

Spiritual Attitude in the Context of Physics Learning: A Quantitative Review of Class XI Thermodynamics

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Article Info	Abstract
Article history: Received: August 4, 2024 Revised: January 20, 2025 Accepted: January 29, 2025 Keywords: Electronic teaching materials Qur'anic verses Spiritual attitude Thermodynamics This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License	This study aims to determine the achievement of students' spiritual attitudes in developing electronic teaching materials on thermodynamics with Al-Qur'anic verses. The type of research used is development research with students at one of the Islamic-based schools in Banjarmasin class XI in the 2023/2024 academic year. The research instrument used is the spiritual attitude observation sheet instrument. The research data were analyzed using descriptive statistics. The results showed that using electronic teaching materials on thermodynamics with Al-Qur'an verses improved spiritual attitudes from a value of 2.14 to 3.14 with a good category. Using teaching materials for thermodynamics with Al-Qur'an verses can improve the spiritual attitude of students, with details of 1 out of 29 students getting a very good category spiritual attitude score. 21 out of 29 students showed good category spiritual attitudes. 7 out of 29 students showed a fairly good spiritual attitude. The final achievement of students' spiritual attitudes of 3.14 in the good category was declared good based on the results of the observation sheet of students' spiritual attitudes.
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INTRODUCTION

The entry of the 21st century is characterized by very significant changes in the fields of technology, information, communication, economy, health, and also in the education sector (Chalkiadaki, 2018; Haryandi et al., 2019). Education is changing rapidly and cannot be predicted (Altbach et al., 2019; Redhana, 2019). Education is a very important need for human life. A human group will not be able to grow and achieve its goals without the presence of education (Habibi et al., 2017; Rieckmann, 2018). The field of education and ways of learning continue to develop in line with changing times (Mishra et al., 2020; Nababan & Putri, 2022).

Several challenges need to be overcome in the 21st century, one of which is the use of learning technology in the digital era: 1) Not all learners have equal access to technology and internet connectivity required for online learning (Astini, 2020; Dhawan, 2020). This can increase the learning gap between learners with adequate access and those without access. 2) Online learning can reduce social interaction and collaboration between learners. Direct communication with teachers and classmates can be limited, affecting learner engagement and motivation (Mukhid, 2023; Vollet et al., 2017). Teachers plan lessons to achieve learning objectives effectively (Khalil & Elkhider, 2016; Rahmayanti et al., 2016).

One case that has surfaced due to a lack of spiritual attitude is the misuse of technology

through adult content. Addiction to watching adult content is considered a violation of moral and spiritual teachings (King & Boyatzis, 2015; Sitompul, 2024). In 2021, the Ministry of Women's Empowerment and Child Protection (MoWECP) reported that approximately 66.6% of boys and 62.3% of girls in Indonesia had viewed sexual or pornographic content through online media. The data also showed that around 34.5% of boys and 25% of girls had been involved in pornographic activities or sexual practices, including sexual abuse and similar activities (Irianti et al., 2023).

In addition, education in schools today only produces individuals who lack self-awareness, including in spiritual and social matters and are less able to communicate effectively in the learning environment and the social life of the community (Gimbert et al., 2023; Gusviani, 2016). The lack of Qur'anic learning in schools also affects students' spiritual attitudes, reflecting a decline in the quality of character education. One of the steps that can be taken to eradicate such cases is to integrate moral and religious education into the school curriculum. The school curriculum is very important as a guide in the implementation of learning activities (Alismail & McGuire, 2015; Hartini et al., 2018).

The spiritual aspect of religion in Islam is found in the Qur'an; education that relates it to the Qur'an will develop the spiritual potential of students. According to Nisa & Farhan (2016); Syarif, (2020), in Islam, science and religious, and spiritual attitudes cannot be separated. The Qur'an has long been the primary guide for Muslims in various fields of knowledge, including science, technology, and social sciences, for both Muslims and non-Muslims. According to Pangestu & Indayati (2023); Sunarya et al., (2021), the Qur'an contains various relevant concepts of knowledge and technology.

The Qur'an is also a source of knowledge and guidance for believers, as stated in Al-A'raf verse 52. In this context, learning physics with the connection to the Qur'an can help students realize that the phenomena studied are signs of the greatness of Allah SWT, making the learning process more meaningful (Diani & Hartati, 2018; Rohmatulloh & Dwijayanto, 2021). Therefore, if students learn physics connected to the Qur'an, they can realize, know, and recognize that the phenomena they obtain and learn in physics are signs of the greatness of Allah SWT, and the learning process will be meaningful. One of the materials in the subject of physics is thermodynamics.

Thermodynamics is a field that investigates heat transfer, or heat. Thermodynamic material is physics material that contributes a lot to the concepts used in everyday life and technology (Bejan, 2017; Meti, 2022). One of the materials studied in thermodynamics is entropy. The relationship between entropy and the Qur'an can be found in Surah Ar-Rahmaan verse 9. In this surah, there is a correlation with concepts in thermodynamics. The surah states, "establish the balance justly and do not diminish it." Clearly, in Surah Ar-Rahmaan, verse 9 explains equilibrium. If it is associated with entropy, then there appears to be meaningful advice for humans, whose contents are: "When everything wants to be balanced, do not reduce or add things or substances that are already balanced because it will cause an imbalance to occur." If it relates to everyday life, we can see if imbalances occur, starting from misalignment, disorganization, and destruction. One example is the number of adultery. Looking at one of these examples, it is very clear that there is a system irregularity or entropy in this life. The phenomenon of the irregularity of a system can be found in the Concept of Thermodynamics (Chusni et al., 2018).

Developing learning tools is part of the learning planning process (Zainuddin & Misbah, 2021; Weni, 2020). Teaching materials are crucial in achieving learning objectives (Haryandi et al., 2023; Kizilcec et al., 2017). Teaching materials associated with verses of the Qur'an are expected to be critical Islamic values in every science learning process in schools to form faithful and devoted students (Biantoro, 2019; Ismail, 2016). Islamic values mean combining religious values with scientific knowledge while maintaining the elements

of both fields ([Nurohmatin, 2017](#); [Sahin, 2018](#)).

Through learning that integrates religious values, students will be formed who are balanced between general knowledge and spiritual aspects and have a balance between IQ (Intelligence Quotient), EQ (Emotional Quotient), and SQ (Spiritual Quotient). The study conducted by [Ihsan et al., \(2019\)](#). It showed that learning tools integrated with Islamic values effectively improved understanding of biology concepts. The results of another study by [Ulia et al., \(2020\)](#). Showed an increase in students' religious attitudes toward mathematics learning after using teaching materials that internalize Islamic values. In research [Santoso et al., \(2023\)](#), it was found that electronic teaching materials based on multi-models of the content of Al-Qur'an verses can be used as alternative materials to improve learning outcomes.

Research from [Sumiyati \(2023\)](#) It found that modules integrated with Islamic values to empower students' religious character can be used as good teaching materials, according to the direction of educators. [Irwansyah \(2020\)](#) also, teaching materials that integrate Al-Qur'anic values on human reproductive system material can increase students' religious attitude scores. Physics modules containing Qur'anic verses in learning about static fluid, with a generative learning model, have also proven feasible and effective for use in learning in high school ([Zainuddin et al., 2020](#)).

Based on initial observations conducted with grade XI students at one of Banjarmasin's MANs, it was found that the lessons provided didn't yet include subject matter on the spiritual aspects of religion. There wasn't yet teaching material related to the verses of the Qur'an for physics subjects or their connection to the students' spiritual aspects. Furthermore, the average score for the achievement of spiritual attitudes observed was categorized as poor.

Table 1 Achievement results of spiritual attitudes initial observation

Indicators	Score	Category
Behave with gratitude	1.93	Less Good
Praying before and after doing activities	1.60	Less Good
Discipline	2.56	Good enough
Responsibility	2.28	Good enough
Respectful	1.87	Less Good
Average	2.05	Not good enough

Based on Table 1, there are two indicators categorized as quite good, namely discipline and responsibility, but three indicators are categorized as less good, namely behaving gratefully, praying before and after doing activities, and being polite. This is because religious character learning has not been given during learning, not reading prayers when learning is finished, using smartphones unwisely during learning, not saying greetings when entering class, talking to friends when the teacher explains, and using harsh and demeaning language. This is not in line with Law Number 20 of 2003 concerning the National Education System, Article 1, paragraph 1. In this observation, the tolerance indicator in worship cannot be observed because they have not been given learning with Al-Qur'an verses during learning. Based on this explanation, this study aims to determine the achievement of students' spiritual attitudes in developing electronic teaching materials on the topic of thermodynamics with Al-Qur'anic verses.

METHODS

This study aimed to improve students' spiritual attitudes by developing electronic teaching materials (learning implementation plan, learner worksheet, teaching materials, and learning outcome test) and spiritual attitude observation sheet instruments. ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation)

(see Figure 1).

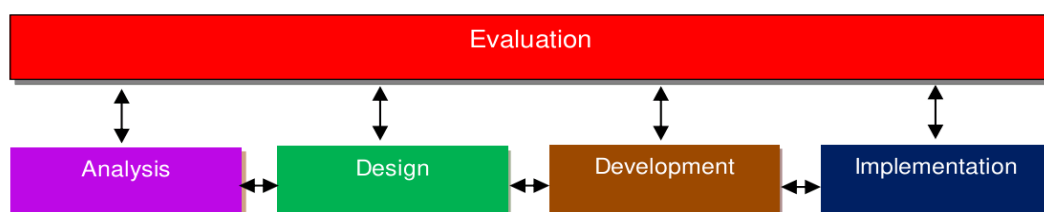


Figure 1 ADDIE model ([Stapa & Mohammad, 2019](#))

At the analysis stage, one of the things analyzed is the characteristics of students. The results of the analysis stage are used in the design stage, namely, making teaching material plans and observation sheet instruments. Based on what was found at the analysis stage, at the development stage, the instruments made were validated by two validators, with one validator from academia and one validator from practitioners. At the implementation stage, the electronic teaching materials and observation sheet instruments that have been made are used to see the increase in the achievement of students' spiritual attitudes.

The achievement of students' spiritual attitudes improved in this study was assessed based on classroom observation sheets. Observations were conducted for six meetings: pre-test, 1, 2, 3, 4 and post-test. The measurement of spiritual attitudes includes direct observation of learners' behavior, recording their interactions with the environment, and reflection on the spiritual values taught during the learning process. In the evaluation stage, the achievement of learners' spiritual attitudes is measured as part of the effort to improve spiritual attitudes. The assessment is carried out systematically by measuring the spiritual attitudes of students after each learning meeting. The results of this evaluation are used as a basis for providing constructive feedback and designing more effective teaching strategies to improve spiritual attitudes.

The validity of the observation sheet is determined based on the aspects observed, measured using a validity sheet. On the validity sheet, there is a rating scale: 4 (Very good), 3 (Good), 2 (Less good), and 1 (Not good). This score is then adjusted to the spiritual attitude achievement criteria ([Widoyoko, 2016](#)) listed in Table 2.

Table 2 Criteria for the validity of observation sheets and achievement of spiritual attitudes

Interval	Criteria
$x > 3.4$	Very good
$2.8 < x \leq 3.4$	Good
$2.2 < x \leq 2.8$	Fair
$1.6 < x \leq 2.2$	Poorly
$x \leq 1.6$	Not Good

The reliability of the observation sheet was calculated using Cronbach's Alpha coefficient and SPSS Statistics 16 software. The reliability score category ([Arikunto, 2021](#)) is interpreted based on Table 3.

Table 3 Reliability criteria of observation sheet

Interval Score	Criteria
$0.00 \leq r \leq 0.20$	Very Low
$0.20 \leq r \leq 0.40$	Low
$0.40 \leq r \leq 0.60$	Medium
$0.60 \leq r \leq 0.80$	High
$0.80 \leq r \leq 1.00$	Very High

This research was conducted during the even semester of the 2023/2024 academic year, from January to May 2024. The subjects of this study were 29 students in class XI at one of the MAN Banjarmasin in the 2023/2024 academic year. The object of this research is

the feasibility of electronic teaching materials on thermodynamics with Qur'anic verses. Qur'anic verses were selected and matched with thermodynamic concepts based on reference books, journal articles, and validator feedback that ensured compatibility between Islamic values and scientific principles. Suggestions from the validators helped ensure that the verses used were scientifically relevant and supported learning spiritual values with scientific understanding.

This research used quantitative data. Quantitative data comes from the spiritual attitude observation sheet, a data collection method using a 4-scale instrument. The teaching teacher, assisted by two observers, filled in the observation sheet. The purpose of the observation sheet is to measure the achievement of students' spiritual attitudes by applying electronic teaching materials on thermodynamics with Al-Qur'anic verses.

This research emphasizes strengthening students' spiritual attitudes based on the 2013 curriculum. Based on [Oviana et al. \(2022\)](#) spiritual attitudes include obedience to worship, praying before and after activities, tolerance in worship, and gratitude. Social attitude indicators include discipline, responsibility, and courtesy. [Tiara and Sari \(2019\)](#) suggests that the techniques and instruments for assessing spiritual and social attitudes are almost identical.

Based on the indicators described in previous studies, the indicators of spiritual attitudes in this study are Behaving with gratitude, praying before and after doing activities, tolerance in worship, discipline, responsibility, and courtesy. The observation sheet has a rating scale: Always, Often, Sometimes, and Never. Each scale has a specific value: Always worth 4, Often worth 3, Sometimes worth 2, and Never worth 1. The scores obtained will be processed using the average results of 29 students on the spiritual attitude observation sheet. This score is then adjusted to the spiritual attitude achievement criteria listed in Table 2.

RESULT AND DISCUSSION

The validity results of the spiritual attitude observation sheet are listed in Table 4.

Table 4 Validity results of spiritual attitude observation sheet

Aspects observed/assessed	Score	Category
This instrument is based on the Qur'anic verses and hadith.	3.00	Good
The accuracy of the Qur'anic verses and hadiths used as the basis.	3.00	Good
The accuracy of the translation of the Qur'anic verses and hadiths used as the basis.	4.00	Very good
The accuracy of the indicators of religious character values with the verses of the Qur'an and hadith.	4.00	Very good
This instrument can measure religious character values in oneself and others.	3.00	Good
This instrument can be a motivational tool for self and others to always be honest.	3.00	Good
This instrument can be a tool for introspection of religious character values in oneself and others.	3.00	Good
This instrument can serve as a tool to motivate oneself and others to hurry up and repent.	3.00	Good
This instrument can serve as a tool to motivate oneself and others always to pray and do good.	4.00	Very good
This instrument can serve as a tool to instill religious character values in oneself and others.	3.50	Very good
Validity	3.35	Good
Reliability	0.89	Very High

Based on Table 4, the observation sheet was designed based on Qur'anic verses and hadith, with the basis of valid arguments and Islamic teachings. The validation results show that this instrument is categorized as good, including the accuracy of the selection and translation of verses and hadith, the suitability of the indicators of religious character values, and its function as a measurement tool. In addition, this instrument is also effective as a means of introspection, motivation to be honest, repent, pray, and do good, and a medium for instilling religious values. With proven quality, this instrument plays a vital role in the measurement and development of religious character both in oneself and others. The achievement of spiritual attitudes in the pre-test meeting is listed in Figure 2.

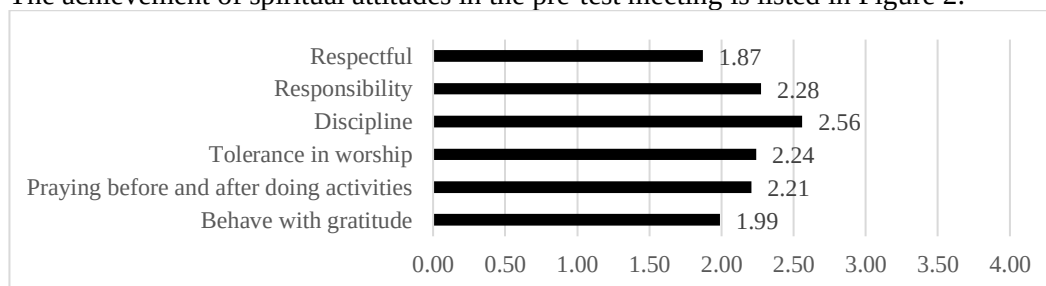


Figure 2 Achievement of spiritual attitudes in the pre-test meeting

Based on Figure 2, two indicators are categorized as less: gratitude and polite behavior. This is because students have only been given religious character learning during learning. Teachers also pay less attention to students' attitudes, such as getting used to saying thank you to students who are enthusiastic about learning, not saying greetings when entering class, talking to friends when the teacher explains, and using harsh and demeaning language to their friends. In this meeting, learning started using smartphones after the pre-test. Therefore, some students use smartphones unwisely because they are used to using printed books during learning. In this meeting, the Islamic character conveyed to students is faith in Allah in the Qur'an surah Ar-Rahman verses 26-27; the message conveyed is that students strengthen their faith that everything depends on His will. The Achievement of spiritual attitudes at meeting one is listed in Figure 3.

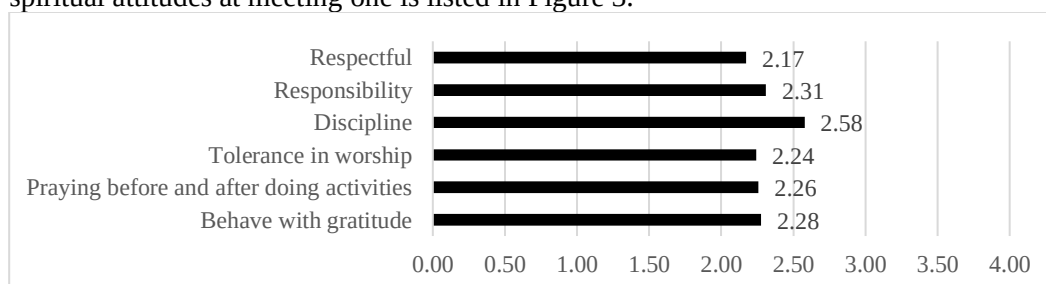


Figure 3 Achievement of spiritual attitudes at meeting 1

Based on Figure 3, the average score of the achievement of spiritual attitudes observed has increased, whereas previously, the category was not good enough. One indicator was previously categorized as not good enough to be enough, namely behaving gratitude. This increase occurred because students began to keep their classes clean. By being a good example, teachers can actively demonstrate gratitude behavior to students ([Sobry & Fitriani, 2022](#); [Wagner & Ruch, 2015](#)). In addition, thanking learners when they do something well and expressing appreciation to those who share ideas or help their friends. This can influence learners to also adopt an attitude of gratitude by the hadith narrated by Abu Daud, No. 4811, and Tirmidzi, No. 1954.

Four indicators are still categorized as sufficient: praying before and after doing activities, tolerance in worship, discipline, and responsibility. While one indicator is still classified as poor, namely politeness. This is because some students are still not accustomed to saying greetings when entering class, talking to friends when the teacher explains, and still using harsh language and being condescending to their friends. At this meeting, the Islamic character conveyed to students is to maintain good communication in the Qur'an surah An-Nahl verse 125; the message conveyed is that students use good language and do not demean their friends by motivating others through conversation. The wisdom approach creates a conducive environment that allows for educational interaction. This helps learners to accept, understand, and increase their enthusiasm for learning through good communication between educators and learners, which still maintains the development of learners' characters and teacher authority ([Nasution, 2017](#); [Somantri, 2017](#)). The achievement of spiritual attitudes at meeting 2 is listed in Figure 4.

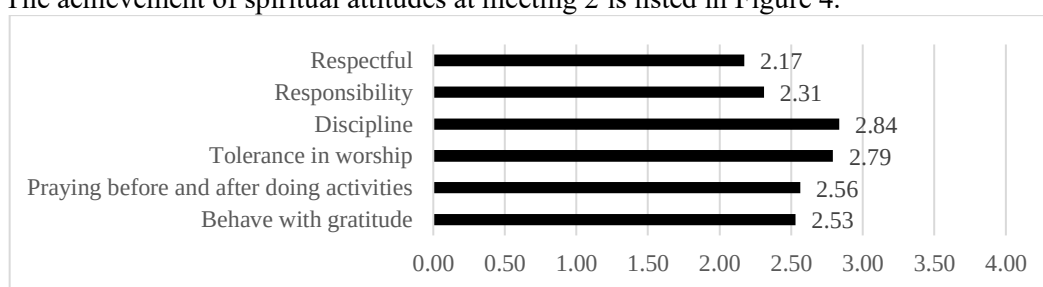


Figure 4 Achievement of spiritual attitudes at meeting 2

Based on Figure 4, the average score for the achievement of spiritual attitudes observed is still categorized as sufficient. 2 indicators have increased, namely discipline, which was previously categorized as sufficient to good. This increase occurred because many students entered class on time. Teachers can be a good example through positive behavior, such as entering class on time, which can positively influence student discipline. By His words in the Qur'an, surah Al-Anfal verse 27.

Four indicators are still categorized as sufficient: behaving with gratitude, praying before and after doing activities, tolerance in worship, and responsibility. While the polite indicator is still categorized as poor. This is due to the practicum, so some students still cannot place themselves on the group assignments given according to the discussion results of each group member. Some students still walk around and chat with students in other groups. At this meeting, the Islamic character conveyed to students is gratitude in the Qur'an surah Al-Baqarah verse 172; the message conveyed is that students apply the habit of being grateful to Allah. In this verse, it is stated that a believer should eat good food given by Allah SWT and be grateful for the sustenance He has bestowed ([Al-Amin, 2023](#); [Khulailiyah, 2023](#)). The Achievement of spiritual attitudes at meeting three is listed in Figure 5.

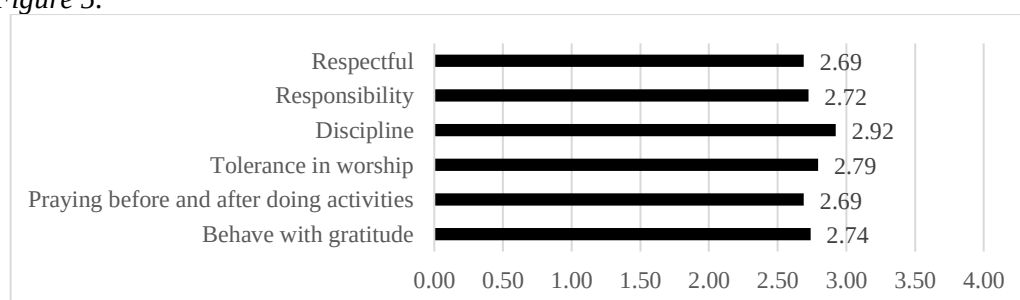


Figure 5 Achievement of spiritual attitudes at meeting 3

Based on Figure 5, the average score for the achievement of spiritual attitudes observed is still in the moderate category. The discipline indicator is still categorized as good. Four indicators are still categorized as sufficient: behaving with gratitude, praying before and after doing activities, tolerance in worship, and responsibility. At this meeting, the Islamic character conveyed to students is a discipline in the Qur'an surah Al-'Asr verses 1-3; the message conveyed is that students maintain regularity in doing assignments and manage their time well so that they can finish well and are carried out by obeying the rules. The achievement of spiritual attitudes at meeting 4 is listed in Figure 6.

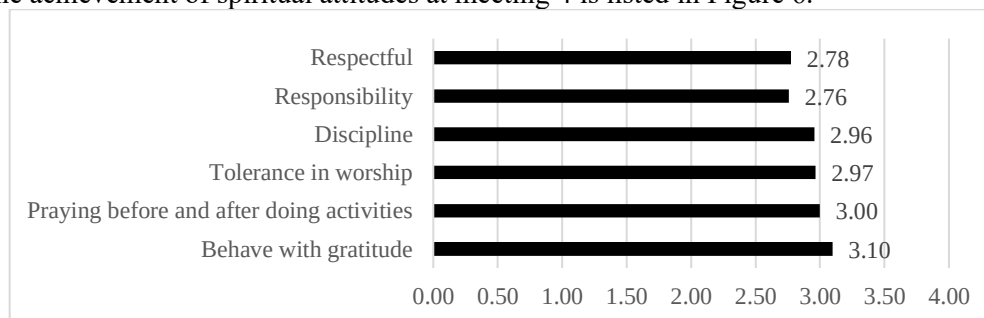


Figure 6 Achievement of spiritual attitudes at meeting 4

Based on Figure 6, the average score for the achievement of spiritual attitudes observed has increased from previously categorized as sufficient to good. Three indicators have increased from moderate to good categories: behaving gratefully, praying before and after doing activities, and tolerance in worship. This increase occurred because students did not complain anymore when receiving assignments, were accustomed to praying before and after learning, and were silent and listened to when hearing verses of the Qur'an. In the Qur'an, Surah Al-A'raf verse 204 teaches to respect the worship of others ([Asy'ari, 2018](#); [Harahap, 2023](#)). By practicing this tolerance, teachers can shape students' religious character by keeping their hearts and minds always respectful of the worship of others. Discipline indicators are still categorized as good. Two indicators are still categorized as sufficient, namely responsibility and courtesy. At this meeting, the Islamic character conveyed to students is polite in the hadith narrated by Ibnu Majah Number 4178; the message is for students to remain calm, patient, and respectful of others in various situations. The achievement of spiritual attitudes at the post-test meeting is listed in Figure 7.

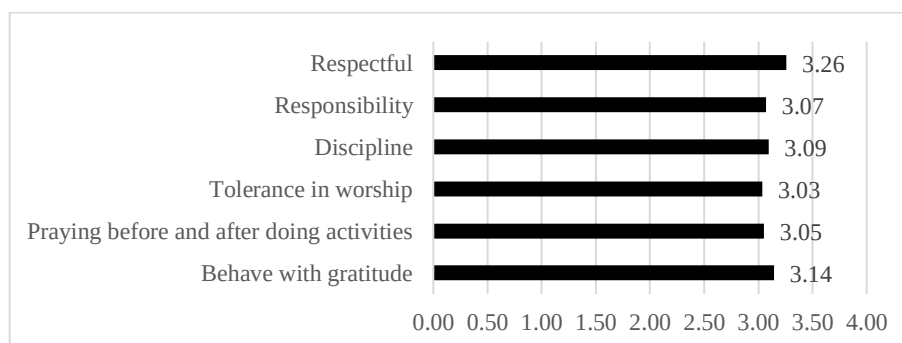


Figure 7 Achievement of spiritual attitudes at the post-test meeting

Based on Figure 7, the average score of spiritual attitudes observed is still in the good category. 2 indicators have increased from moderate to good categories, namely

responsibility and courtesy. This increase occurred because students did not do the task correctly and spoke politely while avoiding harsh language. By giving reprimands to students who are not responsible for their duties, teachers can improve the attitude of responsibility of students ([Dewi et al., 2023](#); [Rahimi & Karkami, 2015](#)). A responsible attitude is one of the values emphasized in the Qur'an surah Al-Isra verse 36. Teachers can model good behavior by providing examples of polite attitudes to students ([Iwan, 2020](#); [Manik & Hutagaol, 2015](#)). Good morals and ethics help a person become a responsible, trustworthy individual and positively contribute to society ([Arcanita & Febriyarni, 2024](#); [Chowdhury, 2018](#)). Individuals with good character will feel responsible for every role they take on. This value of responsibility is mentioned in Al-Muddassir verse 38 ([Kadafi & Ramli, 2017](#); [Zannah, 2020](#)).

In the hadith narrated by Muslim and At-Tarmidzi number 3231, the Prophet taught the importance of being polite and friendly in every interaction with teachers, fellow friends, and others. Indicators of gratitude behavior, such as praying before and after doing activities and tolerance in worship, remain in the good category. The diagram of the increase in achievement of spiritual attitudes obtained is listed in Figure 8.

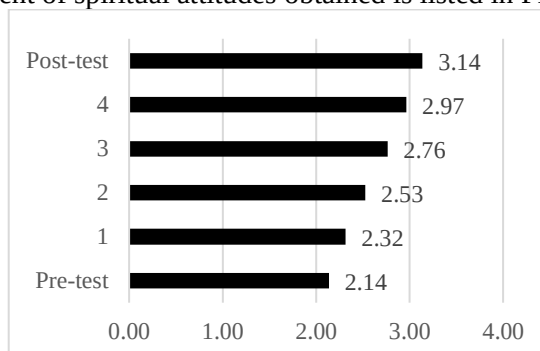


Figure 8 Diagram of the increase in achievement of spiritual attitudes obtained

Before using teaching materials with Qur'anic verses, students tended to show behaviors such as delaying assignments, coming late to class, being individualistic, giving up easily when facing difficulties, and lacking the importance of prayer and gratitude. However, when learning the Qur'anic verses, students become more honest in completing assignments, more disciplined in participating in learning, caring for friends who need help, patient and persistent in completing assignments, and more appreciative when praying and being grateful. This change shows that teaching materials with Qur'anic verses can help shape students' characters to be more positive and to follow Islamic values.

While observing learners' spiritual attitudes, there were some challenges, such as learners' lack of awareness of the importance of being kind to teachers and friends. To overcome this, teachers can provide an initial understanding of the importance of spiritual attitudes, use indicators based on verses from the Qur'an and hadith, create a positive learning environment, take a personal approach to create comfort and ask learners to record things they are grateful for every day in a personal journal to help them increase awareness of the various good things in their lives. In addition, it also involves parents and other subject teachers in strengthening religious character values at home and school by communicating expectations and supporting consistency between the learning environment at school and home. Education policymakers, starting from the local education office to the minister of education, should improve the quality of education, especially educators, by providing teaching materials that can enhance the spiritual attitudes of students so that the educational objectives in the law can be achieved.

CONCLUSION

The use of teaching materials for thermodynamics with Al-Qur'an verses can improve the spiritual attitude of students, with details of 1 out of 29 students getting a very good category spiritual attitude score. 21 out of 29 students showed good category spiritual attitudes. 7 out of 29 students showed a fairly good spiritual attitude. The final achievement of students' spiritual attitudes of 3.14 in the good category was declared good based on the results of the observation sheet of students' spiritual attitudes.

The potential long-term impact of using teaching materials containing Qur'anic verses on student character development includes forming a strong religious character, high moral integrity, and behavior consistent with Islamic values. With a deep understanding of the Qur'anic verses, students can internalize the values of honesty, discipline, empathy, patience, responsibility, and gratitude in their daily lives. In the long run, this can form a more spiritually resilient person, positively face challenges, and establish good social relationships. In addition, students who are accustomed to learning with Qur'anic values have the potential to become individuals who actively contribute to society, promote goodness, and become role models for the surrounding environment. These teaching materials can also increase students' awareness of the importance of relationships with God and others, thus building an intellectually intelligent, morally and spiritually dignified generation. This impact is expected to last into adulthood, forming a mindset and actions always oriented towards goodness and usefulness for others.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

All authors have contributed to the conceptualization, methodology, formal analysis, investigation, and writing this article.

REFERENCES

- Al-Amin, R. A. M. (2023). Food consumption from islamic perspective: Evidence from qur'an and sunnah. *European Journal for Philosophy of Religion*, 15(3), 257–280.
- Alismail, H. A., & McGuire, P. (2015). 21st century standards and curriculum: Current research and practice. *Journal of Education and Practice*, 6(6), 150–154. <https://doi.org/10.3390/bs12020038>
- Altbach, P. G., Reisberg, L., Rumbley, L. E., & Stephen, J. (2019). Trends in global higher education: Tracking an academic revolution. In *Unesco 2009* (Vol. 22, p. 69).
- Arcanita, R., & Febriyarni, B. (2024). Analisis interpretasi tekstual dan kontekstual tentang pendidikan karakter dalam al-qur'an. *AL QUDS: Jurnal Studi Alquran Dan Hadis*, 7(3), 631–640. <https://doi.org/10.29240/alquds.v7i3.8724>
- Arikunto, S. (2021). *Dasar-dasar evaluasi pendidikan edisi 3* (R. Damayanti, Ed.; Edisi Ket). PT Bumi Aksara.
- Astini, N. K. S. (2020). Pemanfaatan teknologi informasi dalam pembelajaran tingkat sekolah dasar pada masa pandemi covid-19. *Lampuhyang*, 11(2), 13–25. <https://e-journal.stkip->
- Asy'ari, M. (2018). Moral and science integration in the qur'anic education perspective. *Addin*, 12(1), 191–220. <https://doi.org/10.21043/addin.v12i1.3616>
- Bejan, A. (2017). Evolution in thermodynamics. *Applied Physics Reviews*, 4(1). <https://doi.org/10.1063/1.4978611>

- Biantoro, O. F. (2019). Urgency of Islamic religious education teachers in character building for students in junior high schools. *Al-Hayat: Journal of Islamic Education*, 3(2), 178–199.
- Chalkiadaki, A. (2018). A systematic literature review of 21st century skills and competencies in primary education. *International Journal of Instruction*, 11(3), 1–16. <https://doi.org/10.12973/iji.2018.1131a>
- Chowdhury, M. (2018). Emphasizing morals, values, ethics, and character education in science education and science teaching. *MOJES: Malaysian Online Journal of Educational Sciences*, 4(2), 1–16.
- Chusni, M. M., Amelia, A., Azizah, D. S., Zafira, K. F., & Agustina, R. D. (2018). Fenomena entropi dilihat dari perspektif sains dan al-qur'an. *SPEKTRA : Jurnal Kajian Pendidikan Sains*, 4(2), 105. <https://doi.org/10.32699/spektra.v4i2.51>
- Dewi, A. C., Ramadhan, B., Fadhil, A. A., Fadhil, F., Idris, A. M., Hidayat, Muh. R., & Yusrin, M. A. D. (2023). Pendidikan moral dan etika mengukir karakter unggul dalam pendidikan. *IJOCE: Indonesia Journal of Civic Education*, 3(2), 69–76. <https://doi.org/10.31539/ijoce.v3i2.8195>
- Dhawan, S. (2020). Online learning: A panacea in the time of covid-19 crisis. *Journal of Educational Technology Systems*, 49(1), 5–22. <https://doi.org/10.1177/0047239520934018>
- Diani, R., & Hartati, N. S. (2018). Flipbook berbasis literasi Islam: Pengembangan media pembelajaran fisika dengan 3D pageflip professional. *Jurnal Inovasi Pendidikan IPA*, 4(2), 234–244. <https://doi.org/10.21831/jipi.v4i2.20819>
- Gimbert, B. G., Miller, D., Herman, E., Breedlove, M., & Molina, C. E. (2023). Social emotional learning in schools: the importance of educator competence. *Journal of Research on Leadership Education*, 18(1), 3–39. <https://doi.org/10.1177/19427751211014920>
- Gusviani, E. (2016). Analisis kemunculan sikap spiritual dan sikap sosial dalam kegiatan pembelajaran IPA kelas IV SD yang menggunakan KTSP dan kurikulum 2013. *EduHumaniora Jurnal Pendidikan Dasar Kampus Cibiru*.
- Habibi, M., Zainuddin, Z., & Misbah, M. (2017). Pengembangan perangkat pembelajaran IPA fisika berorientasi kemampuan pemecahan masalah menggunakan model pengajaran langsung pada pokok bahasan tekanan di SMP Negeri 11 Banjarmasin. *Berkala Ilmiah Pendidikan Fisika*, 5(1).
- Harahap, S. S. (2023). Perilaku memberikan saweran kepada qori atau qori'ah yang sedang melantunkan ayat al-qur'an (studi terhadap qur'an surat al-a'raf ayat 204 dalam perspektif m. quraish shihab). *ANWARUL*, 3(6), 1323–1339. <https://doi.org/10.58578/anwarul.v3i6.1697>
- Hartini, L., Zainuddin, Z., & Miriam, S. (2018). Pengembangan perangkat pembelajaran berorientasi keterampilan proses sains menggunakan model inquiry discovery learning terbimbing. *Berkala Ilmiah Pendidikan Fisika*, 6(1).
- Haryandi, S., Misbah, M., Mastuang, M., Dewantara, D., & Mahtari, S. (2019). Analisis keterampilan berpikir kritis siswa pada materi elastisitas bahan padat. *Kasuari: Jurnal Pendidikan Fisika (KPEJ)*, 2(2), 89–94.
- Haryandi, S., Wati, M., Misbah, M., Azhari, A., Maulana, M. I., Azzahra, A., & Fitri, M. R. (2023). Penguatan implementasi kurikulum merdeka melalui pelatihan pengembangan modul ajar berbasis kearifan lokal di lingkungan lahan basah. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*, 5(4), 1726–1733. <https://doi.org/10.20527/btjpm.v5i3.10188>

- Ihsan, M. S., Ramdani, A., & Hadisaputra, S. (2019). Pengembangan e-learning pada pembelajaran kimia untuk meningkatkan kemampuan berpikir kritis peserta didik. *Jurnal Pijar Mipa*, 14(2), 84–87. <https://doi.org/10.29303/jpm.v14i2.1238>
- Irianti, F., Listina, L., Khairani, L., Marpaung, A. Y. M., Ekasari, A., & Munthe, I. K. (2023). Fungsi dan materi muatan undang-undang no. 44 tahun 2008 tentang pornografi. *Indonesia Berdaya*, 4(4), 1391–1404. <https://doi.org/10.47679/ib.2023571>
- Irwansyah, M. (2020). Pengaruh bahan ajar sistem reproduksi manusia terintegrasi nilai-nilai alquran terhadap sikap spiritual siswa. *Jurnal Pendidikan*, 2, 1–7.
- Ismail, I. (2016). Character education based on religious values: An islamic perspective. *Ta'dib: Jurnal Pendidikan Islam*, 21(1), 41–58. <https://doi.org/10.19109/td.v21i1.744>
- Iwan, I. (2020). Merawat sikap sopan santun dalam lingkungan pendidikan. *Al-Tarbawi Al-Haditsah Jurnal Pendidikan Islam*, 5(1).
- Kadafi, A., & Ramli, M. (2017). Integrated qs al mudatsir in the reality group counseling to grow the character of students academic responsibility. *Counsellia: Jurnal Bimbingan Dan Konseling*, 7(2), 117–125. <https://doi.org/10.25273/counsellia.v7i2.1867>
- Khalil, M. K., & Elkhider, I. A. (2016). Applying learning theories and instructional design models for effective instruction. *Advances in Physiology Education*. <https://doi.org/10.1152/advan.00138.2015>
- Khulailiyah, A. (2023). Konsep syukur dalam al-qur'an dan implikasinya terhadap pendidikan islam. *ILJ Islamic Learning Journal*, 1(3), 805–825.
- King, P. E., & Boyatzis, C. J. (2015). Religious and spiritual development. In *Handbook of child psychology and developmental science: Socioemotional processes*, 3, 975–1021.
- Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses. *Computers and Education*, 104, 18–33. <https://doi.org/10.1016/j.compedu.2016.10.001>
- Manik, S., & Hutagaol, J. (2015). An analysis on teachers' politeness strategy and student's compliance in teaching learning process at sd negeri 024184 binjai timur binjai –north sumatra-indonesia. *English Language Teaching*, 8(8), 152–170. <https://doi.org/10.5539/elt.v8n8p152>
- Meti, I. (2022). *Hubungan kemampuan berpikir kritis dengan self efficacy peserta didik kelas xi di masa pandemi pada materi termodinamika*. UIN Raden Intan Lampung.
- Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of covid-19 pandemic. *International Journal of Educational Research Open*, 1, 100012. <https://doi.org/10.1016/j.ijedro.2020.100012>
- Mukhid, M. P. (2023). *Disain teknologi dan inovasi pembelajaran dalam budaya organisasi di lembaga pendidikan*. Pustaka Egaliter.
- Nababan, S. T., & Putri, D. H. (2022). Pengaruh penerapan media e-learning edmodo terhadap minat dan hasil belajar siswa pada pembelajaran fisika saat tatap muka terbatas. *Jurnal Ilmiah Pendidikan Fisika*, 6(2), 234. <https://doi.org/10.20527/jipf.v6i2.4410>
- Nasution, T. (2017). Konsep dasar pendidikan kewarganegaraan dalam membangun karakter siswa. *Ijtimaiah: Jurnal Pendidikan Dan Ilmu Sosial*, 1(2).
- Nisa, K., & Farhan, A. (2016). Pengaruh pembelajaran fisika berbasis Al-qur'an terhadap sikap spiritual siswa kelas X SMA Negeri 2 Banda Aceh. *Jurnal Ilmiah Mahasiswa Pendidikan Fisika*, 1(4), 202–207.

- Nurohmatin, T. (2017). *Pengembangan modul biologi terintegrasi nilai-nilai keislaman untuk memberdayakan berfikir kritis siswa kelas xi sma al-kautsar bandar lampung*. UIN Raden Intan Lampung.
- Oviana, W., Jannah, M., Juliantika, N., & Fhasya, N. D. (2022). Penanaman sikap spiritual dan sikap sosial siswa melalui pembelajaran tematik pada madrasah ibtidaiah. *Fitrah: International Islamic Education Journal*, 4(1), 148–175.
- Pangestu, M. A. S., & Indayati, T. (2023). Analisis kesulitan dalam pembelajaran ilmu pengetahuan alam pada materi sistem pencernaan di smp negeri 22 surabaya. *Indonesian Journal of Science Learning (IJS�)*, 4(1), 40–47. <https://doi.org/10.15642/ijsl.v4i1.2473>
- Rahimi, M., & Karkami, F. H. (2015). The role of teachers' classroom discipline in their teaching effectiveness and students' language learning motivation and achievement: A path method. *Iranian Journal of Language Teaching Research*, 3(1), 57–82.
- Rahmayanti, P. R., Wati, M., & Mastuang, M. (2016). Pengembangan modul suhu dan kalor menggunakan model pembelajaran kooperatif tipe somatic, auditory, visual, and intellegent untuk siswa kelas X SMA negeri 7 banjarasin. *Berkala Ilmiah Pendidikan Fisika*, 4(3).
- Redhana, W. (2019). Mengembangkan keterampilan abad ke-21 dalam pembelajaran kimia. *Jurnal Inovasi Pendidikan Kimia*, 1(13), 2239-2253.
- Rieckmann, M. (2018). Learning to transform the world: Key competencies in Education for Sustainable Development. In *Issues and trends in education for sustainable development*. <https://doi.org/10.54675/yelo2332>
- Rohmatulloh, D. M., & Dwijayanto, A. (2021). Physics of qur'an: Islamizing the science and its contribution towards humanity. *Religio Education*, 1(2), 75–85.
- Sahin, A. (2018). Critical issues in islamic education studies: Rethinking islamic and western liberal secular values of education. *Religions*, 9(11), 335. <https://doi.org/10.3390/rel9110335>
- Santoso, M. C. H., Zainuddin, Z., & Mastuang, M. (2023). Electronic multimodel-based instructional materials development on the sound wave topic incorporating the verses of the quran. *Jurnal Ilmiah Pendidikan Fisika*, 7(1), 158. <https://doi.org/10.20527/jipf.v7i1.7163>
- Sitompul, N. T. Y. (2024). Pengaruh Media Sosial terhadap Karakter Pemuda Masa Kini. *Jurnal Pendidikan Agama Dan Teologi*, 2(1), 42–59. <https://doi.org/10.59581/jpat.widyakarya.v2i1.2344>
- Sobry, M., & Fitriani, F. (2022). Metode guru pai dalam mengembangkan sikap spiritual dan sosial siswa kelas v sdn 12 mataram. *El Midad*, 12(2), 136–154.
- Somantri, A. (2017). Implementasi al-qur'an surat an-nahl ayat 125 sebagai metode pendidikan agama islam (studi analisis al-quran surah an-nahl ayat 125). *Wahana Karya Ilmiah Pendidikan*, 1(02).
- Stapa, M. A., & Mohammad, N. (2019). The use of addie model for designing blended learning application at vocational colleges in malaysia. *Jurnal Teknologi Maklumat Dan Multimedia Asia-Pasifik*, 8(1), 49–62.
- Sumiyati, F. (2023). *Pengembangan modul biologi terintegrasi nilai-nilai keislaman untuk memberdayakan karakter religius siswa*. UIN Raden Intan Lampung.
- Sunarya, P. A., Lutfiani, N., Santoso, N. P. L., & Toyibah, R. A. (2021). The importance of technology to the view of the qur'an for studying natural sciences. *APTISI Transactions on Technopreneurship (ATT)*, 3(1), 58–67. <https://doi.org/10.34306/att.v3i1.142>

- Syarif, F. (2020). Reintegration of religious knowledge and general knowledge (criticism of the discourse of science dichotomy). *Transformatif*, 4(1), 1–18. <https://doi.org/10.23971/tf.v4i1.1850>
- Tiara, S. K., & Sari, E. Y. (2019). Analisis teknik penilaian sikap sosial siswa dalam penerapan kurikulum 2013 di SDN 1 Watulimo. *EduHumaniora Jurnal Pendidikan Dasar Kampus Cibiru*, 11(1), 21.
- Ulia, N., Sari, Y., & Hariyono, M. (2020). Pengaruh bahan ajar konsep dasar matematika berbasis internalisasi nilai-nilai islam terhadap sikap religius. *Jurnal Studi Guru Dan Pembelajaran*, 3(1), 1–10. <https://doi.org/10.30605/jsgp.3.1.2020.154>
- Vollet, J. W., Kindermann, T. A., & Skinner, E. A. (2017). In peer matters, teachers matter: Peer group influences on students' engagement depend on teacher involvement. *Journal of Educational Psychology*, 109(5), 635–652. <https://doi.org/10.1037/edu0000172>
- Wagner, L., & Ruch, W. (2015). Good character at school: Positive classroom behavior mediates the link between character strengths and school achievement. *Frontiers in Psychology*, 6, 610. <https://doi.org/10.3389/fpsyg.2015.00610>
- Weni, T. (2020). Analisis proses perencanaan pembelajaran pendidikan kesetaraan paket b berbasis kurikulum 2013 di sanggar kegiatan belajar (skb) kota samarinda. *Pepatudzu*, 16(2), 89–95. <https://doi.org/10.35329/fkip.v16i2.1765>
- Widoyoko, S. (2016). *Evaluasi program pembelajaran*. Pustaka Pelajar.
- Zainuddin, Z., Astuti, R. D., Misbah, M., Wati, M., & Dewantara, D. (2020). Pengembangan modul pembelajaran generatif materi fluida statis terintegrasi ayat-ayat Al-Qur'an. *Jurnal Pendidikan Informatika Dan Sains*, 9(1), 1. <https://doi.org/10.31571/saintek.v9i1.1539>
- Zainuddin, Z., & Misbah, M. (2021). Efektivitas perangkat pembelajaran fisika fluida berbasis lingkungan lahan basah. *Jurnal Inovasi Dan Pembelajaran Fisika*, 08(2), 136–143.
- Zannah, F. (2020). Integrasi nilai-nilai pendidikan karakter berbasis al qur'an. *Tunas: Jurnal Pendidikan Guru Sekolah Dasar*, 5(2), 1–8. <https://doi.org/10.33084/tunas.v5i2.1233>

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