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Enhancing Qur'an-Hadith Education through Science, Technology, and Society Approach: A Developmental Study

Rahmiati[1], Muhammad Zubir[2], Muhiddinur Kamal[3], Elfiani[4], Muhamad Rezi[5], Sofia Ridha[6]

[1] Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; rahmiati@uinbukittinggi.ac.id
[2] Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; zubir86choto@gmail.com
[3] Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; muhiddinurkamal@uinbukittinggi.ac.id
[4] Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; elfiani@uinbukittinggi.ac.id
[5] Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; rezineddin@gmail.com
[6] Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; sofiaridha@uinbukittinggi.ac.id

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ABSTRACT

This study explores the development of a *Qur'an-Hadith* learning model incorporating the Science, Technology, and Society (STM) approach to cultivate technological responsiveness and social awareness among *Madrasah Tsanawiyah* students. The integration of STS is intended to bridge traditional religious education with contemporary societal and technological contexts. A Research and Development (R&D) methodology was applied, guided by the McKenney model, which includes the phases of preliminary research, prototyping, and assessment. Each stage was carried out systematically to ensure the validity, practicality, and effectiveness of the proposed model. The STM-based learning model led to notable improvements in student learning outcomes at MTs Sjech Ibrahim Koto Tuo. The model was validated by subject matter experts and demonstrated strong pedagogical relevance. Its practical application in the classroom environment encouraged higher levels of student engagement, creativity, and critical thinking, reflecting a positive shift in students' technological awareness and social responsibility. Incorporating the STM approach into *Qur'an-Hadith* instruction enhanced the overall quality and relevance of religious education. This method successfully linked religious content with real-world issues, fostering a more dynamic and contextually aware learning experience. The STM-based learning model presents a promising alternative for Islamic education. Aligning religious studies with scientific and societal dimensions contributes meaningfully to both academic performance and character development among students.

Corresponding Author:
Muhiddinur Kamal
Universitas Islam Negeri Sjech M. Djamil Djambek, Indonesia; muhiddinurkamal@uinbukittinggi.ac.id

1. INTRODUCTION

In an increasingly complex and dynamic society, educational strategies must evolve to prepare students with academic knowledge and the critical awareness and social sensitivity necessary for active

participation in their communities. As Jovchelovitch (2019) emphasizes, learning should foster understanding and analytical skills related to the social realities surrounding students. The shift toward student-centered learning reflects this educational paradigm change, moving away from expository and textual approaches toward participatory and contextual learning (Hoidn & Reusser, 2020; Sormin, 2023; Holtzblatt & Beyer, 2014). These changes are aimed at improving both the quality of the learning process and its outcomes.

However, these progressive shifts have not been fully realized in certain areas of Islamic education, particularly in the teaching of *Qur'an-Hadith* at the Madrasah Tsanawiyah level. Despite its mandatory status in Indonesia's religious education curriculum (Muliati & Rezi, 2018), the learning of *Qur'an-Hadith* remains largely traditional, lacking the contextual relevance necessary to engage students meaningfully. Observations and classroom studies reveal persistent problems: low student engagement, weak conceptual understanding, and minimal connection to real-life social contexts. Teaching remains largely teacher-centered, with limited opportunities for students to explore, question, or relate religious teachings to contemporary social and technological issues.

At MTs TI Sjech Ibrahim Al Khalidy, these challenges are particularly evident. Teachers are still reliant on outdated instructional materials, often failing to define clear objectives or connect the subject matter to broader educational goals. Lessons frequently neglect cross-disciplinary relevance, relying on a one-dimensional, lecture-based method that limits student participation and creativity. Students are rarely encouraged to construct their understanding or apply religious values within the context of everyday societal life. Such conventional approaches are misaligned with modern educational standards and have significant implications for students' cognitive and moral development.

Despite growing interest in contextual and student-centered pedagogies, little research has focused specifically on integrating the *Science, Technology, and Society* (STS or STM in Bahasa Indonesia) approach into *Qur'an-Hadith* learning within Islamic schools. Prior studies have established that the STM model effectively enhances scientific literacy, creativity, and problem-solving in general science education (Lestari et al., 2016; Evariani et al., 2017; Wati, 2014). However, its application in religious instruction—especially in developing students' awareness of technological developments and their social implications—remains underexplored.

This research seeks to fill this gap by developing and applying an STM-based learning model tailored to the *Qur'an-Hadith* subject at the junior secondary level. The novelty of this study lies in its integration of a secular, science-driven educational model into a religious learning context. It proposes a hybrid pedagogical framework where religious knowledge is not only internalized but also contextualized within current scientific and societal realities. By doing so, the study contributes a new dimension to both religious pedagogy and curriculum development in Indonesian Islamic education.

This study is guided by several key research questions that frame its development and direction. It seeks to explore how the Science, Technology, and Society (STM) learning model can be effectively developed and implemented within the context of *Qur'an-Hadith* instruction at the Madrasah Tsanawiyah level. Furthermore, it examines the extent to which this model influences students' learning outcomes, particularly in fostering technological responsiveness and social awareness. Finally, the research investigates the validity, practicality, and overall effectiveness of the STM-based learning model when applied to Islamic religious education settings.

The primary aim of this study is to design, develop, and evaluate a Science, Technology, and Society (STM)-based learning model for *Qur'an-Hadith* education at the Madrasah Tsanawiyah level. This research also seeks to explore the pedagogical limitations present in current *Qur'an-Hadith* instruction and to identify areas that require improvement. Additionally, it aims to construct a contextually relevant learning model that meaningfully integrates scientific, technological, and societal issues with Islamic teachings. A further objective is to assess the effectiveness of the proposed model in enhancing students' academic performance, fostering critical thinking skills, and increasing their awareness of social and technological challenges.

This research holds both theoretical and practical significance. Theoretically, it contributes to the growing body of literature on contextual religious education by integrating constructivist and interdisciplinary learning frameworks into Islamic pedagogy. Practically, it provides educators and curriculum developers with an innovative model for teaching *Qur'an-Hadith* that resonates with students' lived experiences in a technologically advanced and socially complex world.

By repositioning students as active agents in the learning process—encouraged to question, reflect, and apply religious principles—the STM model aligns well with Paulo Freire's (2020) criticism of "banking education." Freire argued that the conventional model of depositing information into passive students stifles creativity and inhibits the development of critical consciousness. This study aims to address these shortcomings by fostering an educational environment that promotes dialogue, inquiry, and personal responsibility in interpreting and living the teachings of the *Qur'an*.

Moreover, in line with Golombek & Johnson (2004) and Darling-Hammond (2016), this research views teaching as more than content delivery—it is an active process of designing environments that empower learners. The STM model, by its very nature, encourages students to connect religious knowledge to scientific advancements and social realities, thus fostering holistic character development and preparing them for meaningful civic participation.

In summary, this study offers a timely and relevant contribution to the discourse on Islamic education reform. By proposing and testing a context-responsive, student-centered learning model, it addresses longstanding pedagogical challenges in *Qur'an-Hadith* instruction and opens pathways for future innovation in religious education.

2. METHODS

This study employs a Research and Development (R&D) approach aimed at designing and developing a *Qur'an-Hadith* learning model based on the Science, Technology, and Society (STM) framework. The primary goal is to create a set of instructional tools that are internally coherent, pedagogically effective, and practically applicable in the context of Madrasah Tsanawiyah. The research is grounded in a systematic process of designing, developing, and evaluating instructional materials that not only align with curricular standards but also enhance student engagement and learning outcomes.

The development procedure follows the stages outlined in McKenney's development model, which provides a structured framework for iterative design and refinement. The evaluation strategy used is formative in nature, adopting Tessmer's (1994) multi-stage evaluation approach. The initial phase—preliminary analysis—involves a thorough examination of curriculum content, key concepts, student characteristics, existing teaching materials, and relevant literature. This phase ensures that the design is grounded in both theoretical and contextual understanding.

In the prototyping stage, early versions of the STM-based learning tools are developed, including a model book and lesson plans tailored for *Qur'an-Hadith* instruction. These prototypes undergo expert review and classroom trials, followed by revisions to address identified weaknesses or gaps. The final stage is the assessment phase, where the developed products are tested for validity, practicality, and effectiveness. Data collected from product trials help evaluate whether the tools positively impact student learning. Effectiveness is specifically assessed through the implementation of the STM model in classroom settings, focusing on its influence on student participation, comprehension, and responsiveness to both technological and societal issues.

3. FINDINGS AND DISCUSSION

3.1 Data Analysis and Development Results

3.1.1 Preliminary Study Results

The preliminary study was carried out with a literature review as a step taken before the design. The step taken is to read and analyze various literature on learning strategies. Learning strategies are a medium that bridges between learning and students' enjoyment in learning. Strategies are believed to be the best step in inspiring students to take a learning action. In addition, strategies can help the development of cultural appreciation and emotional intelligence, expand knowledge, or cause pleasure. Strategies are also a reference in learning.

In addition to strategies, learning outcomes are also a concern in this study. Learning outcomes are something that students get after carrying out learning activities, either in the form of achievements or changes in the behavior and attitudes of students who have experienced learning. The learning outcomes referred to in this study are student learning outcomes in the cognitive domain obtained after students carry out learning outcome tests in learning using STM learning strategies.

For this reason, developing diverse and exciting learning strategies is necessary for students to develop their interest in learning and achieve the learning outcomes expected by all parties: schools, the environment, and families.

3.1.2 Need Analysis

Grounded in the theoretical perspective that diverse and engaging instructional strategies are essential to fostering students' interest in learning, the researcher conducted a series of observations and interviews with both teachers and students at Madrasah Tsanawiyah Sjech Ibrahim Koto Tuo. The aim was to explore perceptions of effective teaching methods, particularly those that make learning more enjoyable and engaging.

Interviews with teachers revealed a shared understanding that students respond more positively to lessons that incorporate varied instructional strategies. According to Yusriarti, the principal of MTs Sjech Ibrahim and a *Qur'an-Hadith* teacher, students are notably more motivated when teachers employ a range of teaching methods. She emphasized that the introduction of different strategies tends to capture students' attention and enhance their willingness to engage in the learning process. This observation has been reinforced by previous research activities conducted at the school, including undergraduate and doctoral studies, which also found that students showed higher levels of participation and interest when innovative learning models were implemented.

Furthermore, interviews with students confirmed these findings. Students expressed a clear preference for learning experiences that involve a variety of activities and instructional techniques. They reported that lessons become more enjoyable and easier to understand when they are interactive and activity-based, rather than relying solely on traditional, lecture-driven instruction. The students noted that such approaches not only make the learning process more engaging but also help them grasp the material more quickly and effectively.

3.1.3 Instrument Validation

Before submitting the draft of the STM learning strategy instrument in Learning the Qur'an Hadith at MTs, Sjech Ibrahim was first discussed with several experts and practitioners. After going through several revision stages, the draft instrument was sent back to the assessment team consisting of experts and practitioners. In the first submission, the draft learning instrument for learning strategies for Community Science and Technology in Learning Qur'an-Hadith was returned and equipped with an assessment of indicators, especially language.

Based on the assessment results, revisions were carried out again. Then, it was sent back to the assessors. The conclusion from the assessment results is based on the theory that the instrument is said to be valid if more than 75% of the assessors declare it valid. This applies to all tables that contain the results of the instrument assessment.

3.1.4 Learning Tools

Designing learning tools is done by understanding several pieces of literature that support learning design using learning strategies. In addition, an expert assesses the learning design by directly discussing the design of learning tools using the Science and Technology Learning Strategy of Society before being experimented with.

The learning tools, which include Learning Plans (RPP) and *Qur'an-Hadith* subject matter with the Science and Technology of Society strategy, are discussed with teachers who teach these subjects before being experimented with. The assessment of the validity and suitability of this model device consists of several aspects, namely: 1) the rationality of the device, 2) the results of the assessment of the material presented, 3) the assessment of the suitability between aspects, 4) the assessment of the language used, and 5) the physical form.

After measuring the validity and suitability of the appointed experts' learning tools, revisions were made to several aspects that needed improvement in the assessment. Then, a focus group discussion (FGD) was carried out as a training session on using learning tools and community science and technology learning strategies for teachers. The learning tools that have gone through several stages of revision after the FGD are then tested to find shortcomings again so that they can be revised. And so on, until a valid learning device design is seen several times.

Several revisions found that the characteristics of the learning tools using the Community Science and Technology learning strategy have a clear category and differ from other learning tools. The characteristic lies in how the RPP and different Qur'an-Hadith materials are presented with STM learning strategies. Another finding was that learning tools using the Science and Technology Community strategy can motivate students to participate in learning the Qur'an-Hadith with more enthusiasm.

In addition, according to the assessment team, the Qur'an-Hadith learning tool using the Community Science and Technology strategy provides many benefits for students, especially in motivating and attracting their attention. Thus, the rationale of the Qur'an-Hadith Learning tool using the Community Science and Technology learning strategy is as expected.

The reviewers concluded that the context of the problem presented by the learning tool using the STM strategy in Qur'an-Hadith Learning is already in the contextual category. The material presented can touch students' daily activities so that in learning, students can enjoy it and even try to learn some material related to learning at that time. In addition, the theory used is considered to follow the theories of learning and student development based on a solid theory. Then, the assessment team considers the material presented in the learning tool using the Community Science and Technology learning strategy adequate, meaning that students at Madrasah Tsanawiyah learn the material chosen. Then, the organization of the material is also regarded as systematic, which means that it is in order as desired. The teachers who are also assessors stated that the relationship between one topic and another is also considered to have a high category.

The assessor stated that the learning tool using the Community Science and Technology learning strategy can provide opportunities for students to convey their ideas. Thus, the chance to interact with students and teachers in learning is valuable. Hence, it can be concluded that the Al-Qur'an-Hadith Learning tool using the Community Science and Technology learning strategy can be used for students at the Madrasah Tsanawiyah (MTs) level.

Likewise, in language use, it was found that the language used in the Al-Qur'an-Hadith Learning tool using the Community Science and Technology learning strategy was relatively straightforward for students to understand. In addition, the sentences are relatively straightforward, and the difficulty level is easy. That way, the language used is easy for students at the junior high school level to understand.

In addition, regarding learning objectives, it was found that the objectives formulated and the demands contained in them were apparent. The abilities included in the learning objectives are also comprehensive. Thus, the assessor concluded that the learning indicators prepared were under students' abilities at the Madrasah Tsanawiyah level.

Regarding the delivery method of material using the *Qur'an-Hadith* Learning tool with the Community Science and Technology strategy, the assessors concluded that presenting learning activities using it can attract students' attention and increase their seriousness and concentration in learning.

In terms of student involvement in learning, there is a very high participation rate. Many students are willing to respond and interact in learning. In addition, the order of activities is apparent, with systematic presentation steps. The orientation of the activities is aimed at helping students develop their interest in learning. Learning using learning tools based on the Science and Technology Community strategy can be carried out by all teachers and is flexible. Thus, such a learning strategy can provide opportunities for interaction and discussion among students and between students and teachers in learning activities.

3.1.5 Practicality

Practicality in this study is about the level of practicality or not of the development of *Qur'an-Hadith* learning based on Science, Technology, and Society that has been designed. This practicality was assessed by teachers who applied Qur'an-Hadith-based learning based on Science, Technology, and Society.

The results of the practicality test found that implementing Al-Qur'an-Hadith learning based on the Science, Technology, and Society strategy was declared practical, with a score of 80.0. The data also show that the Qur'an-Hadith learning strategy based on science, technology, and society is practical.

3.1.6 Effectiveness

To evaluate the effectiveness of the *Qur'an-Hadith* learning tool based on the Science, Technology, and Society (STM) strategy, an experimental study was conducted by implementing the learning model in a classroom setting. The research design involved dividing participants into two groups: an experimental class that received instruction using the STM-based model and a control class that followed conventional teaching methods.

3.2 Application of Qur'an-Hadith Learning with Science, Technology, and Society Strategies

The implementation of the *Qur'an-Hadith* learning model using the Science, Technology, and Society (STS) approach follows a structured process adapted from Joyce et al. (2009), which emphasizes critical thinking, argumentation, and contextual learning. In the initial stage, students are guided by the teacher to identify real-life social or technological issues that relate to the teachings of the *Qur'an* and *Hadith*. The teacher facilitates this process by encouraging students to explore the facts and ethical dimensions of the selected issues. This method allows students to connect religious teachings with contemporary societal challenges, fostering a more meaningful and relevant learning experience.

Once the issue is identified, students are asked to take a position or express an attitude toward the issue. This stage is not merely about voicing opinions but requires students to make thoughtful judgments based on their understanding of Islamic values. Encouraging students to take a stand promotes personal reflection and moral reasoning, aligning with the goals of character education in Islamic learning. According to Darling-Hammond et al. (2020), engaging students in decision-making processes and ethical reflection is essential for developing responsible, socially aware individuals.

The next phase involves exploring and defending their positions through reasoned arguments. Students are challenged to justify their opinions using logical reasoning and evidence, often facing opposing views from their peers. This dialogic process fosters critical discourse, helping students refine their arguments and engage in respectful debate. Such an approach supports the development of higher-order thinking skills, a core aspect of 21st-century education (Doleck et al., 2020). In this stage, students

learn to articulate their viewpoints, consider alternative perspectives, and defend their stance with appropriate justification grounded in both scripture and logic.

Following this, the teacher facilitates reinforcement, where students are encouraged to revisit their attitudes or positions based on the strength of their arguments and peer feedback. This step is crucial for fostering intellectual flexibility and self-evaluation. Students may either reinforce their original position with stronger evidence or reconsider and revise their stance. This reflective process aligns with metacognitive strategies that promote deep learning, as supported by recent educational research (Zohar & Barzilai, 2022).

The final stage involves testing the assumptions that underlie the students' arguments. Teachers and students collaboratively assess the validity of the facts, definitions, and consequences associated with the discussed issue. This step not only sharpens analytical skills but also teaches students how to critically assess information sources, a vital skill in today's information-rich environment. As students test the soundness of their reasoning, they develop a more nuanced understanding of both the issue at hand and the Islamic principles that relate to it. Research by Breakstone et al. (2021) highlights the importance of such critical literacy practices in preparing students to navigate complex social and ethical landscapes.

Overall, the application of the STM/STS approach in *Qur'an-Hadith* learning has shown to significantly enhance student engagement, critical thinking, and relevance of religious teachings to real-world problems. Students become more responsive to social issues and technological developments, aligning their learning with both faith-based and civic responsibilities. This finding supports the growing body of literature advocating for contextual and inquiry-based religious education as a pathway to deeper understanding and moral development (Nasution & Idris, 2023).

3.2.1 Preliminary Activities

The preliminary stage of the lesson begins with activities designed to establish perceptions and effectively introduce the material. These initial actions are carried out by the teacher to foster students' mental readiness and capture their attention, ensuring they are fully focused on the learning objectives. According to Mulyasa (as cited in Ilyas, 2022), effective strategies for initiating lessons include connecting previously learned content to new material, clearly stating the learning objectives and providing an overview of the topics to be covered, outlining the sequence of learning activities and related tasks, and utilizing instructional media and resources that align with the lesson content. Furthermore, one essential component of preliminary activities is the use of strategic questioning to assess students' understanding of previous lessons and to activate their prior knowledge relevant to the new material. This approach not only engages students but also provides insight into their initial competencies, guiding the teacher in tailoring the instructional process.

3.2.2 Core Activities

The initial phase of the learning process begins with orientation to the case, during which the teacher presents several issues that are either closely related to the lesson content or drawn from relevant social situations encountered in everyday life. The instructional materials utilized in this research consisted of existing student activity sheets (LKS) available at the school. Following this, the teacher facilitates issue identification by guiding students to select one of the presented topics for discussion and assisting them in recognizing the key facts associated with the chosen case. Once the issue has been selected and analyzed, students are encouraged to take a position by expressing their opinions or attitudes toward the issue, thereby engaging in personal reflection and ethical reasoning.

The next phase involves constructing arguments to support the stance taken. At this stage, students engage in a deeper exploration of their perspectives by participating in debates or discussions with peers who hold opposing viewpoints. This interaction serves as a test of their ability to maintain consistency in their position and to justify their opinions with coherent, logical reasoning. Students are expected to provide arguments that are both persuasive and grounded in factual or scriptural evidence.

In the subsequent step, students are invited to revisit and possibly strengthen their stance. Whether their position remains consistent or changes depends on the strength of their previous arguments and the influence of opposing perspectives. Finally, the learning process culminates in the evaluation of assumptions underlying the students' arguments. Together with the teacher, students examine the factual basis, definitions, and consequences of their claims to determine the relevance and validity of their reasoning. This comprehensive process not only sharpens students' critical thinking skills but also encourages a reflective and responsible approach to moral and social decision-making.

3.2.3 Closing Activities

Closing a lesson plays a crucial role in helping teachers evaluate students' understanding and the achievement of learning objectives. It also serves to summarize key points and provide direction for future learning. To conclude a lesson effectively, teachers can engage students in drawing conclusions from the material, either independently or collaboratively. They may also ask reflective questions to assess comprehension, assign follow-up tasks, and provide additional materials for further study. Post-assessment activities—whether oral, written, or practical—are also useful to reinforce learning outcomes and identify areas that may need improvement (Darling-Hammond et al., 2020).

Observations from the implementation of the *Qur'an-Hadith* learning strategy using the Science, Technology, and Society (STS) model revealed significant improvements in students' communication and confidence. Initially, students were hesitant to speak or participate, but over time, they became more engaged and expressive, especially during group discussions and role-play activities. The STS approach subtly encouraged active communication, allowing students to share ideas and apply their understanding to real-life social issues. This strategy not only enhanced their enjoyment of learning but also helped them develop skills in critical thinking, cooperation, and independent learning. As students interacted more freely and took on leadership roles in group settings, their confidence and classroom participation improved noticeably. These findings align with recent studies that highlight the benefits of contextual and collaborative learning in fostering student engagement, communication skills, and deeper understanding (Zohar & Barzilai, 2022; Nasution & Idris, 2023).

3.3 Definition of Learning Outcome Data

To measure the effectiveness or ineffectiveness of the development of Qur'an Hadith Learning based on Science, Technology, and Society, experiments were carried out in two classes, namely the experimental and control classes.

Learning outcome data were obtained in the field from 26 students in the experimental class and 27 students in the control class, and they were classified based on the pre-test and post-test results. Pre-test learning outcomes are student learning outcomes before treatment, consisting of experimental and control class pre-test learning results. Meanwhile, post-test learning outcomes are student learning outcomes after treatment is implemented, consisting of post-test learning results of control classes and experimental classes.

Based on the data obtained, the pre-test score or the score before applying conventional learning in the control class was obtained with the highest score of 70.00 and the lowest score of 10.00, with an average score of 40.00. After applying conventional learning in the control class, the highest score of 90.00 and the lowest score of 30.00, with an average score of 58.89, were obtained. The increase in learning outcomes *(gain)* in the control class showed the highest score of 40.00 and the lowest score of 10.00, with an average increase of 18.89.

Meanwhile, in the experimental class, the pre-test score or the score before applying Science, Technology, and Society learning can be described as the highest score of 70.00 and the lowest score of 10.00, with an average score of 40.00. After applying Science, Technology, and Society learning in the experimental class, the highest score of 100.00 and the lowest score of 40.00, with an average score of

70.38, were obtained. The increase in learning outcomes *(gain)* in the experimental class showed the highest score of 40.00 and the lowest score of 20.00, with an average increase of 30.38.

3.3.1 Normality Test

The purpose of conducting a normality test is to determine whether the dataset follows a normal distribution, typically represented by a bell-shaped curve. A normal distribution is characterized by data that are symmetrically distributed, without skewing significantly to the left or right. In this study, the normality of the data was assessed using the Kolmogorov-Smirnov One-Sample Test through the SPSS software. The criterion for normality is based on comparing the significance value (sig) to the alpha level ($\alpha = 0.05$). If the significance value is greater than the alpha level, the data are considered to be normally distributed.

The results of the normality test indicated that all datasets met this assumption. Specifically, the control class pre-test scores had a significance value of 0.171, and the post-test scores showed a value of 0.174. Similarly, the experimental class pre-test scores had a significance value of 0.116, while the post-test scores were 0.745. Since all significance values exceed the threshold of 0.05, it can be concluded that the data for both the control and experimental classes, at both the pre-test and post-test stages, are normally distributed. Therefore, the data meet the requirements for further analysis using parametric statistical methods, specifically the Paired Samples T-Test, to compare learning outcomes.

3.3.2 Homogeneity Test

In addition to meeting the assumption of normality, parametric statistical tests—such as the *Paired Samples T-Test*—also require the data to be homogeneous, particularly when comparing initial learning outcomes (pre-test scores) between groups. In this study, a homogeneity test was conducted to determine whether the variance of student learning outcome data from the experimental and control classes was similar. Homogeneity in this context refers to the extent to which the variances between groups are equal. Ensuring homogeneity is crucial to validate the use of parametric methods for comparing mean differences between related samples.

The homogeneity test was performed using the SPSS software, employing a non-parametric statistical procedure for two related samples. The decision criteria were based on comparing the significance value (sig) with the alpha level ($\alpha = 0.05$). If the significance value exceeds the alpha level, the data are considered homogeneous. The results showed that the comparison of pre-test data between the control and experimental classes yielded a significance value of 0.909, which is greater than 0.05. This indicates that the pre-test data between the two classes were homogeneous, fulfilling the requirement for parametric testing. However, subsequent comparisons—between the control class pre- and post-tests (sig = 0.000), the experimental class pre- and post-tests (sig = 0.000), and the control and experimental classes' post-tests (sig = 0.000)—produced significance values below the alpha threshold. This suggests that these data sets were not homogeneous. Despite this, because the pre-test data of the experimental and control classes showed homogeneity, the data met the necessary assumptions for applying parametric analysis using the *Paired Samples T-Test* to evaluate the learning outcomes.

3.3.3 Comparative Test

Comparative tests are part of data analysis using parametric statistics. The requirement to analyze assumptions that must be carried out when using parametric statistical analysis (comparative test) is that the data must be normally distributed or close to normal. The comparative test intends to find the average difference from the grouped data.

The rule of comparative test testing is that if –table ≤ count ≤ +ttable, then H_0 is accepted, and H_1 is rejected. To determine whether a significant difference can be made by comparing the *sig* value with *the alpha* value (α), which is 0.05, with the criterion if *the sig* value is less than the *alpha* value (α), the

difference is significant. On the other hand, if *the sig* value is more than the *alpha* value (α), then the difference is not substantial.

The results of the calculation of the comparative test on the student learning outcome data in this study are using *the Compare Means–Paired Samples T Test analysis.* The results of the comparative test between the pre-test value of the control class and the pre-test of the experimental class were found to be at a significant level of 0.05, and *a tcal* value of 0.112 and *a sig* value of 0.912 were obtained. Then, at a substantial level of 0.05 and a *degree of freedom (df)* of 25, a *table* of 2,060 was obtained. Thus –ttable (-2.060) ≤ tcal (0.112) ≤ +ttable (2.060), then H0 is accepted, meaning that there is no difference in the average score in the control class pre-test and the experimental class pre-test.

Testing using standard curves can be seen in Figure 2. Testing through a standard curve, as shown in Figure 2, shows a tcal value of 0.122 located in the H_0 region is accepted. H_0 areas between -ttable and +ttable are received, and H_0 regions are rejected. Meanwhile, *the sig* value of 0.912 is more than the *alpha value* of 0.05, which means it is insignificant. Thus, it can be concluded that there is no significant average difference between the pre-test learning outcomes of the control class and the pre-test learning results of the experimental class.

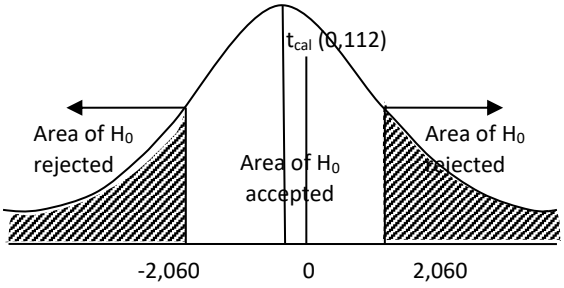

Figure 1. T-test comparison of pre-test scores between the control and experimental classes using a standard curve

The results of the comparative test between the pre-test value of the control class and the post-test of the control class at a significant level of 0.05 obtained *a tcal* value of -13.068 and a *sig* value of 0.000. Then, at a substantial level of 0.05 and a *degree of freedom (df)* of 26, a *table* of 2.052 was obtained. Thus –ttable (-2.052) ≥ tcal (-13.068) ≤ +ttable (2.052), then H0 is rejected, meaning that there is a difference in the average score between the control class pre-test and the control class post-test score.

Testing through a standard curve in Figure 3 shows that the tcal value of -13.068 is located in the H_0 region and is rejected. Meanwhile, *the sig* value of 0.000 is less than the *alpha value* of 0.05, which means it is significant. Thus, it can be concluded that there is a substantial difference in average scores between the pre-test learning outcomes of the control class and the post-test learning outcomes of the control class.

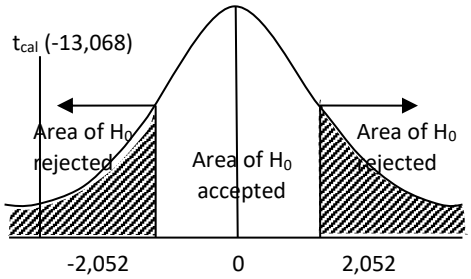

Figure 2. T-test comparison of pre-test and post-test scores in the control class using a standard curve

The comparative test results between the experimental class's pre-test value and the experimental class's post-test at a significant level of 0.05 obtained *a tcal* value of -29.360 and a *sig* value of 0.000. Then, at a substantial level of 0.05 and a *degree of freedom (df)* of 25, a *table* of 2,060 was obtained. Thus –ttable

(-2.060) ≥ tcal (-29.360) ≤ +ttable (2.060), then H_0 is rejected, meaning that there is a difference in the average score between the pre-test score of the experimental class and the post-test of the experimental class.

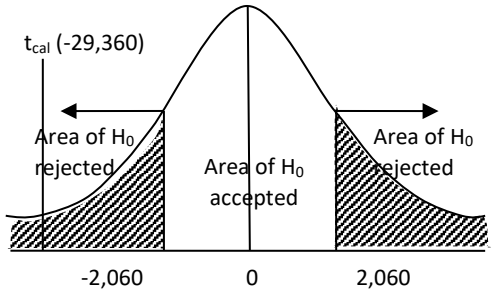

Figure 3. T-test comparison of pre-test and post-test scores in the experimental class using a standard curve

Testing through the standard curve in Figure 4 shows that the tcal value of -29,360 located in the H_0 region is rejected. Meanwhile, *the sig* value of 0.000 is less than the *alpha value* of 0.05, which means it is significant. Thus, it can be concluded that there is a substantial difference in average scores between the pre-test and post-test scores of the experimental class.

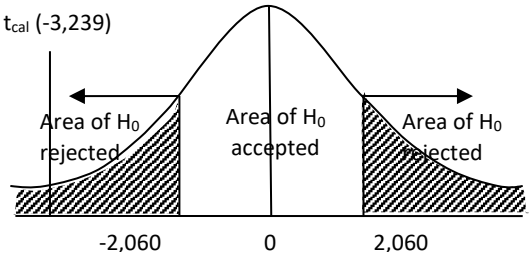

Figure 5. T-test of pre-test and post-test scores in the experimental class using a standard curve

The results of the comparative test between the post-test scores of the control class and the experimental class show a significant difference. At a significance level of 0.05, the t-test yielded a calculated value (t_cal) of -3.239 with a significance (p-value) of 0.003. With 25 degrees of freedom (df), the critical t-value (t_table) was ±2.060. Since the calculated t-value falls outside the range of -2.060 to 2.060 and the p-value is less than 0.05, the null hypothesis (H_0) is rejected. This confirms that there is a statistically significant difference in the mean scores between the two groups. The visual representation in Figure 5 supports this finding, as the t_cal value clearly lies in the rejection region of H_0. These results indicate that students in the experimental group—who were taught using the Science, Technology, and Society (STM) learning model—performed better than those in the control group.

The implementation of the STS-based *Qur'an-Hadith* learning model contributed significantly to enhancing students' engagement, creativity, and critical thinking. Students became more confident in discussing social issues, expressing opinions, participating in group discussions, and drawing conclusions from real-world scenarios. This model encouraged active learning, where students not only absorbed religious content but also connected it with broader societal and technological contexts. These findings align with research by Zohar and Barzilai (2022), which emphasizes the role of dialogic and reflective learning in fostering metacognitive skills and intellectual independence. Similarly, Nasution and Idris (2023) found that integrating religious education with contextual learning strategies leads to improved student engagement, deeper understanding, and moral reasoning.

Furthermore, the STM learning model supports the development of essential 21st-century competencies, such as collaboration, responsibility, problem-solving, and ethical reasoning (Darling-Hammond et al., 2020). In the context of *Qur'an-Hadith* learning, these competencies are crucial for

helping students internalize Islamic teachings while also becoming more socially aware and critically engaged citizens. By encouraging students to explore, analyze, and respond to real-life issues through a religious lens, the STM approach makes Islamic education more relevant and impactful.

Therefore, integrating the STM model into *Qur'an-Hadith* instruction at the Madrasah Tsanawiyah level presents a promising alternative to traditional approaches. It not only enhances academic performance but also nurtures values such as empathy, respect, and accountability. As education systems continue to seek methods that prepare students for the complexities of modern life, context-based strategies like STS offer a powerful framework for both intellectual and moral development in Islamic education.

4. CONCLUSION

Based on the findings and analysis, this study concludes that the implementation of the Qur'an-Hadith learning model grounded in the Science, Technology, and Society (STM) approach significantly improved student learning outcomes at MTs Sjech Ibrahim Koto Tuo. The model not only enhanced students' academic performance but also positively influenced their motivation, responsibility, discipline, and participation in classroom activities. Students demonstrated greater commitment to assigned tasks, improved collaboration, and increased engagement both inside and outside the classroom. The STM-based learning model was validated through its structured steps and proved to be both pedagogically sound and practically applicable. Teachers also observed a notable increase in student creativity and critical thinking, supporting the practicality of this model in real classroom settings. A comparative analysis revealed that students taught using the STM-based approach outperformed those taught through conventional methods, confirming the model's effectiveness in enhancing comprehension and engagement in Qur'an-Hadith learning.

However, this research has limitations, particularly in its scope and sample size, which was restricted to one institution. As such, the findings may not be fully generalizable across different educational contexts or regions. Future research should consider applying the STM-based learning model in a broader range of schools, including diverse student populations and varied Islamic education environments. Longitudinal studies are also recommended to explore the long-term impact of this model on students' spiritual, social, and academic development.

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