

The Effectiveness of Cooperative Learning Using the Contextual Teaching and Learning (CTL) Approach Based on Thematic Quranic Verses on Learning Outcomes and Spiritual Attitudes

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Abstract

The integration of scientific concepts with religious values is an important aspect of developing holistic education, particularly in biology learning that aims not only to improve cognitive achievement but also to strengthen students' spiritual attitudes. However, biology learning, especially on psychotropic materials, often remains focused on conceptual understanding and has limited connections with students' real-life experiences and moral awareness. This study aimed to examine the effectiveness of cooperative learning using the Contextual Teaching and Learning (CTL) approach based on thematic Quranic verses on students' learning outcomes and spiritual attitudes in psychotropic material. This research employed a quantitative approach with a quasi-experimental method using a nonequivalent control group design. The research sample consisted of 27 students of class XI science at MAN 4 Bantul, divided into an experimental group and a control group. Data were collected through learning outcome tests and spiritual attitude questionnaires, while data analysis was conducted using validity, reliability, N-gain, paired sample t-test, and independent sample t-test. The results showed that the experimental class experienced greater improvement in learning outcomes with an N-gain score of 0.43 (medium category) compared with the control class with an N-gain score of 0.25 (low category). Statistical analysis revealed significant differences between groups, while the experimental class also demonstrated higher spiritual attitude scores. In conclusion, cooperative learning integrated with CTL and thematic Quranic verses effectively enhances students' biological understanding and contributes to strengthening spiritual values in learning.

INTRODUCTION

Education is a strategic process in developing students' potential as a whole which includes knowledge, skills, attitudes and spiritual aspects. In an Islamic perspective, education is not only oriented towards mastering knowledge, but also the formation of morals and strengthening faith as preparation for carrying out human functions as caliphs on earth (Khasanah, 2021). In line with national education goals, learning in schools is expected to produce students who are faithful, pious, and have character, possess critical thinking skills, and are able to solve real-life problems. However, the development of digital technology, while providing easy access to information, also presents various challenges, such as increased social media use, exposure to negative information, and tendencies toward addictive behavior that can impact students' concentration, character, and moral development (Maritsa et al., 2021; Meilinda et al., 2020).

In studying biology, students are not only required to understand scientific concepts, but also be able to relate biological phenomena to everyday life through critical, analytical and contextual thinking processes (Lutfiah et al., 2021). Meaningful biology learning should encourage students to build their own knowledge through authentic learning experiences so that the concepts learned do not stop at memorization, but can be applied in decision-making on various life issues (Johnson, 2002; Trianto, 2014). However, the results of observations at MAN 4 Bantul show that students' biology learning outcomes are still relatively low. Learning tends to take place conventionally with limited time, a variety of methods that are not yet optimal, and a lack of connection between the material and students' real experiences so that learning is less meaningful. One of the materials that requires a contextual learning approach is the psychotropic sub-material on the nervous system.

The psychotropic sub-material on the nervous system not only requires an understanding of the types, working mechanisms, and biological impacts of psychotropics, but also the ability of students to analyze the social, health, legal, and moral consequences of the abuse of these substances (Amanda, 2017). The urgency of learning this sub-material is increasing considering that adolescents are an age group that is vulnerable to narcotics and psychotropic abuse due to environmental influences and psychological development (Hakim, 2023). Data from the Badan Narkotika Nasional (BNN) shows that the school and college age group is still one of the groups vulnerable to drug abuse, so a learning strategy is needed that not only improves conceptual understanding, but also builds students' moral and spiritual awareness of the dangers of psychotropic abuse (Dwi Lestari et al., 2022). One alternative that can be used to overcome this problem is the application of a cooperative learning model combined with a Contextual Teaching and Learning (CTL) approach based on thematic Al-Quran verses.

Cooperative learning provides opportunities for students to discuss, help each other, exchange ideas, and build knowledge collaboratively, which has been proven to improve learning outcomes and social skills (Slavin, 2015). Meanwhile, the CTL approach emphasizes the relationship between learning materials and students' real experiences so that the concepts learned become more meaningful and easier to understand (Johnson, 2002; Lestari et al., 2023). Support for the integration of relevant verses of the Qur'an with psychotropic material can strengthen the spiritual dimension through the instillation of religious values that encourage students to stay away from behavior that is harmful to themselves and others (Mualimin, 2020; Abdullah, 2019). The synergy of these three approaches is expected to be able to develop cognitive abilities while forming students' spiritual attitudes in a balanced manner.

Several previous studies have reported that cooperative learning models effectively improve learning outcomes, while the CTL approach is able to improve students' conceptual understanding and thinking skills. Other studies also show that the integration of Islamic values in learning contributes to the formation of students' religious character. However, research that combines cooperative learning models, the CTL approach, and the integration of thematic Quranic verses simultaneously in psychotropic material, especially by measuring both learning outcomes and students' spiritual attitudes, is still relatively limited. Therefore, this study aims to analyze the effectiveness of a cooperative learning model with a Contextual Teaching and Learning (CTL) approach based on thematic Quranic verses on students' learning outcomes and spiritual attitudes in the psychotropic sub-material.

Contextual Teaching and Learning (CTL) is a learning approach that links material to real

life situations of students so as to make learning more meaningful (Ismatunsarrah *et al.*, 2020). CTL is a learning concept that helps teachers relate lesson content to real-world situations, so that students can relate knowledge to everyday experiences.

According to Sastradiharja *et al.* (2020), CTL involves several basic principles, including: connecting learning materials to students' experiences and life contexts; actively involving students in the learning process; and encouraging students to reflect on their learning experiences so they can understand the knowledge they have acquired.

Several studies have demonstrated the effectiveness of CTL in improving learning outcomes. Syamsuddin & Utami (2021) noted a significant increase in students' post-test scores in mathematics learning. Similarly, Lestari *et al.*'s (2023) study demonstrated that implementing CTL with seventh-grade students at MTs Roudhotul Ulum successfully increased their average scores. CTL has proven effective at various levels of education because it connects classroom material with the real world, making learning more relevant and positively impacting student understanding.

The integration of Quranic verses into biology learning is an effort to combine biological concepts with Quranic teachings to create meaningful learning. The Quran contains over 750 verses discussing natural phenomena, including the creation of humans, plants, and the environment, which are relevant to biology. This integration aims to increase students' faith and piety through the introduction of verses that demonstrate the greatness of Allah. (Mualimin, 2020).

According to Mualimin (2020), biology is closely related to the verses of the Quran because biological phenomena such as the creation of living things and ecosystems are among the signs of Allah's power. This approach not only provides knowledge of biological concepts but also develops Islamic values such as environmental responsibility as part of humanity's role as caliph on earth.

The integration of Quranic verses into biology learning is carried out by teachers by listing verses relevant to biology material, both explicitly and implicitly, to then be implemented in the learning process. This learning process can encourage students to reflect on biological phenomena in the context of faith in God and create a holistic learning experience encompassing affective and psychomotor aspects of knowledge (Mualimin, 2020). In the psychotropic sub-topic, there are two main verses used as a spiritual foundation and contextual learning, namely:

QS. Al-Baqarah: 219

يَسْأَلُونَكَ عَنِ الْخَمْرِ وَالْمَيْسِرِ قُلْ فِيهِمَا إِثْمٌ كَبِيرٌ وَمَنَافِعُ لِلنَّاسِ وَإِثْمُهُمَا
أَكْبَرُ مِنْ نَّفْعِهِمَا وَيَسْأَلُونَكَ مَاذَا يُنْفِقُونَ قُلِ الْعَفْوَ كَذَلِكَ يُبَيِّنُ اللَّهُ لَكُمُ
الْآيَاتِ لَعَلَّكُمْ تَتَفَكَّرُونَ ﴿٢١٩﴾

Which means: "They ask you (O Muhammad) about alcohol and gambling. Say, 'In both of them is great sin and some benefit for mankind. But the sin in both of them is greater than the benefit.'"

This verse provides a critical perspective on substances that provide temporary effects

but carry a high risk of damaging human reason and behavior. Psychotropics, as substances that affect the central nervous system, have the potential to damage consciousness and self-control, so this verse aligns with both biological and ethical concepts.

QS. Al-Baqarah: 195

وَأَنفِقُوا فِي سَبِيلِ اللَّهِ وَلَا تُلْقُوا بِأَيْدِيكُمْ إِلَى التَّهْلُكَةِ وَأَحْسِنُوا إِنَّ اللَّهَ يُحِبُّ
الْمُحْسِنِينَ ﴿١٩٥﴾

Which means: "And do not throw (yourself) into destruction with your own hands."

This verse emphasizes the importance of protecting oneself from actions that endanger the body and soul, including the abuse of psychotropic substances. Integrating this verse into learning aims to foster awareness that maintaining health is part of worship and responsibility to Allah SWT.

Instilling the values of these two verses not only strengthens students' spiritual aspects but also helps them understand the importance of maintaining the function of the nervous system, body, and social behavior in a scientific and religious manner. Integrating Quranic verses into biology learning also provides an opportunity to evaluate their impact on students' understanding of spiritual concepts and values. This evaluation can include assessing students' understanding of biology material as well as their internalization of relevant Islamic values. This approach ensures that biology learning encompasses not only scientific knowledge but also strengthens students' spiritual beliefs, in line with the national education goal of developing individuals with faith, piety, and noble character (Mualimin, 2020).

Psychotropic Material in Biology Learning

Psychotropics are substances or drugs, whether derived from plants or synthetically, that have psychoactive effects through selective influence on the central nervous system, thereby causing characteristic changes in mental activity and behavior. Based on Law No. 5 of 1997 concerning Psychotropics, psychotropics are classified into four groups (Kusuma, 2020):

- a. Group I: Psychotropics that can only be used for the purpose of developing science and are not used for therapy, and have a very high potential to cause dependence.
- b. Group II: psychotropic drugs with medicinal properties, used as a last resort and can be used in therapy and/or for the purpose of developing scientific knowledge with a high potential to cause dependency.
- c. Group III: psychotropic drugs that have medicinal properties, are widely used in therapy or can be used for scientific purposes.
- d. Group IV: Psychotropics that have medicinal properties are widely used in therapy or can be used for scientific purposes with low potential to cause dependence.

Based on the impacts they cause, psychotropic drugs are classified into three, namely:

- a. Stimulants: Stimulants stimulate the sympathetic nervous system through the hypothalamus, increasing organ function. For example, they increase heart rate and blood pressure. Thus, stimulants stimulate users to use their energy more quickly and without pain. Compounds that are stimulants include amphetamines, ecstasy, and cocaine.

- b. **Depressants:** Depressants are drugs that inhibit neuron function in the central nervous system. Depressants are also known as tranquilizers. There are five main categories of depressants: barbiturates, tranquilizers, ethyl alcohol, anesthetics, and opiates.
- c. **Hallucinogens:** Hallucinogens have a strong influence on visual and auditory perception, as well as increasing emotional responses. Subjects experience hallucinations, and at high doses, actual hallucinations can occur, namely the subject "seeing" or "hearing" objects that are not there at all or seeing objects that appear to be alive.

Psychotropic drug abuse can have various negative impacts, both physical and psychological (Amanda, 2017). Physically, it can cause organ damage, nervous system disorders, and decreased vital organ function. Psychologically, it can lead to dependency, mental disorders, and behavioral changes that are detrimental to the individual and their environment (Kusuma, 2020). These detrimental behavioral changes can cause problems in social relationships and the daily lives of the individuals involved.

Addressing psychotropic drug abuse requires a comprehensive approach, encompassing prevention, rehabilitation, and law enforcement. Prevention is achieved through education and outreach regarding the dangers of drug abuse. Rehabilitation aims to help individuals who have already abused psychotropic drugs recover and return to normal functioning. Law enforcement is implemented to take firm action against perpetrators of psychotropic drug abuse in accordance with applicable laws and regulations (Kusuma, 2020). Strict law enforcement not only provides a deterrent effect for perpetrators but also demonstrates the government's commitment to protecting the public from the dangers of drug abuse.

Psychotropic drugs have medical benefits, but their misuse can have highly detrimental effects. Therefore, a thorough understanding of psychotropic drugs, the impacts of their abuse, and mitigation efforts is crucial for preventing and addressing the problems they cause (Kusuma, 2020). When individuals understand the impacts of psychotropic drug abuse, they can be more vigilant and avoid risky situations.

Learning outcomes are a key aspect of educational evaluation, reflecting the extent to which students understand and master learning materials. According to Bloom (as cited in Magdalena et al., 2021), the knowledge domain encompasses six levels of thinking: remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6).

According to Statis (2017), learning outcomes are defined as behavioral changes that occur in the knowledge domain after students receive, store, and process information to apply it to solve a problem. This study shows that remembering has the highest achievement level, while applying tends to have lower achievement levels due to limitations in understanding complex concepts. Furthermore, research by Somayana (2020) found that skills in the knowledge domain enable students to think logically and rationally, which are crucial for the learning process and mastery of material.

A spiritual attitude is a state of being in which every activity is always linked to the teachings of their religion. The individual strives to practice religious teachings in accordance with their beliefs as a servant who believes in God (Haryadi et al., 2024). A spiritual attitude in education is a fundamental aspect aimed at developing students who not only excel academically but also possess a strong spiritual awareness. According to Liza Sundari et al. (2023), a spiritual attitude in learning can be instilled through various methods, such as making

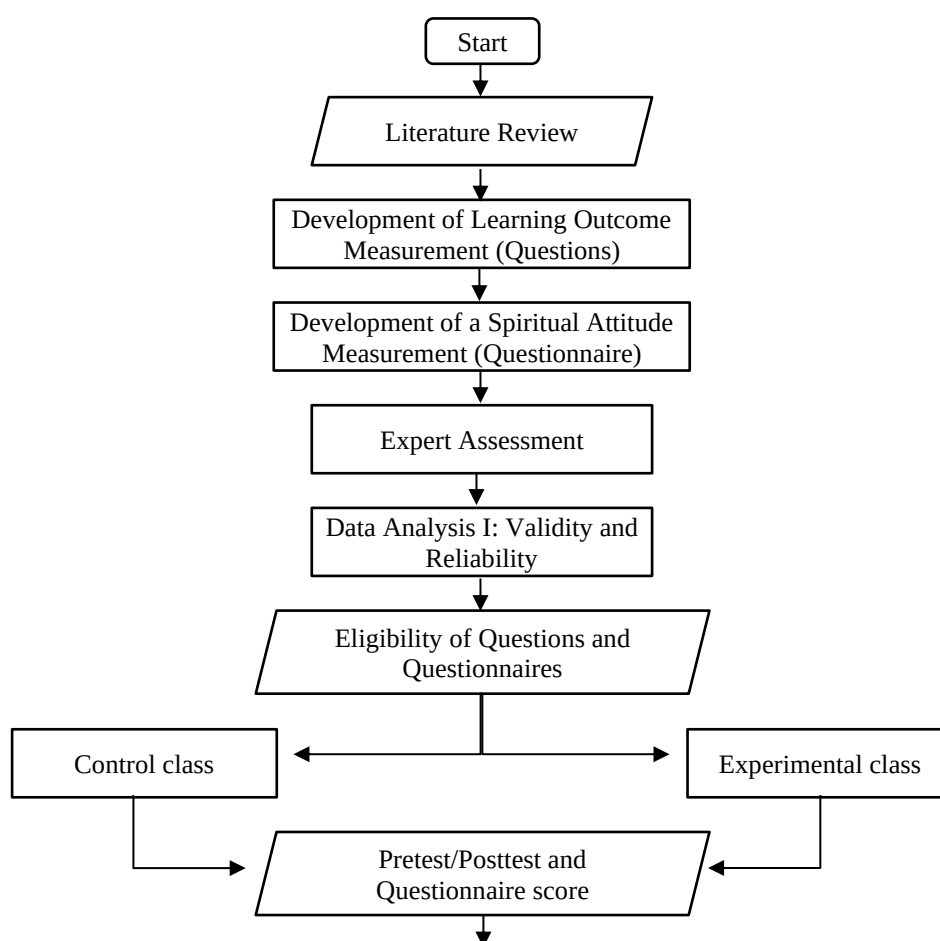
a habit of praying before starting lessons, integrating religious values into learning materials, and student involvement in religious activities at school.

Spiritual attitude is not only measured through involvement in religious activities but also through the application of moral values in daily life, such as honesty, responsibility, and social awareness (Liza Sundari et al., 2023). A strong spiritual attitude can shape students' character, making them more disciplined in carrying out their obligations, both within the school environment and in the community. Applying a spiritual attitude in daily life helps students become more responsible individuals in completing their tasks and obligations. Liza Sundari et al., (2023) revealed that an approach that connects science with religious teachings can strengthen students' awareness of God's greatness and increase their motivation to learn. The integration of science with religious teachings provides students with a broader perspective that science is not only about facts, but also part of the majesty of God's creation. Understanding the relationship between science and spiritual values can make students more motivated to learn because they realize that every science they learn has a deeper meaning.

METHOD

Research Design

This research used a quantitative approach with a quasi-experimental method and a nonequivalent control group design (Sugiyono, 2013). The flowchart of research procedure is shown in Figure 1.



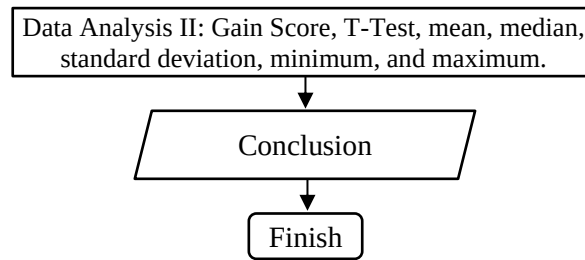


Figure 1. Flowchart of research procedure

Research Scope and Sample

The research population was all 43 students of class XI science major at MAN 4 Bantul in the 2024/2025 academic year. Of the 43 students, only 27 students completed all activities. The sampling technique used was total sampling because the entire population was used as a research sample. The students were divided into 2 classes, namely: 14 students in class X1 as the control group and 13 students in class X2 as the experimental group. Both classes will be treated with the basic scheme of "One-Group Pretests-Posttest Design" (Sugiyono, 2015). The scheme is as shown in Figure 2.

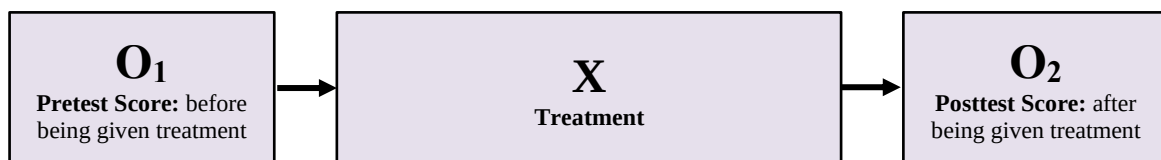


Figure 2. One-Group Pretest-Posttest Design Scheme

The experimental group received treatment in the form of a cooperative learning model with a CTL approach based on thematic Al-Quran verses, while the control group used a cooperative learning model with a classical approach.

Variables, Techniques, and Instruments

The dependent variables included student learning outcomes and spiritual attitudes. Learning outcomes were measured using a test with 15 multiple-choice questions validated by two experts, while spiritual attitudes were measured using a questionnaire containing 32 statements also validated by two experts. The experts' assessments used a five-point Likert scale, as shown in Table 1.

Table 1. 5-variation Likert scale

No.	Category	Score
1.	Very Eligible	5
2.	Eligible	4
3.	Cukup Eligible	3
4.	Kurang Eligible	2
5.	Tidak Eligible	1

After the instruments were deemed suitable based on the validity and reliability analysis of expert assessments, the instruments were then used to measure the dependent variable, with the

independent variable being a cooperative learning model using the Contextual Teaching and Learning (CTL) approach based on thematic Quranic verses. The relationship between the variables and the instruments can be seen in Table 2.

Table 2. Relationship between variables, techniques, and instruments

Variable	Data Techniques	Collection	Instrument	Data obtained
X1 (experiment class)			The treatment is in the form of cooperative learning using the CTL approach based on thematic Al-Quran verses.	
X2 (control class)			Treatment in the form of cooperative learning with a classical approach	
Y ₁ (learning outcomes)	Tes (Pretest/Posttest)		Questions	Learning outcome scores
Y ₂ (spiritual attitude)	Quitionaire		Quitionaire	Spiritual attitude score

Research Hypothesis

Based on the research variables and literature studies conducted, this study proposes several hypotheses, including:

Ha₁: The learning outcomes of the psychotropic sub-material at MAN 4 Bantul are influenced by the treatment (thematic cooperative learning model with a CTL approach based on Al-Qur'an verses in the experimental class/cooperative learning with a classical approach in the control class).

Ha₂: There is a difference in learning outcomes for the psychotropic sub-material at MAN 4 Bantul between the experimental class and the control class..

Data Analysis Techniques

The data for measuring the suitability of the question and questionnaire instruments through a validation process or expert assessment, each carried out by two experts, was analyzed for validity values using the Aiken's V formula in Equation (1).

$$V = \frac{\sum s}{n(c - 1)} \quad (1)$$

The results of the validity value calculation using Equation (1) will then be compared with Aiken's validity criteria as shown in Table 3.

Table 3. Aiken Validity Criteria

No.	Score Range	Criteria
1.	0,80 - 1,00	Very High Validity
2.	0,60 - 0,79	High Validity
3.	0,40 - 0,59	Mid Validity
4.	0,20 - 0,39	Low Validity
5.	0,00 - 0,19	Very Low Validity

(Mokhtar et al., 2023)

In addition to analyzing the validity value, the measurement data for the feasibility of the question and questionnaire instruments were analyzed for reliability using the Cronbach's Alpha

formula in Jamovi 2.6.26 software. If the α value ≥ 0.70 , then the instrument is said to be reliable (Sugiyono, 2011).

Data measuring learning outcomes through test techniques with question instruments were analyzed using the gain score technique. The gain score was carried out to answer the question whether there was an increase in student's psychotropic sub-material learning outcomes using a cooperative learning model with a CTL approach based on thematic Al-Qur'an verses. The amount of gain score can be calculated using Equation 2.

$$\text{gain score} = O_2 - O_1 \quad (2)$$

To determine whether the gain score is in the high, medium or low category, this is done by calculating the normalized gain score (N-gain) which can be calculated using Equation 3.

$$N - \text{gain} = \frac{O_2 - O_1}{100 - O_1} \quad (3)$$

The N-gain calculation result will be matched to the N-gain category coefficient interval based on Hake's formula (Aziz et al., 2021). Category N-gain based on Hake's formula is shown in Table 4.

Table 4. Category N-gain based on Hake's formula

N-gain	Category
$N\text{-gain} \geq 0,7$	High
$0,3 \leq N\text{-gain} < 0,7$	Medium
$N\text{-gain} < 0,3$	Low

In addition to the gain score technique, a normality test using the Shapiro-Wilk method and a homogeneity test using the Levene's method were also conducted as prerequisites for hypothesis testing. Hypothesis testing was conducted using a paired samples t-test to prove hypothesis H_{a1} and an independent samples t-test to prove hypothesis H_{a2} . The prerequisite and hypothesis testing processes used Jamovi 2.6.26 software.

The decision rule for the H_{a1} hypothesis is carried out by analyzing the Paired-Samples T-Test table using a 95% confidence interval ($\alpha = 5\%$ or 0.05). The results of the Paired-Samples T-Test can be determined by the p-value, using the following criteria:

- If the p-value is > 0.05 , then H_{01} is accepted and H_{a1} is rejected.
- If the p-value is < 0.05 , then H_{01} is rejected and H_{a1} is accepted.

The decision rule for the H_{a2} hypothesis is carried out by analyzing the Independent-Samples T-Test table using a 95% confidence interval ($\alpha = 5\%$ or 0.05). The results of the Independent-Samples T-Test can be determined by the p-value, using the following criteria:

- If the p-value is > 0.05 , then H_{02} is accepted and H_{a2} is rejected.
- If the p-value is < 0.05 , then H_{02} is rejected and H_{a2} is accepted.

The spiritual attitude measurement data through questionnaire technique with spiritual attitude questionnaire was analyzed by the validity value of r count using Pearson Product Moment correlation with a significance level of 5% ($\alpha = 0.05$), the next r count validity result was compared with r table at degrees of freedom $df = N - 1$. The reliability value used Cronbach's Alpha formula as well as descriptive analysis through the average, median, standard deviation, minimum, and maximum values.

RESULTS AND DISCUSSION

Measuring the suitability of question and questionnaire instruments

The results of the validity and reliability analysis of the 15 items measuring learning outcomes are shown in Table 5.

Table 5. Results of the validity and reliability analysis of the 15 items measuring learning outcomes

Statement to-	Average score	Category	Validity	Annotation	Reliability
1	4,5	Very Eligible	0,9	Very High Validity	0,84 ≥ 0,70
2	5	Very Eligible	1	Very High Validity	
3	5	Very Eligible	1	Very High Validity	
4	4,5	Very Eligible	0,9	Very High Validity	
5	4,5	Very Eligible	0,9	Very High Validity	
6	5	Very Eligible	1	Very High Validity	
7	4,5	Very Eligible	0,9	Very High Validity	
8	5	Very Eligible	1	Very High Validity	
9	5	Very Eligible	1	Very High Validity	
10	5	Very Eligible	1	Very High Validity	
11	5	Very Eligible	1	Very High Validity	
12	4,5	Very Eligible	0,9	Very High Validity	
13	5	Very Eligible	1	Very High Validity	
14	5	Very Eligible	1	Very High Validity	
15	4,5	Very Eligible	0,9	Very High Validity	
Average	4,8	Very Eligible	0,99	Very High Validity	

Table 5 shows that all items are highly suitable for use in measuring learning outcomes, with all assessments in the very high validity and reliability categories. Overall, the learning outcome measurement items had an average feasibility score of 4.8, with a validity score of 0.96 and a reliability score of 0.84. These values indicate that the learning outcome measurement items have very high validity and reliability.

The results of the validity and reliability analysis of the 32 items in the spiritual attitudes questionnaire are shown in Table 6.

Table 6. Results of the validity and reliability analysis of the 32 items in the spiritual attitudes questionnaire

Statement to-	Average score	Category	Validity	Annotation	Reliability
1	5	Very Eligible	1	VST	0,70 ≥ 0,70
2	5	Very Eligible	1	VST	
3	5	Very Eligible	1	VST	
4	4,5	Very Eligible	0,88	VST	
5	5	Very Eligible	1	VST	
6	5	Very Eligible	1	VST	
7*	3,5	Eligible	0,62	VT	
8	4,5	Very Eligible	0,88	VST	
9	4,5	Very Eligible	0,88	VST	
10	5	Very Eligible	1	VST	
11	5	Very Eligible	1	VST	
12	5	Very Eligible	1	VST	

Statement to-	Average score	Category	Validity	Annotation	Reliability
13	4,5	Very Eligible	0,88	VST	
14	5	Very Eligible	1	VST	
15*	3	Cukup Layak	0,50	VS	
16	5	Very Eligible	1	VST	
17	5	Very Eligible	1	VST	
18	4	Layak	0,76	VT	
19	5	Very Eligible	1	VST	
20	5	Very Eligible	1	VST	
21	4,5	Very Eligible	0,88	VST	
22	5	Very Eligible	1	VST	
23	5	Very Eligible	1	VST	
24	4,5	Very Eligible	0,88	VST	
25	5	Very Eligible	1	VST	
26	5	Very Eligible	1	VST	
27	5	Very Eligible	1	VST	
28*	3,5	Layak	0,62	VT	
29	4,5	Very Eligible	0,88	VST	
30	4	Layak	1	VST	
31	5	Very Eligible	1	VST	
32*	3,5	Layak	0,50	VS	
Rata-rata	4,59	Very Eligible	0,91	VST	

Table 6 shows that most of the statement items are very suitable for use in measuring spiritual attitudes, with most assessments in the very high validity and reliability categories. However, there are still several items marked with an asterisk (*) and therefore not included in the questionnaire distribution to students. This is due to qualitative considerations by the validator, such as meanings that are too similar to other items, requiring revisions to several statements that are deemed to need editorial adjustments to be easily understood by students. Overall, the questionnaire measuring spiritual attitudes has an average feasibility value of 4.59 with a validity score of 0.91 and a reliability of 0.70. These values indicate that the questionnaire measuring spiritual attitudes has feasibility with very high validity and reliability.

Measurement of learning outcomes

The results of the data analysis of learning outcomes are displayed in the form of average pretest and posttest scores with their standard deviations. The average pretest and posttest score data are then used as data to calculate the gain score and N-gain. The results of the data analysis of learning outcomes are shown in Table 7.

Table 7. Results of data analysis measuring learning outcomes

Class	Average value of Pretest (Std Dev)	Average value of Posttest (Std Dev)	Gain Score	N-gain (Category)
Control	9,57 (1,40)	11,00 (2,48)	1,43	0,25 (Low)
Experiment	9,85 (1,41)	12,10 (1,61)	2,25	0,43 (Mid)

The difference in learning outcomes based on Pretest, Posttest, Gain Score and N-gain between the control and the experimental class can be seen in Figure 3.

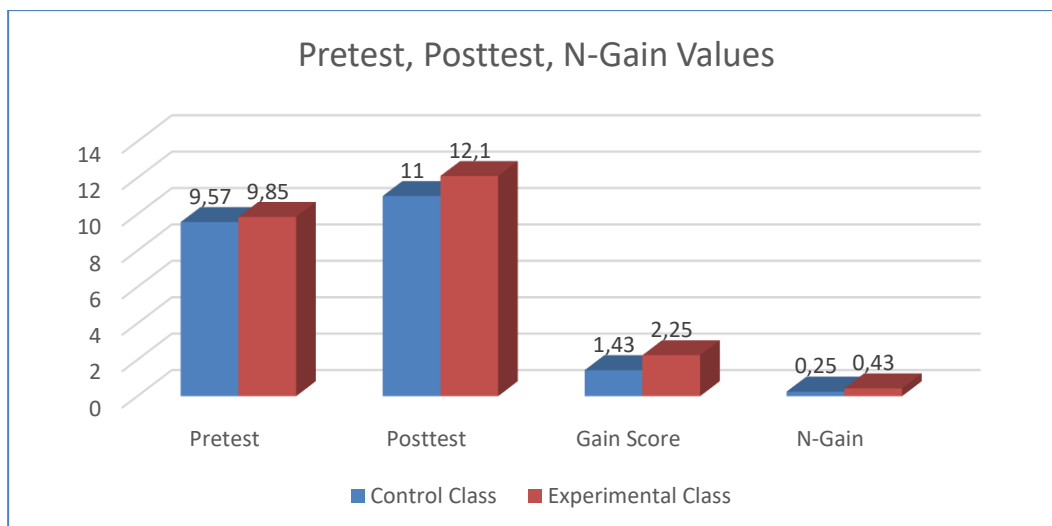


Figure 3. The difference in learning outcomes based on Pretest, Posttest, Gain Score and N-gain between the control and the experimental class

Figure 3 shows that the average pretest scores for the control and experimental classes are relatively the same, namely 9.57 and 9.85. After both classes were given their respective treatments, the average posttest score increased to 11.00 in the control class with a Gain Score is 1.43 and 12.08 in the experimental class with a Gain Score is 2.25. The results of the Gain Score calculation then obtained the N-Gain value for each class and the N-Gain value was compared with Table 4. The results of the comparison of the N-Gain value for each class showed that the control class was in the low improvement category, while the experimental class was in the medium category.

Based on the results of the parametric statistical analysis of the Paired-Sample T Test on the pretest and posttest value data for the control class and experimental class, a p-value is 0.031 was obtained in the control class and $p < 0.001$ in the experimental class. Both p-value calculation results are < 0.05 . Based on the decision withdrawal rules, H_{01} is rejected and H_{a1} is accepted. Therefore, it can be concluded that learning outcomes for psychotropic sub-materials at MAN 4 Bantul are influenced by treatment (cooperative learning model with a CTL approach based on thematic Al-Qur'an verses in the experimental class/cooperative learning with a classical approach in the control class). The treatment effect was greater in the experimental class (Cohen's $d = 1.32$) than in the control class ($d = 0.647$). This shows that CTL learning based on Al-Qur'an verses is able to provide stronger practical improvements in learning outcomes.

Next, based on the results of the parametric statistical analysis of the Independent-Sample T Test on the control class posttest value data with the experimental class posttest value, a p-value of 0.042 was obtained. If the p-value < 0.05 . Based on the decision withdrawal rules, H_{02} is rejected and H_{a2} is accepted. Therefore, it can be concluded that there are differences in learning outcomes for psychotropic sub-materials at MAN 4 Bantul between the experimental class and the control class.

Measurement of spiritual attitudes

The results of the analysis of spiritual attitude measurement data are shown in Table 8.

Table 8. Results of the analysis of spiritual attitude measurement data

Class	Average Spiritual Attitude Score (Std Dev)
Control	85,4 (2,63)
Experiment	88,4 (1,57)

The difference in spiritual attitude based on Questionnaire Score between the control and the experimental class can be seen in Figure 4.

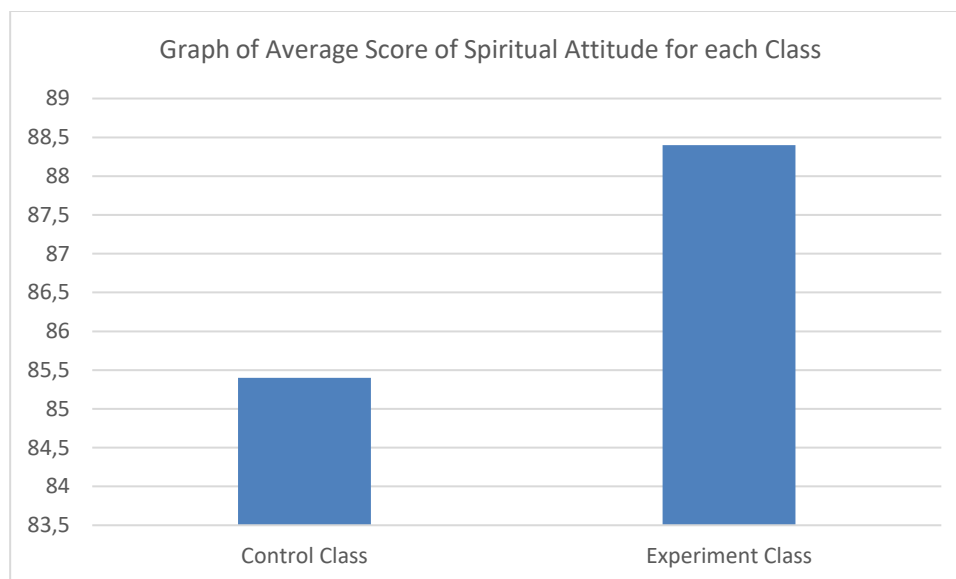


Figure 4. The difference in spiritual attitude based on Questionnaire Score between the control and the experimental class

Figure 4 shows the results of the descriptive analysis, showing that the average score for the experimental class was higher than that of the control class. This result indicates a tendency to strengthen spiritual attitudes in the experimental class. Field observations reinforce this finding: students in the experimental class appeared more reflective in linking biological concepts to religious values, for example, by citing Surah Al-Baqarah: 195 concerning the prohibition of self-harm when discussing the dangers of psychotropic drugs.

The integration of Quranic verses into learning helps students understand that protecting the mind and body from harm is part of religious commandments. This aligns with constructivist theory, which emphasizes the formation of knowledge through direct experience, social interaction, and reflection (Sugrah, 2020). In the affective domain, Krathwohl's theory explains that spiritual attitudes and values are formed gradually through the process of internalization of values.

These research findings align with the opinion (Mualimin, 2020) that Islamic values-based learning tends to produce gradual and sustainable spiritual change. Liza Sundari et al., (2023) also stated that the formation of spiritual character through learning Islamic values requires environmental support and consistent habituation. Thus, although the statistical difference between groups was not yet significant, the results of this study indicate that the

implementation of a cooperative learning model with a thematic CTL approach based on Al-Quranic verses has the potential to be effective in improving learning outcomes while fostering students' spiritual attitudes.

CONCLUSION

Based on the research findings, this study concludes that the application of cooperative learning using the Contextual Teaching and Learning (CTL) approach based on thematic Quranic verses is effective in improving students' learning outcomes on psychotropic material and has the potential to strengthen their spiritual attitudes. The experimental class showed a higher improvement in learning outcomes compared with the control class, as indicated by the higher gain score (2.25) and medium N-gain category (0.43) compared with the control class, which obtained a lower gain score (1.43) and low N-gain category (0.25). Statistical testing also confirmed significant differences between pretest and posttest scores, as well as significant differences in posttest results between the experimental and control groups. Furthermore, students in the experimental class obtained a higher average spiritual attitude score (88.4) compared with the control class (85.4), indicating that integrating Quranic values into biology learning can support students in connecting scientific concepts with religious reflection and moral awareness.

Future research is recommended to involve a larger sample size, broader research locations, and longer implementation periods to obtain more comprehensive evidence regarding the effectiveness of CTL-based cooperative learning integrated with thematic Quranic verses. Further studies may also examine the long-term impact of this learning model on students' character development, spiritual attitudes, critical thinking skills, and application of scientific concepts in real-life contexts. In addition, future researchers are encouraged to develop more varied learning materials and assessment instruments that can better measure affective and spiritual dimensions, considering that changes in spiritual attitudes generally require continuous habituation and repeated learning experiences. This approach has the potential to become an alternative strategy for developing holistic science learning that balances cognitive achievement with character and spiritual development.

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