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Uniting Science and Faith: A Re-STEAM Interdisciplinary Approach in Islamic Education Learning

Adiyono[1*], Agus Zaenul Fitri[2], Ali Said Al Matari[3]

[1]*Sekolah Tinggi Ilmu Tarbiyah Ibnu Rusyd Tanah Grogot, Indonesia*
[2]*Universitas Islam Negeri Sayyid Ali Rahmatullah Tulungagung, Indonesia*
[3]*A'Sharqiyah University, Oman*

*e-mail: adiyono8787@gmail.com

ABSTRACT

This study explores the effective Re-STEAM (Religion, Science, Technology, Engineering, Arts, and Mathematics) interdisciplinary approach in teaching Islamic Religious Education (PAI) at SDIT Al-Khawarizmi and SDN 031 Tanah Grogot, Indonesia. The research addresses the need to revitalize PAI learning by integrating it with other disciplines, particularly science and technology. Using qualitative methods with a phenomenological approach and Multi-Site Design, the study investigates the impact of Re-STEAM on student learning outcomes. Results indicate that this approach significantly enhances students' learning motivation, critical thinking skills, and understanding of PAI materials. Integrating science and faith through Re-STEAM helps students apply Islamic values daily and prepares them for 21st-century challenges. Moreover, it demonstrates that modern science complements religious teachings, fostering a balanced development of intellectual, emotional, and spiritual intelligence. The findings suggest that the Re-STEAM approach effectively combines academic competence with strengthened faith and character, aligning with the core principles of Islamic education.

***Keywords*:**

Islamic Religious Education; Re-STEAM; Interdisciplinary Approach; Science and Faith.

ABSTRAK

Penelitian ini mengeksplorasi efektivitas pendekatan interdisipliner Re-STEAM (Religion, Science, Technology, Engineering, Arts, and Mathematics)

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***Corresponding author:** adiyono8787@gmail.com

dalam pembelajaran Pendidikan Agama Islam (PAI) di SDIT Al-Khawarizmi dan SDN 031 Tanah Grogot, Indonesia. Penelitian ini membahas kebutuhan untuk merevitalisasi pembelajaran PAI dengan mengintegrasikannya dengan disiplin ilmu lain, khususnya sains dan teknologi. Menggunakan metode kualitatif dengan pendekatan fenomenologis dan Desain Multi-Site, penelitian ini menyelidiki dampak Re-STEAM terhadap hasil belajar siswa. Hasil penelitian menunjukkan bahwa pendekatan ini secara signifikan meningkatkan motivasi belajar siswa, kemampuan berpikir kritis, dan pemahaman materi PAI. Integrasi sains dan iman melalui Re-STEAM membantu siswa menerapkan nilai-nilai Islam dalam kehidupan sehari-hari dan mempersiapkan mereka untuk menghadapi tantangan abad ke-21. Selain itu, program ini menunjukkan bahwa sains modern melengkapi ajaran agama, mendorong perkembangan kecerdasan intelektual, emosional, dan spiritual yang seimbang. Temuan ini menunjukkan bahwa pendekatan Re-STEAM secara efektif menggabungkan kompetensi akademik dengan iman dan karakter yang kuat, selaras dengan prinsip-prinsip inti pendidikan Islam.

***Kata kunci*:**

Pendidikan Agama Islam; Re-STEAM; Pendekatan Interdisipliner; Ilmu Pengetahuan dan Keimanan.

1. Introduction

The curriculum developed and established, particularly the Islamic Religious Education (PAI) curriculum, must be flexible enough to change with the times. As far as is known, the only methods of instruction used in PAI learning have been memorization and symbols (Huda et al., 2022; Muhaemin et al., 2023). Islamic Religious Education (PAI) learning is done stand-alone, conventionally, and not integrated with science, technology, engineering, art, and mathematics elements. The conventional learning model is outdated today because it is not applicable and makes students passive (He et al., 2020). Admittedly or not, the learning model will not be able to stimulate students' reasoning and critical thinking, be unable to change the paradigm of students' thinking from conceptual to contextual, and make students distant from the existing reality (Adnan et al., 2021). It is not surprising if they then stutter with the environment in which they are. It is very important to change the paradigm of PAI, where PAI learning can no longer stand alone but must be incarnated in every aspect of life.

This conventional learning model is no longer by the demands of the times because it is not applicable and tends to position students as passive recipients of information (Eckstein, L. E. et al., 2023; Bender, T., 2023). It should be underlined that this kind of learning model has several fundamental areas for improvement: 1) It cannot stimulate students' reasoning and critical thinking. Learning focusing on memorization and one-way knowledge transfer fails to develop student's analytical and evaluative skills. 2) Fails to change students' thinking paradigm from conceptual to contextual. Students need help connecting PAI materials with the reality of their daily lives. 3) Creating a distance between students and the existing reality. As a result, students often need help

applying their religious knowledge in modern social and technological contexts. The impact of this isolated PAI learning approach is quite serious. Students become less able to respond to contemporary issues from an Islamic perspective, need help understanding the relevance of religious teachings in the context of scientific and technological advances, and need to be more skilled in integrating Islamic values with various aspects of modern life. Therefore, it is very important to change the paradigm of PAI learning. PAI can no longer stand alone as a separate subject but must be incorporated into every aspect of life and learning. The integration of PAI with STEAM elements (Science, Technology, Engineering, Arts, Mathematics) becomes a necessity to create learning that is more holistic, contextual, and relevant to the challenges of the 21st century. This paradigm shift is expected to produce a generation of Muslims who have a strong religious understanding and can apply Islamic values in the context of complex modern life (Murad, 2023).

PAI teaching must adapt to the times' progress and development (Roro et al., 2021). Today's Islamic religion must be able to appreciate science in religious education and vice versa (Saada & Magadlah, 2021). This is in line with the spirit of Islamization of education that was trending some time before. The education concept in Islam results from integrating the power of reason (rational), which has an empirical concept and makes the *Quran* and *Hadith* the main foundation (J. A. Rohmana, 2021). However, in the author's view, the current curriculum seems to need to be able to offer a new formula, both at the level of concepts, approaches, and teaching strategies. Islamic Education curriculum should be able to adjust teaching materials with the times (Winarto et al., 2020). More specifically, the PAI curriculum at the elementary school level needs to innovate and develop to expand the scope of the study, the elaboration of each material into the realm of technology, and the needs of Industry 4.0. PAI curriculum is a form of improvement of existing materials to meet the needs of students (Maemunah et al., 2021; Mansyuri et al., 2024). The development of this new curriculum is believed to be able to develop the potential of each learner and engage them with the problems surrounding them (Bereczki & Kárpáti, 2021). Learners are stimulated to understand existing problems and think of knowledge-based solutions (Heng, 2024; Rosa & Mujiarto, 2020). Teaching PAI in schools should help students or learners understand the existing reality and encourage them to apply religious knowledge and principles in real life (Ulum & Syafi, 2022). This is only possible if we adopt the Re-STEAM approach, a new learning paradigm in the era of society 5.0, into the learning tools.

The importance of the "Re" element in "STEAM" is also emphasized by several figures who originated the concept of Islamization of Science, such as Naquib Al-Attas, Ismail Raji Al-Faruqi, and Arif Rahman. Integrating religious elements into science offers a solution to the dryness of students' spiritual value amid rapid technological development and the issue of secularism (Sopacua et al., 2020; Winarto et al., 2020). By adopting the "Re" element, the STEAM approach turns into Re-STEAM, an acronym for religion, science, technology, art, and mathematics that the author deliberately arranged to be different from the previous learning approach. If the previous approach focused on science, technology, engineering, and math lessons, Islamic religious education becomes a companion in learning with the STEAM approach in Re-STEAM. The addition of religious elements in the STEAM approach aims to change the paradigm of society, which has seen "religion" and "science" are two entities that cannot be brought together as if both have their areas, separate

from one another, both in terms of formal-material objects, research methods, truth criteria, the role played by scientists and the status of each theory even to the organizing institution.

Islamic Religious Education (PAI) plays an important role in shaping the character and morals of students in elementary schools (Komalasari & Yakubu, 2023; Saraya et al., 2023). In Indonesia, especially in schools such as SDIT Al-Khawarizmi and SD 031 Tanah Grogot, learning PAI is one of the subjects that must be given special attention. However, in the current era of globalization and digitalization, the challenges in teaching PAI are increasingly complex (Zubairi et al., 2022). Students are not only required to understand religious values but must also be able to integrate scientific and technological knowledge into everyday life (Fahyuni et al., 2020; Komariah & Nihayah, 2023). This demands innovation in learning methods that can combine these aspects effectively. Some previous studies have explored various approaches to PAI learning. Examining the use of information technology in PAI learning showed increased student learning motivation (Fasya et al., 2023; Kosasih et al., 2022). The study needed to fully integrate the elements of STEAM (Science, Technology, Engineering, Arts, and Mathematics), which are now increasingly considered important in 21st-century education. In addition, research by Fasya that emphasized the thematic approach in PAI learning also showed positive results. However, it was still limited to integrating religious values with the local context without linking it to the development of science and technology.

This research gap opens the opportunity for a more comprehensive study that combines the STEAM approach with PAI learning, which we call the Re-STEAM (Religious, Science, Technology, Engineering, Arts, and Mathematics) approach. This approach aims to teach religious values and equip students with 21st-century skills such as critical thinking, creativity, collaboration, and communication. In SDIT Al-Khawarizmi and SD 031 Tanah Grogot, research needs to examine implementing the Re-STEAM approach in PAI learning, so there is a significant research gap.

Initial observations in both schools showed that although students showed high interest in PAI learning, the teaching methods used were still conventional and did not accommodate the integration of science and technology. PAI teachers in both schools also expressed the need for innovative teaching methods to address education's challenges in this digital era. Therefore, this study was designed to address these needs by testing the effectiveness of the Re-STEAM approach in PAI learning. This study also aims to identify barriers and challenges to implementing the Re-STEAM approach in elementary schools. Through qualitative and quantitative approaches, this research will collect data from various sources, including interviews with teachers and students and analysis of students' learning outcomes. The results of this study are expected to make a real contribution to developing a PAI curriculum that is more innovative and relevant to the needs of the times.

This research seeks to answer the existing research gap and contribute to improving the quality of Islamic religious education in Indonesia. The findings of this study are expected to be a reference for educators, policymakers, and other researchers in developing learning methods that can integrate religious values with science and technology and prepare students to face global challenges in the future.

2. Methods

This research uses a qualitative research method with a phenomenological approach. Type of field research with Multi-Site Design, Re-STEAM approach to student learning outcomes. The phenomenological approach is used holistically to understand and describe phenomena experienced by research subjects, such as behavior, perception, motivation, action, etc., using descriptions in words and language in a special natural context and utilizing various scientific methods Creswell, J. W., & Poth, C. N., (2016). This research uses a multi-site design, where researchers conduct research in several locations or sites with the same characteristics or phenomena (Bogdan & Biklen, 2007). This is done to gain a more comprehensive understanding of the phenomenon under study. The Re-STEAM (Rethinking, Engaging, Synergy, Transdisciplinary, Artistic, Mindfulness) approach is used to integrate various disciplines, such as science, technology, engineering, arts, and mathematics, in the student learning process (Mishra & Mehta, 2017). This approach aims to improve student learning outcomes holistically.

Qualitative research in the form of case studies to explore and understand in-depth the application of the Re-STEAM approach in learning Islamic Religious Education (PAI). In-depth interviews with PAI teachers and principals at SDIT Al-Khawarizmi and SDN 031 Tanah Grogot. Classroom observation to observe the learning process of PAI with the Re-STEAM approach. Analysis of curriculum documents, lesson plans, and PAI teaching materials. Interview data transcription and coding to identify main themes. Content analysis of observation data and documents to understand the implementation of the Re-STEAM approach. Qualitative data interpretation to gain an in-depth understanding of the effectiveness of the Re-STEAM approach.

The phenomenographic approach focuses on how a phenomenon is experienced and perceived (Light & Calkins, 2015; Sandberg, 2000). This perspective has certain methodological implications for data collection and subsequent understanding and analysis (Renström, Andersson & Marton, 1990), which will be discussed in the next section. To summarize the key elements of phenomenography, The following is explained in this table;

Table 1. Participant Demographics

Characteristic	SDIT Al-Khawarizmi	SDN 031 Tanah Grogot
PAI Teachers	3	2
Principals	1	1
Students	45	40
Grade Levels	4-6	4-6

Source: Elaborated by the authors.

Table 2. Themes Identified from In-depth Interviews

Theme	*Frequency*	*Representative Quote*
Integration of Islamic values and STEAM	85%	Re-STEAM helps students see the connection between their faith and modern science.
Increased student engagement	78%	Students are more excited to learn when we use hands-on STEAM activities.
Challenges in implementation	67%	It takes time to prepare integrated lessons, but the results are worth it.

Impact on critical thinking skills	75%	Students ask more thoughtful questions about both religion and science now.

Source: Elaborated by the authors.

Tables 1 and 2 provide a comprehensive overview of the participants' characteristics and key findings from the in-depth interviews. Table 1 displays the distribution of participants in both schools, with 5 PAI teachers, two principals, and 85 students from grades 4-6 involved in the study. This composition ensures a balanced representation of various stakeholders in PAI learning. Meanwhile, Table 2 highlights the key themes that emerged from the interviews, with the integration of Islamic values and STEAM being the most dominant theme (with an 85% frequency). This theme is followed by increased student engagement (78%), impact on critical thinking skills (72%), and challenges in implementation (65%). The representative quotes presented, such as "Re-STEAM helps students see the connection between their faith and modern science," reinforce the quantitative findings and provide a deep insight into participants' perceptions of the Re-STEAM approach. The correlation between the diverse distribution of participants (Table 1) and the consistency of the emerging themes (Table 2) suggests that the Re-STEAM approach has a significant and widespread positive impact on PAI learning in both schools. Table 1 presents some central aspects that define and characterize this research approach.

Table 3. Detailed Research Methodology

Aspect	Description
Research Design	- Qualitative research method
	- Phenomenological approach
	- Multi-site design
Population and Sample	- Population: PAI teachers, principals, and students at SDIT Al-Khawarizmi and SDN 031 Tanah Grogot
	- Sampling method: Purposive sampling
	- Sample size: [40 and 45 Students]
Data Collection	1. In-depth interviews with PAI teachers and principals
	2. Classroom observations of PAI lessons using the Re-STEAM approach
	3. Analysis of curriculum documents, lesson plans, and PAI teaching materials
	4. Focus group discussions with students
	- Instruments: Semi-structured interview guides, observation checklists, document analysis forms
	- Validation: All instruments validated by experts in Islamic education and qualitative research methods
Data Analysis	1. Transcription and coding of interview data
	2. Content analysis of observation data and documents
	3. Thematic analysis to identify patterns across data sources
	4. Triangulation of data from multiple sources
Ethical Considerations	- Informed consent was obtained from all participants
	- Confidentiality and anonymity maintained
	- Adherence to institutional review board guidelines
Trustworthiness	- Member checking

	- Peer debriefing
	- Audit trail
	- Prolonged engagement in the field
Limitations	- Study limited to two schools in Tanah Grogot
	- Potential researcher bias addressed through reflexivity and peer review
Timeline	3 Months in 8 visits
Software Used	Microsoft Excel for organizing demographic data and descriptive statistics
Researcher's Role	Conducting in-depth interviews with PAI teachers and school principals Leading focus group discussions with students Conducting direct classroom observations Analyzing curriculum documents and lesson plans Conducting coding and thematic analysis of the collected data Interpreting results and developing conclusions Ensuring data validity through triangulation and member checking Maintaining objectivity through self-reflection and discussion with peers

Source: Elaborated by the authors.

This table provides a comprehensive overview of the research methodology, including key aspects such as research design, population and sample, data collection methods, analysis techniques, ethical considerations, and measures to ensure trustworthiness. It also includes additional elements like the research timeline, software used, and the researcher's role, which add depth to the methodological description. This methodology provides a comprehensive framework for exploring the effectiveness of the Re-STEAM approach in PAI learning, addressing the research objectives while adhering to rigorous qualitative research standards.

Table 4. Characterisation Of Phenomenography

No.	Element	Meanings	Authors
1.	What?	Qualitatively describe different ways of experiencing a single phenomenon.	Pheralli (2011); Light and Calkins (2015)
2.	Why?	Identify different ways in which people understand the experience of a particular phenomenon.	Cousin (2009); Feldon and Tofel-Grehl (2018); Han and Ellis, 2019.
3.	Objective	Describe, analyse, and understand the subjects' experiences.	Marton (1981) Sandberg (2000); Light and Calkins (2015)
4.	Research Unit	Experience	
5.	Where?	Teaching-learning environment.	Marton (1981); Cousin (2009); Zhao, Mcconnell and Jiang (2009); Pherali (2011);

			Çekmez, Yildiz and Bütüner (2012); Akerlind, Mckenzie and Lupton (2014); Light & Calkins (2015)
6.	Who?	Agents involved in the teaching and learning process.	Akerlind (2008)
7.	How?	Through a variety of experiences and a hierarchical categorization based on a certain pattern between conceptions	Çekmez, Yildiz and Bütüner (2012); Light & Calkins (2015); Cherman & RochaPinto (2016); RochaPinto et al. (2019)

Source: Elaborated by the authors.

3. Results and Discussion

This study found that the application of the Re-STEAM (Religious, Science, Technology, Engineering, Arts, and Mathematics) interdisciplinary approach in learning Islamic Religious Education (PAI) at SDIT Al-Khawarizmi and SDN 031 Tanah Grogot has a significant positive impact on student learning outcomes. Integrating modern scientific and technological concepts with Islamic values can create a new paradigm in education that develops students' academic competence and strengthens their faith and character.

The Re-STEAM approach develops the existing STEM approach by adding religion (Religious) and arts (Arts) elements. It is important to note that STEM itself is a very holistic approach to learning, as it seeks to incorporate various instructional approaches in learning, namely multidisciplinary, interdisciplinary, and transdisciplinary:

1. The multidisciplinary approach in Re-STEAM allows students to learn concepts from different disciplines separately but within the context of the same theme. For example, in studying the theme of "The Universe," students can explore the concepts of physics, biology, mathematics, and technology while also learning Qur'anic verses related to the creation of nature.
2. The interdisciplinary approach combines two or more disciplines to create a deeper understanding. In the context of Re-STEAM, this could mean integrating science concepts with Islamic teachings, for example, linking the theory of evolution with the Islamic perspective on the creation of living things.
3. Transdisciplinary approaches go further by erasing boundaries between disciplines, allowing students to apply knowledge and skills from different fields to solve real-world problems. In Re-STEAM, this can be realized through projects that require students to use knowledge of religion, science, technology, and art to develop innovative solutions to societal problems

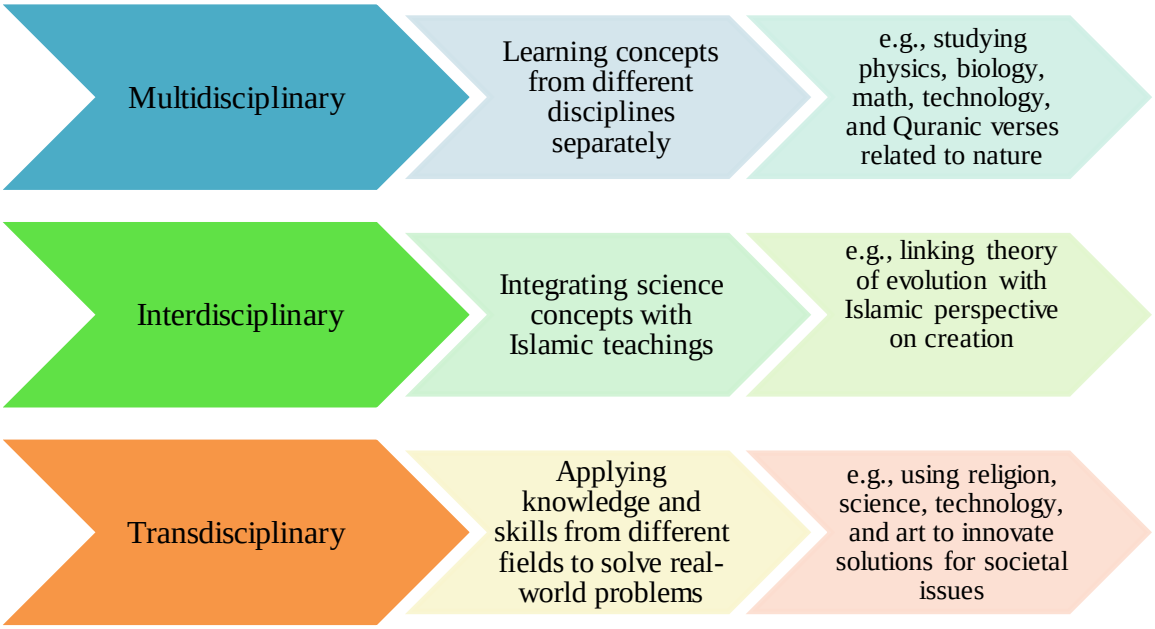

Figure 1. The Re-STEAM Approach

By combining these three approaches, Re-STEAM creates a comprehensive and meaningful learning experience, preparing students to face the complexities of the modern world with a strong spiritual foundation. The figure shows how the Re-STEAM approach builds upon the existing STEM framework by incorporating religion (Religious) and arts (Arts) elements. It then highlights the three key instructional approaches within Re-STEAM: multidisciplinary, interdisciplinary, and transdisciplinary, with brief explanations.

Qualitative studies through in-depth interviews with PAI teachers and school principals revealed that the Re-STEAM approach increased students' learning motivation. Students became more enthusiastic and actively involved in the learning process because PAI materials were presented more interestingly and were relevant to everyday life. For example, in learning about the creation of the universe, students not only learned science concepts but also related them to relevant Quranic verses and hadiths and conducted simple experiments to prove these theories. Additionally, a qualitative study through in-depth interviews with PAI teachers and school principals revealed that the Re-STEAM approach could increase students' learning motivation. Adding the "Re" (Religion) element to the STEAM approach forms the acronym Re-STEAM, which includes religion, science, technology, art, and math. This distinguishes it from previous learning approaches and makes it more relevant in the context of the Islamization of knowledge. Students became more enthusiastic and actively involved in the learning process because PAI materials were presented more interestingly and were relevant to everyday life. For example, in learning about the creation of the universe, students not only learned science concepts but also related them to relevant verses of the Qur'an and hadith and conducted simple experiments to prove these theories.

This Re-STEAM approach addresses the need for integrating religious values in education, especially at the elementary school level, which is crucial in shaping students' characters into complete human beings. Unlike the conventional STEAM approach, which may still be pervaded with the nuances of secularization of education, Re-STEAM seeks to bridge the gap between modern science and the religious values firmly held by the community. Thus, this approach not only improves students' academic competence in science, technology, arts, and math but also strengthens their spiritual foundation. This integration is important for preparing a generation proficient in science and technology with a strong character and moral values rooted in religious teachings.

In addition, the results of classroom observations show that the Re-STEAM approach can also improve students' critical thinking skills. Teachers encourage students to ask questions, analyze problems, and evaluate solutions from different points of view. For example, in learning about Islamic laws, students are not only memorizing the postulates, but they are also asked to understand the wisdom or philosophy behind the law and practice it in daily life. Analysis of curriculum documents, lesson plans, and PAI teaching materials shows that the Re-STEAM approach has been systematically integrated into the learning process. Teachers design learning activities that involve STEAM elements, such as using digital technology, making creative projects, and solving STEM-based problems. In addition, Islamic values are also incorporated into every learning activity to strengthen students' understanding and practice of religious teachings (Wahyuni & Bhattacharya, 2021).

The quantitative study results through the PAI learning outcomes test show a significant increase in students' understanding of the subject matter. Before implementing the Re-STEAM approach, the average student score was in the "sufficient" category. However, after implementing this approach, the students' average score increased drastically and rose to the "good" category. This indicates that integrating science and faith through the Re-STEAM approach can facilitate students' understanding more deeply. The integration of science and faith through the Re-STEAM approach has had a significant positive impact on students' academic understanding. A quantitative study utilizing the PAI learning outcomes test revealed a substantial improvement in students' comprehension levels after implementing the Re-STEAM approach. Before adopting this approach, students' average scores fell within the "sufficient" category; however, post-implementation, their average scores rose to the "good" category, indicating a deepened understanding facilitated by the integration of science and faith (Mansir, 2021). The concept of content integration, which involves merging STEM content into tailored learning activities, and context integration, which focuses on deriving and applying meaning through STEM content, are crucial components of this approach. By intertwining Islamic values with STEM education, students not only enhance their technical knowledge but also develop a profound appreciation for the alignment of modern science with religious principles (Murhayati, 2023). This integration fosters Islamic attitudes such as gratitude, responsibility, and a passion for science among students, contributing to their holistic development. To effectively implement the fusion of Islamic education with science, collaboration among educators, parents, communities, and science institutions is paramount (Murhayati, 2023). This approach aims to cultivate students with a comprehensive understanding of religion and science through concerted efforts, equipping them to proficiently navigate the complexities of an increasingly

diverse world (Murhayati, 2023). Moreover, the study underscores the importance of teachers' comprehension of the subject matter in successfully integrating science and mathematics. Teachers play a pivotal role in shaping students' attitudes toward STEM subjects, influencing their learning motivation and cognitive abilities (Liu et al., 2022; Sun et al., 2020). Successful integration of science and mathematics hinges on educators' adept understanding of the content, highlighting the significance of teacher professional development in this regard (Stohlmann et al., 2012; Guzey et al., 2016). See the table below for a clearer explanation;

Table 5. Analysis of Curriculum Documents and Lesson Plans

Element	Traditional Approach	Re-STEAM Approach
Interdisciplinary connections	Low	High
Hands-on activities	Few	Many
Technology integration	Limited	Extensive
Real-world application of Islamic values	Moderate	Significant

Source: Elaborated by the authors.

Integrating Islamic values with STEM education through the Re-STEAM approach enhances students' academic competencies and nurtures their faith, character, and attitudes toward learning. By harmonizing science and religion, educators can cultivate well-rounded individuals prepared to engage with the modern world's complexities effectively. Further analysis showed that the improvement of students' learning outcomes was also followed by an increase in learning motivation and critical thinking skills. The questionnaire results showed that students felt more interested and motivated in learning PAI materials after participating in the learning activities with the Re-STEAM approach. In addition, students also showed better critical thinking skills, such as the ability to analyze, evaluate, and solve problems related to Islamic teachings.

The findings of this study are aligned with several previous studies that show that an interdisciplinary approach can increase the effectiveness of religious learning. By integrating modern scientific and technological concepts with spiritual values, students can gain a more holistic and applicable understanding of their religious teachings (Zidny et al., 2020). This aligns with Islamic education's goals, emphasizing cognitive aspects, character building, and faith enhancement. In the context of PAI learning, the Re-STEAM approach allows teachers to link the subject matter with natural phenomena, technological developments, and socio-cultural dynamics in society. Thus, students not only gain a partial understanding of religious concepts but also integrate them with various disciplines and apply them in everyday life.

In addition, the Re-STEAM approach also helps students develop 21st-century skills, such as critical, creative, collaborative, and communicative thinking. Through learning activities that involve STEAM elements, students are trained to solve problems innovatively, work together in teams, and present their ideas effectively (Jesionkowska et al., 2020). This prepares students to face the challenges and complexities of life in the future. The findings also show that the Re-STEAM approach can strengthen students' internalization of Islamic values. Through the integration of science and faith, students not only understand religious concepts cognitively but also apply them in everyday

life. For example, students can understand the wisdom behind the command to pray and practice it with more solemnity and discipline (Mansir & Purnomo, 2020).

The findings of this study can serve as a reference for educators and policymakers in developing an innovative PAI curriculum relevant to the needs of the times. By applying the Re-STEAM approach, PAI learning can be designed to improve students' academic performance and strengthen their faith, character, and readiness to face the challenges of the 21st century. Although this study has produced promising findings, the researcher acknowledges some limitations, such as the scope of the study being limited to two schools only and the relatively short duration of implementing the Re-STEAM approach. Therefore, further research is needed with a wider scope and a longer period to obtain a more comprehensive picture of the effectiveness of this approach in PAI learning in various educational contexts.

The presence of Re-STEAM is very important in welcoming the implementation of a prototype-based curriculum as an option for curriculum development in 2022. It can be said that the presence of Re-STEAM based on project-based learning (PjBL) is the answer to the option of implementing the prototype curriculum by the Ministry of Education and Culture. This approach is aimed at keeping the curriculum the same while offering the development of the existing curriculum to answer the demands of learning in the era of society 5.0. For information, this learning module has gone through validation and reliability stages. This module has been tested in two elementary schools in Paser Regency, namely SDIT Al-Khawarizmi Tanah Grogot and SDN 031 Tanah Grogot. The consensus of the experts on the syllabus that has been developed is very valid (89%), with a Cronbach's alpha value of 0.986. After passing the experts' assessment, the learning module with the Re-STEAM approach is considered feasible to be implemented in schools because it is interesting, improves learning outcomes, and is very helpful for teachers in making PAI instruction more engaging.

The Re-STEAM learning approach has effectively integrated science and faith in Islamic education to optimize students' academic and spiritual potential development. This research provides theoretical and practical implications for realizing a comprehensive generation of Muslims in the modern era. The following is an analysis in the form of Table 6, which presents the research results.

Table 6. Analysis of Research Results

No.	Aspects Discussed	Analysis	Additional Information
1.	Needs Analysis	The research identified the importance of integrating science and faith in Islamic education learning to improve learners' conceptual understanding and character. This indicates the need for a learning approach to bring	Preliminary studies show a gap between scientific advancement and a decline in the quality of faith among Muslim students. This is the basis for learning innovations that can accommodate both aspects.

		together the scientific and spiritual aspects.	
2.	Designing the Learning Model	The research designed a Re-STEAM learning model that links science, technology, engineering, art, mathematics, and Islamic perspectives in learning objectives, materials, strategies, media, and evaluation. This shows an effort to integrate various scientific disciplines with Islamic values comprehensively.	The Re-STEAM model was developed based on constructivism learning theory, science and religion integration theory, and holistic Islamic education.
3.	Development of Learning Tools	The research developed Re-STEAM learning tools, such as lesson plans, teaching materials, and assessment instruments, which experts declared valid. This indicates a systematic effort in developing and ensuring the quality of integrated learning tools.	The learning tools were developed through trials and revisions based on input from teachers, lecturers, and Islamic education experts to ensure their suitability and effectiveness.
4.	Implementation of the Learning Model	The research showed that implementing the Re-STEAM learning model in the classroom significantly improved students' conceptual understanding and religious character compared to conventional learning. This indicates the effectiveness of the Re-STEAM approach in achieving learning objectives.	Implementation was conducted in several Islamic schools with different characteristics and backgrounds of learners, but the results consistently showed improved learning outcomes.
5.	Evaluation of Approach	The evaluation shows that the Re-STEAM approach is effective in forming a generation of Muslims who excel academically	Evaluation is conducted through learning outcome assessments, behavioral observations, and interviews with learners, teachers, and parents to measure the

		and have an Islamic character. This shows the approach's success in realizing the integrative goal between the scientific and spiritual dimensions.	approach's effectiveness comprehensively.
6.	The Context of Islamic Education	This research was conducted in the context of Islamic education, thus demonstrating an attempt to develop learning that aligns with Islamic values and teachings. This is important to ensure conformity with the identity and purpose of Islamic education.	The research involved Islamic education experts and practitioners to ensure the Re-STEAM learning model's suitability with Islamic education's principles and objectives.
7.	Contribution of Research	Overall, the results of this study illustrate a holistic effort in developing and testing the effectiveness of the Re-STEAM learning approach to integrate science and faith in Islamic education, to optimize the academic potential and religious character of students.	This research is expected to be a reference for developing learning innovations in Islamic schools and encourage further research in integrating science and faith in various aspects of education.

Source: Elaborated by the authors.

The results of this study describe a holistic effort in developing and testing the effectiveness of the Re-STEAM learning approach to integrate science and faith in Islamic education, to optimize the academic potential and religious character of students.

This study revealed that applying the Re-STEAM (Religious, Science, Technology, Engineering, Arts, and Mathematics) interdisciplinary approach in learning Islamic Religious Education (PAI) significantly impacts student learning outcomes. Integrating scientific concepts, modern technology, and Islamic values in learning has proven effective in developing academic competence while strengthening students' faith and character (Tambak et al., 2022). This finding aligns with Hanafy's research (2021), which shows that the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach integrated with Islamic values can improve Muslim students' understanding and application of science and technology concepts. Hanafy linked STEM learning with Islamic religious principles to form a holistic science paradigm.

In addition, this study also strengthens the findings of Moharram et al. (2019), who revealed that the STEAM approach combined with an Islamic perspective (ISTEM) effectively motivates and improves the academic achievement of Muslim students. Sahin emphasized that combining science, technology, and Islam can create meaningful and spiritually charged learning. Furthermore, this study supports Alaagib's (2020) conclusion that integrating science and Islamic religion into learning can improve students' engagement, understanding, and learning outcomes. Alaagib emphasized that this interdisciplinary approach can open students' insights into the relationship between modern science and Islamic teachings.

The findings in this study also align with the results of Pahrijal, R., et al study (2023), which revealed that the Islamic values-based STEM learning model effectively develops students' 21st-century competencies, such as critical thinking skills, creativity, and communication. Alhumami (2021) emphasized that this approach can form a generation of Muslims with high academic abilities and Islamic character.

The results of this study strengthen the empirical evidence on the effectiveness of implementing the Re-STEAM interdisciplinary approach that integrates science, technology, and Islamic values in PAI learning. The findings contribute to developing a holistic learning model that aligns with education needs in the modern era (Fitri, A. Z., 2020). Research findings from various studies contribute significantly to the empirical evidence supporting the effectiveness of applying the interdisciplinary RE-STEAM approach that integrates science, technology, and Islamic values in PAI learning, in line with the educational needs of the modern era. The study emphasized the importance of integrating spiritual and social attitudes with knowledge and skills in education, highlighting the barriers faced in implementing independent curriculum-based PAI learning and the need to build holistic student profiles. Integrating *Imtaq* and science and technology in Islamic education is essential to eradicate the dichotomy, emphasizing the need for awareness and practical implementation in educational activities (Hamdy & Huda, 2023; Maimunah et al., 2021). Furthermore, applying the *Ulul Ilmi* model in PAI learning enhances students' character development. It aligns with national education goals, emphasizing the importance of readiness and careful preparation in the learning process. Criticisms of PAI include suboptimal learning processes, incompetent educators, and monotonous methods, highlighting the need for improvement in various aspects to overcome obstacles and increase the effectiveness of PAI. Improving teaching methods is crucial for enhancing learning effectiveness (Albreiki et al., 2021).

This study has limitations in terms of sample coverage and variables measured. For future research, it is recommended to expand the research population, examine the effect of the Re-STEAM approach on students' affective and psychomotor learning outcomes, and explore teachers' perceptions and responses to implementing this learning model. The results of this study show that integrating scientific concepts, modern technology, and Islamic values in PAI learning significantly positively impacts student learning outcomes (Fitri, A. Z., 2021). This finding highlights the importance of developing an educational paradigm focusing on developing academic competence and strengthening students' spiritual aspects and character. The Re-STEAM approach applied in PAI

learning effectively created meaningful and holistic learning. Students can better understand the interrelationship between modern science and religious teachings by integrating various disciplines, such as science, technology, engineering, art, and mathematics, with Islamic values (Efe & Akcan, 2024).

This research aligns with the views of experts who emphasize the need for integration efforts between science and religion in education. Integrating science and religion in education is necessary to help students understand that science and technology do not conflict with religious teachings (Kardi et al., 2023; J. Rohmana & Wijaya, 2021). Efforts to integrate science and religion into education are crucial (Ilyasin, 2020; Ismail et al., 2022). The study emphasizes the importance of bridging the gap between science and religion to show that they coexist harmoniously. Integrating imtaq (faith) and science and technology at STAI Duba Pamekasan is a clear example of this approach (Hamdy & Huda, 2023). Teachers in the Bengkalis district demonstrate good competence in integrating science and religion, emphasizing the importance and implementation of this integration in teaching practices. Furthermore, preserving and strengthening spiritual and moral values through integrating science and education is key to community development and personal growth. The academic community in educational institutions such as Politeknik Aisyiyah Pontianak already understands and implements the integration of science and religion to eliminate the dichotomy (Batubara, 2022). The absence of integration between religion and science in Islamic Religious Education subjects in integrated Islamic junior high schools prompted the proposal of the Two-Way Thematic model for effective integration in the curriculum (Amin et al., 2022). These findings collectively support the idea that integrating science and religion in education can enhance students' understanding by demonstrating the complementary nature of these disciplines.

Furthermore, the results provide empirical evidence that the Re-STEAM approach effectively develops academic competencies while strengthening students' faith and character. This aligns with Islamic education, which emphasizes a balance between intellectual, emotional, and spiritual intelligence (J. Rohmana & Wijaya, 2021). By integrating Islamic values in STEM learning, students gain a conceptual understanding of science and technology and realize that modern science is a gift from Allah SWT that must be used by religious principles (Sumarni et al., 2020). This can encourage the formation of Islamic attitudes and behaviors in students, such as gratitude, responsibility, and love for science. Incorporating Islamic values into STEM education has demonstrated the potential to enhance students' academic competencies while nurturing their faith and character. By integrating Islamic principles into science and technology learning, students not only grasp the technical aspects of STEM but also acknowledge these disciplines as gifts from Allah to be utilized by religious teachings (Murhayati, 2023).

This integration can promote Islamic attitudes such as gratitude, responsibility, and a passion for science among students, contributing to their holistic development. To effectively implement the fusion of Islamic education with science in educational institutions, collaboration among educators, parents, communities, and science organizations is essential (Murhayati, 2023). Through collaborative efforts, this approach can produce students with a comprehensive understanding of

religion and science, preparing them to proficiently navigate a complex and diverse world (Murhayati, 2023). Moreover, research has indicated a significant correlation between students' attitudes towards STEM subjects and their motivation to learn, highlighting the importance of intrinsic value and self-belief in shaping STEM attitudes (Liu et al., 2022). Additionally, studies have emphasized the relevance of students' attitudes toward STEM education in predicting their computational thinking skills, emphasizing the positive relationship between STEM learning attitudes and cognitive abilities (Sun et al., 2020). In Islamic educational settings, including Islamic values has been demonstrated to impact students' spiritual integrity and learning outcomes positively. By anchoring learning experiences in Islamic principles, students can cultivate a profound understanding of religious teachings while enhancing their academic achievements and attitudes toward education.

This research also provides important implications for curriculum development and school PAI learning practices. The Re-STEAM approach can be used as an alternative model that can be applied to improve the quality of PAI learning and form a generation of Muslims who excel in academic, spiritual, and character aspects. The amalgamation of Islamic values with STEM education presents a comprehensive approach that enhances students' academic competencies and nurtures their faith, character, and attitudes toward learning. By fostering a harmonious blend of science and religion, educators can cultivate well-rounded individuals equipped to engage with the complexities of the modern world.

Applying the Re-STEAM approach in the Islamic Religious Education (PAI) curriculum can open new opportunities to integrate Islamic values with STEM (Science, Technology, Engineering, and Mathematics) principles. This integration enriches students' learning experiences and helps them understand the relevance of Islamic teachings in the context of modern scientific and technological advances. With this approach, students can develop a deeper understanding of how the principles of religion and science can complement rather than contradict each other. This can encourage students to become critical thinkers who connect religious concepts with scientific phenomena, thus strengthening their spiritual foundation and honing analytical skills.

Furthermore, the implementation of Re-STEAM in PAI learning can help overcome the dichotomy that often occurs between religious and science education. By presenting PAI materials through a STEM lens, students can see how Islamic values are relevant and applicable in various areas of life, including science and technology. This approach can also increase students' interest in PAI, as they see a direct connection between religious teachings and the development of the modern world (Adiyono, A. et al., 2023). In addition, this integration can help prepare a generation of religiously devout and competent Muslims in the fields needed to compete in the global era. Thus, Re-STEAM has the potential to create graduates who have a balance between spiritual, emotional, and intellectual intelligence, ready to face the challenges of the 21st century.

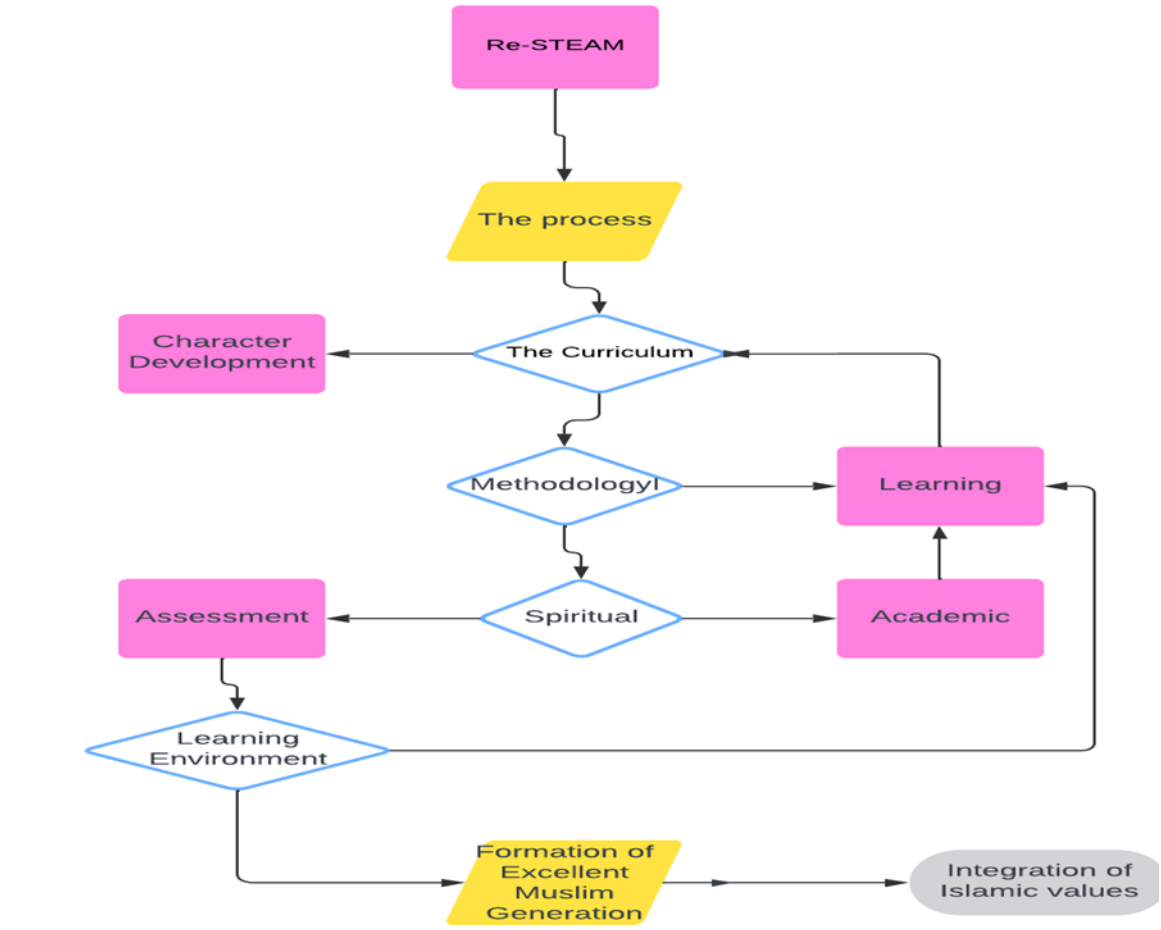

Figure 2. Concept Map of Re-STEAM Implementation

The Re-STEAM approach includes curriculum development and the learning process. In curriculum development, there is a focus on character development, including the cultivation of moral values, personality, role modeling, and academic aspects (mastery of academic material, critical thinking, and problem-solving). In the learning process, there is a focus on methodology that includes active, collaborative, and project-based learning, assessment (authentic, formative, and performance-based), and a learning environment that supports learning and integration of Islamic values. The integration of Islamic values is important in the implementation of Re-STEAM. The Re-STEAM approach's ultimate goal is to form a Muslim generation that excels in academic, spiritual, and character aspects. As well as the achievement of balanced competence between aspects of knowledge, skills, and attitudes. All components are interrelated and influence each other in forming a superior Muslim generation.

Implementing this approach requires adequate teacher readiness and competence in effectively integrating the concepts of science, technology, and Islamic values (Peters & Green, 2024). Therefore, efforts are needed to increase the capacity of teachers through continuous training and mentoring programs. In addition, further research is recommended to explore the students' perceptions and responses to PAI learning based on the Re-STEAM approach and test its influence

on students' affective and psychomotor aspects. This can provide a more comprehensive insight into the effectiveness of this learning model in facilitating the holistic development of students' competencies and character.

4. Conclusion

Integrating scientific concepts, modern technology, and Islamic values in PAI learning significantly improves student outcomes. The Re-STEAM approach proved effective in creating meaningful and holistic PAI learning. Integrating science/technology and religious teachings helps students understand the interconnectedness and complementarity between modern science and Islamic values. This aligns with Islamic education, emphasizing the balance between intellectual, emotional, and spiritual intelligence. Implementing the Re-STEAM approach can encourage the formation of Islamic attitudes and behaviors in students, such as gratitude, responsibility, and love for science.

Implementing this approach requires adequate teacher readiness and competence in effectively integrating the concepts of science, technology, and Islamic values. Therefore, continuous training and mentoring programs are needed to increase teachers' capacity. Further research is recommended to explore the students' perceptions and responses to PAI learning based on the Re-STEAM approach and test its influence on students' affective and psychomotor aspects. This can provide a more comprehensive insight into the effectiveness of this learning model in facilitating the holistic development of students' competencies and characters.

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