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INTEGRATION OF SCIENCE EDUCATION THROUGH THE TPACK APPROACH WITH PPRA CULTIVATION IN MADRASAH IBTIDAIYAH

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Abstract

Science education in Madrasah Ibtidaiyah (MI) plays an important role in shaping the character and competencies of the 21st century based on Islamic values. However, science learning in MI is still dominated by conventional methods that have not integrated spiritual and technological values optimally. This study aims to analyze the integration of the Technological Pedagogical Content Knowledge (TPACK) approach with the values of the Rahmatan Lil Alamin Student Profile (PPRA) in science learning in Madrasah Ibtidaiyah. The aspects analyzed include the use of the TPACK approach in science learning, instilling PPRA values, the urgency of instilling PPRA values in MI, strategies for instilling PPRA values in MI, integration between the TPACK model and instilling PPRA values in science learning in MI, and the synergy between the two. This study uses a literature study method by reviewing relevant scientific sources and policy documents. The results of the study indicate that the TPACK model that combines content knowledge, pedagogy, and technology is able to create interactive and meaningful science learning. Meanwhile, PPRA values such as faith, noble morals, religious moderation, love for the environment, and social responsibility provide a character dimension that enriches the learning process. The synergy between TPACK and PPRA is believed to be able to create a holistic learning experience that not only enriches students' intellectual intelligence, but also strengthens their spirituality and social awareness. This study recommends the development of a science learning strategy in MI that is technology-based, contextual, and has Islamic values as an effort to realize transformative madrasah education and rahmatan lil alamin.

Keywords: *TPACK, PPRA, Science Learning, Madrasah Ibtidaiyah, Islamic Education*

INTRODUCTION

Basic education is the main foundation in shaping the character and competence of students. In the Madrasah Ibtidaiyah (MI) environment, education is not only oriented towards mastering basic knowledge, but also emphasizes spiritual values and Islamic character (Paramasasti & Marzuki, 2025) . One of the challenges in science learning in MI is how to integrate a scientific approach with strengthening Islamic values that are rahmatan lil alamin (Ghifari, 2024) . In this context, it is very important to present a learning model that is able to answer the needs of 21st

century learning while being in line with the moderate Islamic character that is the identity of the madrasah.

In response to the challenges of the times, the Indonesian Ministry of Religion has formulated the Rahmatan Lil Alamin Student Profile (PPRA) as a foundation for character formation of students in madrasas. This profile seeks to form students who practice moderate religious values. The values of religious moderation in PPRA include 1) civilized (*ta'addub*); 2) exemplary (*qudwah*); 3) citizenship and nationality (*muwatanah*); 4) taking the middle path (*tawassuṭ*); 5) balanced (*tawāzun*); 6) straight and firm (*i'tidāl*); 7) equality (*musāwah*); 8) deliberation (*shūra*); 9) tolerance (*tasāmuh*), and 10) dynamic and innovative (*tathawwur wa ibtikâr*) (Directorate of KSKK, 2022) . PPRA is an important foundation in the formation of Islamic students who are not only intellectually intelligent but also have noble characters and contribute positively to community life (Nurhakim & Rizki, 2024) . These values need to be instilled systematically in all subjects, including science, so that students not only understand scientific concepts but are also able to relate them to life values and faith (Hidayat, 2015) .

However, in reality, the science learning approach in MI is still dominated by lecture and memorization methods that are less contextual. This makes students less actively involved in learning and tend to understand science as something separate from life and religious values. Therefore, an innovative approach is needed that is in accordance with 21st century learning. This approach must be able to integrate technology, pedagogy, and material content with Islamic values. One relevant approach is *the Technological Pedagogical Content Knowledge* (TPACK) model.

The TPACK approach, as developed by (Koehler & Mishra, 2005) , emphasizes the importance of synergy between three main components: content knowledge *, pedagogical* knowledge *,* and technological knowledge . Teachers who have a good understanding of these three aspects will be able to design learning that is not only innovative, but also contextual and meaningful for students (Nasrul et al., 2025) .

Research on the implementation of PPRA and the TPACK learning model in Madrasah Ibtidaiyah has been conducted by previous researchers . Research by (Kurnia & Saragih, 2024) shows that the implementation of the Rahmatan Lil-Alamin Student Profile requires a holistic and systematic approach. This includes the development of a curriculum that integrates rahmatan values, teacher training, and a comprehensive evaluation of student character. Schools can create an environment that supports the application of moral and ethical principles in students' daily lives through various extracurricular activities, teaching methods, and parental and community involvement. Other research by (Rohmah, 2024) emphasized the importance of implementing PPRA in strengthening character values in madrasas. This character strengthening can be done by

instilling the values of PPRA. Furthermore, research conducted by (Radiansyah, 2024) on the implementation of TPACK in elementary schools. The results of the study showed that using the TPACK approach in science learning at SDN Tabunganen Kecil can improve critical thinking skills and student learning outcomes. The use of this TPACK approach is through showing learning videos to improve students' understanding of science concepts.

previous research , it shows that the implementation of PPRA values in Madrasah Ibtidaiyah has been done well. In addition, the TPACK approach is also widely used in Madrasah Ibtidaiyah and is effective in improving students' understanding of science concepts. This TPACK approach can also encourage the quality of 21st century learning through the use of technology. However, there has not been much research examining the integration between TPACK and PPRA in the context of science learning in Madrasah Ibtidaiyah. Most studies still analyze the implementation of PPRA and the TPACK approach without integrating them. This shows that there is a gap in scientific studies that can be filled through this research. The integration of TPACK-based learning models and the instillation of PPRA values is believed to be able to create a holistic learning experience for MI students. Science is no longer only understood as a stand-alone science, but as a means to get to know God's creation, increase concern for the environment, and build awareness of social responsibility.

Considering the importance of integrating Islamic values and 21st century competencies in learning, a study of adaptive and transformative learning models needs to be conducted . The TPACK model that combines content knowledge, pedagogy, and technology is seen as the right approach to support a more meaningful science learning process. On the other hand, the application of the Rahmatan Lil Alamin Student Profile values in the learning process will strengthen the character aspects of students to be in line with the holistic goals of madrasah education. Therefore, the integration of both is expected to create a science learning model that is not only academically competent, but also spiritually and socially strong.

Seeing this background, the author is interested in conducting research with the title "Integration of Science Education Through the TPACK Approach with PPRA Cultivation in Madrasah Ibtidaiyah". Through this study, the author attempts to examine how the integration between the TPACK approach and PPRA values in the context of science learning in Madrasah Ibtidaiyah. This study is expected to provide theoretical and practical contributions in the development of religious, contextual, and technology-based science learning strategies. The findings of this study are also expected to be a reference for madrasah educators in designing learning that is balanced between mastery of knowledge and the formation of rahmatan lil alamin characters.

METHOD

This research employs a literature review method (Sugiyono, 2018) , aiming to analyze and synthesize relevant prior studies on the implementation of the TPACK learning model and the integration of Rahmatan Lil Alamin Student Profile (PPRA) values in science learning at Madrasah Ibtidaiyah (Kurniasari & Mardikaningsih, 2022) . This method was chosen because the research was not conducted directly in the field but relied on secondary data from credible sources such as scientific journal articles, books, research reports, and official documents from the Indonesian Ministry of Religious Affairs related to PPRA.

The data sources in this study consisted of academic literature selected purposively based on relevance and credibility, including scientific articles, curriculum documents, and books. Data were collected through documentation techniques and systematic literature review. The researchers accessed and examined these sources in depth to build a comprehensive understanding of TPACK implementation and PPRA integration in science education.

Data analysis was conducted using a qualitative descriptive approach, through three main stages: (1) data reduction — identifying and selecting information related to pedagogical approaches and character education values; (2) data display — organizing findings into categories such as technological aspects, pedagogical content, and Islamic values; and (3) conclusion drawing — synthesizing the findings into an integrated conceptual framework.

To ensure data validity, source triangulation was employed by comparing and verifying information across multiple literature sources. Additionally, primary documents from the Ministry of Religious Affairs served as key references to strengthen the accuracy and credibility of the findings (Subagiya, 2023).

RESULTS AND DISCUSSION

The findings of this study are in the form of a study of previous research results related to the application of *the Technological Pedagogical Content Knowledge (TPACK)* learning approach integrated with the values of the Rahmatan Lil Alamin Student Profile (PPRA) in the context of science learning in Madrasah Ibtidaiyah. The main focus of this study is how the three aspects of teacher knowledge in the TPACK model—namely content knowledge, pedagogy, and technology—can be applied effectively in instilling the character and Islamic values of rahmatan lil alamin . The Islamic values in question include faith, noble morals, religious moderation, love for the environment, and social responsibility in the science learning process.

In the following sub- chapters, the main findings from the literature study will be discussed, outlining the use of the TPACK approach in science learning , the application of PPRA values in madrasas, and how the integration of the two can be realized in daily learning practices.

Using the TPACK Approach in Science Learning

The TPACK (Technological Pedagogical and Content Knowledge) approach is a concept that emphasizes the importance of integration between content knowledge, pedagogy, and technology in the learning process. This framework was introduced by Mishra and Koehler. They stated that effective teachers do not only master the content of the material or teaching strategies. Teachers must also be able to combine technology appropriately and contextually. The three main components in TPACK are interrelated and cannot stand alone. Content knowledge explains what is taught. Pedagogical knowledge explains how to teach it. While technological knowledge includes tools that support the learning process. All three must be harmoniously integrated. If one is not integrated, the effectiveness of learning will be reduced. Therefore, TPACK is an important basis for designing modern learning that is meaningful and easy for students to understand (Koehler & Mishra, 2006).

Science learning is a systematic process to help students understand concepts, principles, and natural phenomena scientifically. According to (Setiawati & Ekayanti, 2021), the goal of science learning is to develop students' critical, creative, and practical thinking skills. The content of science learning includes material about life, earth, physics, and chemistry that are interrelated. Learning that is in accordance with science material is active, experimental, and contextual so that students can directly experience and observe phenomena. (Primayana et al., 2019). Methods such as discussions, practicums, and projects are highly recommended to improve understanding. In addition, the use of technology in science learning will provide a more meaningful learning experience for students. One of them is through the use of TPACK classification.

The TPACK model emphasizes the importance of a deep understanding of the content of the material (*content knowledge*), effective pedagogical strategies (*pedagogical knowledge*), and the use of relevant technology (*technological knowledge*). By integrating these three components, teachers can design interactive, contextual, and meaningful science learning for students. For example, the use of simulation applications such as PhET can help students understand abstract concepts in science, such as in the solar system material through interesting and interactive visualizations. In accordance with Jean Piaget's cognitive development theory, elementary school children in the range of 7-11 years are in the concrete operational stage (Marinda, 2020). At this stage, children are able to think logically about concrete events and are related to real objects. Without physical objects in front of them, children in the concrete operational stage will have difficulty

understanding science concepts related to logic (Ibda, 2015). With this PhET application, the solar system can be depicted in real terms in front of students, so that they can easily understand the concept of the solar system.

On the other hand, the implementation of TPACK can also increase student engagement in science learning in elementary schools. By utilizing technology appropriately, teachers can create a more interactive and enjoyable learning atmosphere, so that students are more motivated to actively participate. For example, in a study conducted by (Rahmawati & Susilo, 2020)the use of multimedia-based learning applications in science subjects succeeded in increasing student participation and learning focus. Through interesting media, such as animation and interactive quizzes, students feel challenged to follow the learning process enthusiastically. This study also shows that higher student engagement has a positive impact on their ability to master the material. The TPACK approach is very important in supporting effective and enjoyable science learning in elementary schools. Thus, the implementation of TPACK in elementary schools not only enriches learning methods, but also supports the creation of an effective and enjoyable learning atmosphere for students.

Instilling Rahmatan Lil Alamin Student Profile Values in Science Learning

The integration of the values of the Rahmatan Lil Alamin Student Profile (PPRA) in science learning at Madrasah Ibtidaiyah is a strategic step in forming the character of students who are not only academically intelligent, but also have noble morals and spiritual awareness. The main values of PPRA that are relevant to science learning include faith, noble morals, religious moderation, love of the environment, and social responsibility. These PPRA values can be instilled in science learning through various applicable approaches.

a. Faith and Noble Morals

Science learning can be a means to strengthen students' faith by showing the greatness of Allah SWT through the wonders of the universe. For example, when studying the solar system or the water cycle, teachers can relate it to verses of the Qur'an that describe the signs of Allah's power. This is in line with the view that Islamic education must be based on faith in Allah and teach individual responsibility as part of society and nature (Munawir, Amillatuz Zuhriah, Hepy Dwi Nur'aini, 2024). In addition, instilling noble morals can be done through the habit of honesty, discipline, and responsibility in science practicum activities. Through practicum activities, students will conduct experiments and obtain scientific concepts from the results of the experiments carried out, so that students will get a more meaningful learning experience (Nuai & Nurkamiden, 2022). In practicum activities in Madrasah Ibtidaiyah, it can be used as a means of instilling PPRA values, namely noble morals. This instillation can be

done by teaching students to record observation results honestly and work together in groups by respecting each other's opinions.

b. Religious Moderation

The values of religious moderation contained in the PPRA teach students to be tolerant and respect differences. These values include being civilized (*ta'adduh*); exemplary (*qudwah*); citizenship and nationality (*muwatanah*); taking the middle path (*tawassu ṭ*); balanced (*tawāzun*); straight and firm (*i'tidāl*); equality (*musāwah*); deliberation (*shūra*); tolerance (*tasāmuh*), and dynamic and innovative (*tathawwur wa ibtikâr*) (Direktorat KSKK, 2022). In science learning, teachers can emphasize that science is universal and can be a bridge to understanding cultural and belief diversity. The implementation of religious moderation in madrasas is carried out structurally and integrated into the curriculum (Badrudin, 2023). The value of religious moderation can be introduced by accustoming students to be open to various views in science, in line with the spirit of universality of science. One of them is through instilling the value of tolerance (*tasāmuh*) when getting different results from other groups when conducting experimental activities. By instilling such an attitude, students will be created who are in accordance with the Rahmatan Lil Alamin Student Profile and are open to the existence of science.

c. Love the Environment

Science learning is an effort to study the universe scientifically through various phenomena and events that occur (Prasetio & Ahmad, 2020). Science provides an opportunity for students to gain knowledge concepts through direct experiences that occur around them. That way, students will be more familiar with the condition of the surrounding environment, the damage that occurs, and find solutions to minimize the occurrence of even more severe environmental damage. This science learning also provides an opportunity to foster a sense of love for the environment in students (Amelia et al., 2025). Love for the environment can be developed through composting projects from organic waste, students learn about recycling, and the importance of maintaining a clean environment with waste management. Activities like this not only increase understanding of scientific concepts, but also build awareness of responsibility as caliphs on earth and instill the value of responsibility towards nature.

d. Social Responsibility

The concept of social responsibility has an important meaning in Islamic ethics, because it underlines the principle of empathy and concern for others. (Sari & Haris, 2023). This attitude must of course be instilled in children, especially at elementary school age . The instillation of social responsibility values aims so that students are not only able to master

knowledge well, but also have good moral ethics. The values of social responsibility can be instilled through learning activities that involve students in community-based projects. For example, students can conduct an energy saving campaign in the school environment or create posters about the importance of maintaining cleanliness. These kinds of activities encourage students to contribute positively to society.

Overall, the instillation of the values of the Rahmatan *Lil Alamin Student Profile* (PPRA) in science learning in Madrasah Ibtidaiyah can be done through comprehensive integration . This integration includes learning materials, teaching methods, and learning activities that are designed systematically and sustainably. Science learning is not only focused on mastering scientific concepts, but is also directed at instilling moral, spiritual, and social values that are part of PPRA. In this case, the teacher acts as a facilitator who does not only deliver the material . Teachers are also allowed to guide students to understand the meaning of each science concept in the context of everyday life and to form characters who care about the environment and others. In order for the implementation of these values to run effectively, strong collaboration is needed from all elements of the madrasah . This collaboration includes the principal who provides policy support, teachers who consistently apply these values in learning, madrasah staff who create a conducive environment, and parents who accompany and strengthen these values at home.

The Urgency of Instilling PPRA Values in Science Learning in Elementary Madrasahs

Instilling the values of the Rahmatan Lil Alamin Student Profile (PPRA **)** in science learning at Madrasah Ibtidaiyah is an important part of building the character of students as a whole. In this context, students are not only required to have intellectual intelligence, but are also expected to grow into strong individuals in spiritual, social, and environmental aspects. In line with this, (Wulandari & Fauzi, 2021)stated that instilling character education in schools is very important in order to create a generation that is not only intelligent but also has good character. PPRA values such as faith, noble morals, religious moderation, love for the environment, and social responsibility are efforts to instill character that are integrated into every learning process. This can be done through a thematic approach that links science material with religious values and everyday life, a contextual approach that links scientific concepts with social and environmental realities around students, and a reflective approach that invites students to reflect on the meaning and impact of the knowledge they are learning.

Science as a science that studies God's creation can be an effective medium for instilling values of faith. Studies on the solar system, human organs, or the water cycle can be directed to raise awareness of the greatness and power of Allah SWT. Research by Jefri Pramono at SD Alam Perwira Purbalingga shows that the integration of Islamic values in science learning has been

successfully implemented, as seen from the pattern of integration of Islamic values in each component of learning such as objectives, materials, methods, media, and learning evaluations. This has a positive impact on increasing students' faith and devotion to Allah SWT. (Pramono, 2022). On the other hand, the values of environmental love and social responsibility are also very relevant in science learning practices. Research at MIN 3 Tanjungbalai City shows that science learning with methods such as Outdoor study, the use of video learning media, and the application of learning models such as Project-Based Learning (PjBL) and Contextual Teaching Learning (CTL) can improve students' understanding of the importance of the environment and develop environmental care characters in students (Hasibuan & Sapri, 2023).

The value of religious moderation, which emphasizes fairness, tolerance, and respect for differences, can be internalized through a critical and open scientific approach. In scientific experiments and discussions, teachers can train students to think objectively, listen to the opinions of others, and respect data as a basis for decision making. The urgency of this integration is also supported by the policy of the Indonesian Ministry of Religion which through the P5 PPRA Guidebook encourages madrasas to integrate PPRA values in all subjects, including science. This is important within the framework of the Merdeka Curriculum, where learning is not only oriented towards mastering the material, but also on strengthening the character and values of nationality and Islam. Thus, instilling PPRA values in science learning becomes an important foundation in forming madrasa students who do not only think logically and scientifically . Students will also be formed to have the soul of rahmatan lil alamin , namely individuals who are faithful, have good morals, care about the environment, and are socially responsible. (Direktorat KSKK, 2022).

Strategy for Implementing Rahmatan Lil Alamin Student Profile Values in Science Learning at Elementary Madrasahs

The implementation of the Rahmatan Lil Alamin Student Profile (PPRA) values in science learning requires a planned, systematic, and relevant pedagogical strategy for the world of children. This strategy not only focuses on delivering science material cognitively, but also emphasizes the formation of character, spiritual values, and social awareness of students. In practice, teachers need to design meaningful and contextual learning, for example by linking science concepts with religious values, ethics, and social realities that students face every day. The implementation of PPRA values in science learning in Madrasahs can be carried out by teachers with the following strategies.

a. Integration in Learning Objectives and Materials

The initial step in implementing PPRA values is to integrate these values into the formulation of learning objectives and materials. Teachers can design learning objectives that

not only include the achievement of knowledge, but also include the development of religious attitudes, concern for the environment, and students' social responsibility. This can be done by incorporating spiritual and ethical values into every topic taught. For example, in science learning on the topic of ecosystems, teachers can include learning objectives with the value of loving the environment as part of Allah SWT's mandate to His creatures (Direktorat KSKK, 2022). Thus, science learning is not only a means of mastering scientific concepts . Science learning is also a medium for instilling PPRA values. such as having good morals , being responsible, and caring about the preservation of nature and social life around them.

b. Contextual Learning Methods and Models

The next strategy is the use of contextual learning methods that link science to everyday life and Islamic values. Contextual learning provides a more meaningful learning experience because students can understand that the science they are learning has direct relevance to the reality around them. (Rahmah et al., 2025). Models such as *Project-Based Learning* (PjBL), *Discovery Learning* , or *Problem-Based Learning* (PBL) can be a medium for inserting the values of social responsibility, morals and faith. very effective in this context, because it encourages students to actively seek solutions to real problems, think critically, and collaborate with friends. Through these models, teachers can insert values such as social responsibility, noble morals, and faith in every stage of learning activities.

c. Educational and Inspiring Teacher-Student Interaction

Interaction in the classroom is an important moment to instill PPRA values in real terms. Teachers are role models in attitudes and communication that reflect the values of rahmatan lil alamin, such as gentleness, justice, and empathy. In accordance with what was conveyed by (Sari & Haris, 2023)that educators and teachers have a significant influence on the lives of their students. Every action, character, and behavior of teachers becomes a guideline for students on their journey towards moral development and character building. Therefore, instilling PPRA values must be supported by good role models shown by teachers. Teachers can also provide value reinforcement when students demonstrate positive behavior, such as cooperation, honesty in experiments, and respecting friends' opinions.

d. Value-Based Reflection and Evaluation

Learning reflection carried out routinely after science learning activities is an important step in instilling the values of *the Rahmatan Lil Alamin Student Profile* (PPRA) in depth. Through reflection, it can become a space for students to connect the scientific knowledge they learn with spiritual and social values. In addition, the evaluation of learning outcomes in science learning is not limited to cognitive aspects alone, but also includes affective and psychomotor

dimensions, as emphasized in the holistic approach of the Independent Curriculum. This assessment of attitudes, knowledge , and skills encourages students to internalize science as a whole, not only as knowledge, but also as part of character formation.

With these strategies, PPRA values can be implemented comprehensively in the science learning process at Madrasah Ibtidaiyah. This approach not only makes science learning a means to improve academic abilities, but also a medium to instill moral, spiritual, and social values in an integrated manner. By using this strategy, it can help students develop their character as madrasa students who are academically intelligent as well as moral and behave nobly.

Integration of Science Education through the TPACK Learning Model with the Implementation of PPRA in Elementary Madrasahs

Integration of science education through the TPACK learning model with the instillation of PPRA values is a relevant approach for the context of Madrasah Ibtidaiyah. Science education in Madrasah Ibtidaiyah (MI) has a strategic role in forming students who are not only academically capable, but also have noble characters in accordance with Islamic values. To achieve this goal, a learning approach is needed that is able to integrate content knowledge, pedagogical strategies, and the use of technology holistically. The TPACK (*Technological Pedagogical Content Knowledge*) learning model offers the right framework to combine these three aspects in the learning process (Sukmawati et al., 2022).

The TPACK model has been proven to be able to increase student engagement and deepen the understanding of science concepts in a contextual and meaningful way. However, in the context of madrasah education which is not only oriented towards academic aspects but also in the formation of Islamic character , the integration of PPRA values becomes very important. The spiritual and social values contained in PPRA provide additional dimensions that enrich the learning process . Science is not only studied as a natural science, but also as a means to develop the character of students who believe and are responsible for the environment and society. (Rohmatic et al., 2025).

The integration of the TPACK model in science learning in MI is in line with efforts to instill the values of the Rahmatan Lil Alamin Student Profile (PPRA). PPRA is an initiative of the Ministry of Religion of the Republic of Indonesia which aims to form students who are noble, moderate, and care about the environment and others. PPRA values include being civilized (*ta'adduh*), exemplary (*qudwah*), citizenship and nationality (*muwatanah*), taking the middle path (*tawassu ṭ*), balanced (*tawāzun*), straight and firm (*i'tidāl*), equality (*musāwah*), deliberation (*shūra*), tolerance (*tasāmuh*), and dynamic and innovative (*tathawwur wa ibtikâr*) (Direktorat KSKK, 2022). In the context of science learning, PPRA values can be integrated through various strategies.

For example, when studying ecosystems, teachers can emphasize the importance of maintaining the balance of nature as a form of human responsibility as caliphs on earth. Discussions about global warming can be a means to instill the values of moderation and concern for the environment. In addition, practical activities carried out in groups can develop attitudes of deliberation, tolerance, and cooperation among students.

The implementation of the TPACK model integrated with PPRA values requires support from various parties, including training for teachers to develop competencies in managing technology, pedagogy, and content simultaneously. In addition, the development of learning tools in accordance with the principles of TPACK and PPRA values is the key to the success of this integration. Research by (Irmita & Atun, 2017)shows that the use of the TPACK approach in developing learning tools can significantly improve students' scientific literacy. Thus, the integration of science education through the TPACK learning model with the instillation of PPRA values in Madrasah Ibtidaiyah is a strategic step in forming a generation that is intelligent, has character, and is ready to face future challenges.

Synergy of Integration of TPACK Model with PPRA Values in Science Learning

The integration of the Technological Pedagogical Content Knowledge (TPACK) model with the values of the Rahmatan Lil Alamin Student Profile (PPRA) in science learning at Madrasah Ibtidaiyah is a strategic approach to creating a holistic learning process. The TPACK model combines content knowledge, pedagogy, and technology, while PPRA values such as faith, noble character, religious moderation, love for the environment, and social responsibility provide a moral and spiritual foundation. The synergy between TPACK and PPRA allows for the implementation of science learning that is not only interactive and contextual, but also has strong spiritual and social dimensions.

The implementation of TPACK encourages teachers to design interactive science learning that is relevant to students' daily lives. For example, the use of digital media such as digital Big Books can help convey science concepts in an interesting and easy-to-understand way. A study showed that prospective MI teachers who developed digital Big Books demonstrated excellent TPACK skills, with effective integration between content, pedagogy, and technology (Nurmatin, 2025).

Integration of PPRA values in science learning can be done by linking science materials with Islamic and social values. For example, when studying ecosystems, teachers can emphasize the importance of preserving the environment as a form of social responsibility and love for God's creation. This approach not only improves students' understanding of science materials but also shapes their character according to PPRA values. The synergy between TPACK and PPRA can

also increase students' learning motivation. By using relevant technology and appropriate pedagogical approaches, teachers can create a conducive and enjoyable learning environment. This is in line with the findings that the implementation of TPACK in learning can increase student activity and learning outcomes (Rizal, 2022). Thus, the integration of PPRA values within the TPACK framework can be a highly effective learning strategy.

However, this integration requires teacher readiness and competence in combining aspects of technology, pedagogy, content, and PPRA values. Training and professional development for teachers are essential to ensure the successful implementation of this approach. Support from schools and education policies is also needed to create a learning ecosystem that supports the integration of TPACK and PPRA (Hanik et al., 2022). Thus, the integration of the TPACK model and PPRA values in science learning in Madrasah Ibtidaiyah is not only theoretically relevant but has also been proven to have a positive impact on the practice of character education rooted in Islamic values.

CONCLUSION

Based on the research results, it can be concluded that the Technological Pedagogical Content Knowledge (TPACK) learning model integrated with the values of the Rahmatan Lil Alamin Student Profile (PPRA) is an effective and relevant approach to improving the quality of science learning in Elementary Madrasahs. The integration of the three aspects of teacher knowledge—content, pedagogy, and technology—in the TPACK model enables an interactive, contextual, and meaningful learning process. This can increase student engagement and in-depth understanding of science concepts. In addition, the success of learning in madrasahs is not only measured from the academic aspect, but also from the ability to instill Islamic character and values that reflect rahmatan lil alamin, such as faith, noble morals, religious moderation, love for the environment, and social responsibility. The PPRA values, which are an initiative of the Indonesian Ministry of Religion, provide spiritual and social dimensions that enrich the science learning process, so that the science taught is not only natural knowledge, but also a means of forming the character of students who are pious and care about the environment and society.

Through various approaches, such as the use of learning technology, contextual methods, and the role of teachers as role models, PPRA values can be effectively inserted into science materials. Support for teacher training and the development of TPACK-PPRA-based teaching tools are important factors so that this integration can run optimally. Various empirical studies also further strengthen the urgency and benefits of integrating the TPACK model with PPRA values in science learning in Madrasah Ibtidaiyah. Government policies that support the implementation

of character and Islamic values in the curriculum further emphasize the importance of this learning strategy. Thus, the application of the TPACK learning model that integrates the Rahmatan Lil Alamin Student Profile values not only improves students' conceptual understanding and technological skills, but also forms students who are noble, moderate, and socially and environmentally responsible, who are ready to become a generation of students who bring blessings to the universe.

However, the researcher realizes that this study still has limitations. The study presented by the researcher only uses a qualitative approach with data collection techniques sourced from a literature review. To develop this research further, it is recommended for other researchers to use a quantitative approach or mixed methods. In addition, direct research in the field through interview and observation techniques is also effective in developing this research. Thus, it can obtain a more objective and representative picture of the implementation of the integration of the TPACK model with PPRA values in direct science learning. Further research with larger samples and more diverse variables will also make an important contribution in strengthening the existing findings.

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