning interest and increased learning outcomes. In addition, the significance value of Deviation from Linearity in the experimental class of 0.830, which is greater than 0.05, confirms that the relationship is significantly linear. Meanwhile, in the control class, the calculated F value of 0.314 is smaller than the F table of 2.63, also indicating a linear relationship between learning interest and increased learning outcomes. The significance value of Deviation from Linearity in the control class of 0.990, which is greater than 0.05, confirms that the relationship is also linearly significant.

6. Hypothesis test

Hypothesis 1

Data analysis was carried out systematically using SPSS version 21 after ensuring that the data were normally distributed and the variations were homogeneous. The Independent Sample t-test was carried out with an error rate of 5% and a confidence level of 95% ($\alpha = 0.05$). The testing criteria are as follows: if the sig value (2-tailed) $\leq \alpha$ (0.05), then Ha is accepted and Ho is rejected; conversely, if the sig value (2-tailed) $> \alpha$ (0.05), then Ha is rejected and Ho is accepted. Hypothesis testing uses learning outcome improvement data (N-gain), because the pre-test data between the two classes showed a significant difference. The test results are presented in Table 13.

Tabel 13. Results of Hypothesis Test Analysis of Student Learning Outcomes

	Independent Sampel t test				
	t	**df**	**Sig. (2-tailed)**	**Mean Disserence**	**Description**
N-Gain	3,493	68	0,001	0.07011	Ha accepted

Table 13 shows the Sig. (2-tailed) value of 0.001. Based on the hypothesis test criteria, because the significance value $\leq \alpha$ (0.05), then Ha is accepted and Ho is rejected. Therefore, in the first hypothesis it can be concluded that Ha is accepted, which means there is a significant influence of hydrocarbon teaching materials integrated with spiritual values on student learning outcomes. The results of the study showed that students who were taught using hydrocarbon teaching materials integrated with spiritual values experienced a higher increase in learning outcomes compared to students who used the Student Handbook.

Hypothesis 2

The test was conducted using the paired sample t-test method at a 5% error rate after ensuring that the data were normally distributed, using a threshold value of 75 as a good criterion. The test criteria are: if the Sig. (2-tailed) $\leq \alpha$ (0.05), then Ha is accepted and Ho is rejected; while if the Sig. (2-tailed)$> \alpha$ (0.05), then Ha is rejected and Ho is accepted. The test results are presented in Table 14.

Table 14. Results of Spiritual Attitude Hypothesis Test Analysis

	Paired Sample T-Test

	t	df	Sig. (2-tailed)	Description
Spiritual Attitude	-7.579	34	0,000	Ha accepted

Table 14 shows the Sig. (2-tailed) value of 0.000. In accordance with the hypothesis testing criteria, if the Sig. (2-tailed) value ≤ α (0.05), then Ha is accepted and Ho is rejected. Thus, in the second hypothesis it can be concluded that Ha is accepted, which indicates a significant difference in students' spiritual attitudes before and after learning using integrated hydrocarbon teaching materials with spiritual values. This indicates that hypothesis 2 is accepted.

Hypothesis 3

Data analysis was conducted systematically using a simple linear regression test with a 5% error rate and a 95% confidence level (α = 0.05), after ensuring that the data met the requirements for normality and linearity. The test criteria state that if the significance value ≤ α (0.05), then Ha is accepted and Ho is rejected. Conversely, if the significance value > α (0.05), then Ha is rejected and Ho is accepted. Hypothesis testing was conducted based on data on learning outcome improvement (N-gain) and data on student learning interest in both classes. The test results are shown in Table 15.

Table 15. Results of Hypothesis Test Analysis of Interest on Learning Outcomes

Class	***Simple linear regression***				
	R Square	***unstandardized coefficients* (B)**		Sig.	Description
		a	b		
Eksperiment	0,250	0,428	0,005	0,002	Ha accepted
Control	0,394	0,370	0,005	0,000	Ha accepted

Table 15 shows that in the experimental class, the R Square value of 0.250 indicates that learning interest contributes 25% to student learning outcomes, while the remaining 75% is influenced by other factors, such as teaching methods, learning environment, or individual abilities. Based on the unstandardized coefficients table, the constant value (a) is 0.428 and the regression coefficient (b) is 0.005. Thus, the regression equation for the experimental class is Y = 0.428 + 0.005X. The regression coefficient (b) shows that every 1% increase in learning interest will increase learning outcomes by 0.005. The significance value listed in the table is 0.002, which is smaller than α (0.05), so Ha is accepted and Ho is rejected, indicating a significant effect of learning interest on student learning outcomes.

Meanwhile, in the control class, the R Square value is higher, which is 0.394, which means that learning interest contributes 39.4% to student learning outcomes, while the remaining 60.6% is influenced by other factors. Based on the unstandardized coefficients table, the constant value (a) is 0.370 and the regression coefficient (b) is 0.005. So, the regression equation for the control class is Y = 0.370 + 0.005X. The regression coefficient (b) shows that every 1% increase in learning interest will increase learning outcomes by 0.005. The significance value in the table is 0.000, which is smaller than α (0.05), so Ha is accepted and Ho is rejected, indicating a significant effect of learning interest on student learning outcomes.

- **DISCUSSION**

This research was conducted at SMA Negeri 1 Percut Sei Tuan in the 2024/2025 academic year with a population of all students of class XI IPA consisting of six classes. The research sample was selected randomly, namely class XI Matlanfor as the experimental class and XI Matlansos as the control class. The experimental class used hydrocarbon teaching materials based on spiritual values, while the control class used a class XI student handbook. Learning in both classes was carried out using the POGIL (Process Oriented Guided Inquiry Learning) model on hydrocarbon material.

The research instruments included a multiple-choice test of 40 questions, a spiritual attitude questionnaire with 20 statements, and a learning interest questionnaire with 15 statements based on a Likert scale. Of the 40 questions tested, 35 questions were declared feasible after going through validation, difficulty level test, discrimination power, distractor analysis, and reliability test with a KR-20 value of 0.84 (high category). This test was used for the pretest and posttest in both classes.

In the initial stage, a pretest was conducted to measure students' initial abilities. The pretest results showed an average value of 44.14 for the experimental class and 31.71 for the control class. A questionnaire on spiritual attitudes and learning interests was also given before learning. The initial results showed an average spiritual attitude of students in the experimental class of 81.18 and an average learning interest of students in the experimental class of 74.066, while in the control class it was 69.606.

Learning was conducted in four meetings using validated POGIL-based LKPD. LKPD is designed to encourage students to explore concepts through group discussions, with specific roles such as leaders, recorders, and reporters. At the end of learning, a posttest was conducted to measure learning outcomes and a spiritual attitude questionnaire to evaluate changes in student attitudes in the experimental class.

The posttest results showed an average value of 89.71 for the experimental class, while 82.57 for the control class. The N-gain calculation showed an increase in learning outcomes in the experimental class of 0.8124 (high category) and 0.7423 for the control class (high category). The spiritual attitude of students in the experimental class also increased, with an average N-gain of 0.454.

Data analysis included normality, homogeneity, and linearity tests. The test results showed that the data met the assumptions of parametric statistics. Data on learning outcomes, spiritual attitudes, and learning interests were normally distributed (significance > 0.05), data variance was homogeneous (Levene's test, significance 0.199 > 0.05), and the relationship between learning interests and learning outcomes was linear (significance Deviation from Linearity > 0.05).

The Influence of Integrated Hydrocarbon Teaching Materials with Spiritual Values on Student Learning Outcomes

The results of the hypothesis test using the Independent t-test in both classes showed a Sig. (2-tailed) value of 0.001. Based on the hypothesis testing criteria, if the significance value $\leq \alpha$ (0.05), then Ha is accepted and Ho is rejected. Thus, Ha is accepted, which means that there is a significant effect of the use of integrated hydrocarbon teaching materials with spiritual values through the POGIL model on student learning outcomes. This research shows that the increase in student learning outcomes using integrated hydrocarbon teaching materials with spiritual values is higher than students using SMA/MA handbooks. This is due to the integration of spiritual values in teaching

materials that are able to attract students' interest, increase their involvement during the learning process, and encourage better learning outcomes.

The results of this study are in line with the findings of Heppy Okmarisa, Ayi Darmana, and Retno Dwi Suyatni (2016), which show a significant difference in student learning outcomes using integrated chemistry teaching materials with spiritual values compared to standard teaching materials. The integration of spiritual values provides a deeper and more relevant dimension, while the application of the POGIL model encourages students to be actively involved, think critically, and work together in groups. In addition, the learning experience enriched with religious reflection and the relevance of learning materials to everyday life makes the learning process more meaningful and relevant. Thus, hydrocarbon teaching materials integrated with spiritual values have been proven to have a significant positive impact on improving student learning outcomes in hydrocarbon materials.

Differences in Students' Spiritual Attitudes Before and After Learning

The second hypothesis aims to identify differences in students' spiritual attitudes before and after learning using hydrocarbon teaching materials integrated with spiritual values in the experimental class. Data were obtained through questionnaires filled out by students before and after the learning process. Hypothesis testing was carried out using the paired sample t-test after ensuring that the data was normally distributed. The results of the analysis showed a Sig. (2-tailed) value of 0.000, which means the significance value ≤ α (0.05). Therefore, Ha is accepted and Ho is rejected.

These results indicate a significant difference in students' spiritual attitudes before and after learning. Students' spiritual attitudes increased after learning. This finding is consistent with the results of research by Heppy Okmarisa, Ayi Darmana, and Retno Dwi Suyatni (2016), which also reported a significant increase in students' spiritual attitudes after using hydrocarbon teaching materials based on spiritual values.

During learning, observation results recorded a consistent increase in the average spiritual attitudes of students in the experimental class, from 84.49 to 90.98. This improvement reflects the positive impact of integrated spiritual value teaching materials in helping students build religious awareness. These results confirm that the integration of spiritual values not only supports academic understanding, but also plays an important role in improving students' spiritual attitudes during the learning process.

The Influence of Learning Interest on Students' Learning Outcomes

The third hypothesis test aims to evaluate the effect of learning interest on student learning outcomes. This test is carried out using simple linear regression by ensuring that the data is normally distributed and linear, with a significance level <α (0.05). In the experimental class, the results of the analysis showed a significance value of 0.002, which means that Ha is accepted and Ho is rejected because the significance value is smaller than α (0.05). The analysis also shows an R square value of 0.250, which indicates that learning interest contributes 25% to improving student learning outcomes, while the remaining 75% is influenced by other factors such as teaching methods, learning environment, or individual abilities. Based on the unstandardized coefficient, a constant value (a) of 0.428 and a regression coefficient (b) of 0.005 are obtained, so the regression equation for the experimental class is Y = 0.428 + 0.005X. This shows that every 1%

increase in student learning interest will increase learning outcomes by 0.005. However, the effect is relatively small, so other factors still have a greater role.

In the control class, the analysis shows a significance value of 0.000, which means Ha is accepted and Ho is rejected because the significance value is smaller than α (0.05). The R square value for the control class is 0.394, which means that learning interest contributes 39.4% to student learning achievement, while the other 60.6% is influenced by external factors. Based on the unstandardized coefficient, the constant value (a) is 0.379 and the regression coefficient (b) is 0.005, so the regression equation for the control class is Y = 0.379 + 0.005X. This regression coefficient shows that every 1% increase in student learning interest will increase learning outcomes by 0.005. This shows that the relationship between learning interest and learning outcomes in the control class is stronger than in the experimental class, although it remains small.

These results are in line with research by Raudatul Hasanah Siregar, Linda Rosita, and Tita Juwitaningsih (2024), who found a significant correlation between learning interest and student learning outcomes using electronic modules based on Problem-Based Learning (PBL), with a high correlation of 0.764. Research by Lia Andini and Utiya Azizah (2021) also showed that learning interest has a positive and significant influence on student learning outcomes, with a contribution of 76.6% to learning outcomes along with metacognitive skills in chemical equilibrium material. Learning interest plays an important role in increasing students' focus on the material, encouraging active involvement in learning, and influencing students' understanding and memory of the material. In addition, learning interest also functions as an internal motivation that helps students achieve optimal learning outcomes. These findings confirm that learning interest plays an important role in improving students' academic understanding.

• CONCLUSION

This research shows a positive influence of integrated hydrocarbon teaching materials with spiritual values on student learning outcomes through the POGIL model, with a Sig value (2-tailed) of 0.001 ≤ α (0.05), which means significant. There is also a significant difference in students' spiritual attitudes before and after learning, with a Sig value (2-tailed) of 0.000 ≤ α (0.05). Learning interest also affects learning outcomes, where the experimental class contributes 25% (R Square = 0.250), while the control class contributes 39.4% (R Square = 0.394). These results are important because they show that the integration of spiritual values in learning can improve student learning outcomes, attitudes, and interests, providing insight into curriculum development that includes cognitive and character aspects of students.

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