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Integration of Steam Curriculum in Islamic Education to Prepare the 21st Century Generation

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ABSTRACT

The STEAM-based curriculum (Science, Technology, Engineering, Arts, and Mathematics) offers a learning approach that emphasizes interdisciplinary integration, real-world contextualization, and the deep internalization of character values. This conceptual study explores the value-oriented STEAM approach as an alternative paradigm in Islamic education curriculum development—one that is not only responsive to 21st-century demands but also rooted in spirituality and local wisdom. Through a systematic analysis of the curriculum model presented in the book *Curriculum STEAM Based: Preparing Future Generations*, this article elaborates on the foundational principles of STEAM, its stepwise and contextual implementation strategies, and the practical challenges encountered by educational institutions. Findings indicate that value-based STEAM can bridge 21st-century competencies with the holistic character development of students. Project-based learning, value-oriented reflection, and interdisciplinary collaboration serve as key elements in actualizing a curriculum that unites knowledge and ethics. Despite facing several obstacles—including limited teacher capacity and the absence of relevant assessment systems—this approach offers a promising pathway toward a transformative, context-sensitive, and value-driven model of education.

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1. INTRODUCTION

In recent years, the discourse on the need for curriculum transformation has become increasingly intense, especially due to the pressures of a rapidly changing era. Educational institutions are required not only to teach subject matter, but also to equip students with complex life skills (Asad, 2023) . One approach that is considered promising is the STEAM-based curriculum which combines science, technology, engineering, art, and mathematics. In theory, this approach is in line with the demands of 21st century competencies. (Hermansyah, Ali, & Aqodiah, 2025; Mustofiyah, Rahmawati, & Ghufron,

2024) . However, in practice, there are still very few Islamic educational institutions that truly implement this approach in a comprehensive and contextual manner. This is where the gap arises: on the one hand, the need for an adaptive curriculum is urgent; on the other hand, the implementation models offered have not paid enough attention to the roots of Islamic values. The question arises: how is it possible to build an interdisciplinary and modern approach, without abandoning the spirituality and distinctive character of Islamic education? This study attempts to answer this concern by exploring the possibility of a meeting point between STEAM and Islamic values, not as parallel concepts, but as a mutually reinforcing unity.

There have been quite a few studies discussing the STEAM approach in the context of general education (Adelia & Idi, 2024; Halim & Roshayanti, 2021) . Some of them emphasize the improvement of critical thinking skills, creativity, and collaboration as positive impacts of implementing STEAM in the classroom. However, if we look at studies that focus on Islamic education, the number is still limited. There are studies that try to link religious values to STEAM projects, but they are often only normative, not going into the technical aspects or learning practices in the classroom. In addition, most of these studies have not touched on how the curriculum in madrasahs or Islamic schools can be redesigned to be truly integrated in terms of values and structure. This is where this research lies: not just extending the discussion, but trying to enter a deeper space—connecting the STEAM approach with the distinctive characteristics of Islamic education more comprehensively. That way, this research is not intended to replace or compete with previous research, but rather to continue and enrich the direction of the search for a relevant and meaningful educational approach.

What distinguishes this study from previous studies is its perspective that starts from the needs of Islamic educational institutions themselves, not just implementing an approach that is "imported" from abroad. This study not only adopts STEAM, but also tries to reinterpret the approach with Islamic values as a starting point. It does not mean rejecting modern technology or science, but placing it in a more complete framework - where science, character, and spirituality go hand in hand (Indriani & Herman, 2025) **.** In addition, the approach used does not stop at the level of ideas, but attempts to compile an implementation picture: how STEAM learning can take place in the classroom, how the roles of teachers and students are built, and how Islamic values are translated into every step of learning. In other words, the novelty of this study lies in its effort to build an integrative approach that not only unites two different systems, but processes them into one form of curriculum that is naturally and functionally integrated.

This study seeks to answer a fundamental question: *Can the STEAM approach be substantially integrated into Islamic education without losing its character values?* From this main question, several derivatives emerge: (1) How compatible are the basic values of STEAM with the principles of Islamic education? (2) What forms of learning allow the integration of these two approaches to occur in real terms? (3) What challenges might Islamic educational institutions face in implementing this model? The reasons behind these questions are quite clear: currently, many Islamic educational institutions want to innovate, but hesitate because they are afraid of losing their identity. This study seeks to show that innovation does not have to abandon values. In fact, with strong values, innovation can be directed more meaningfully. Therefore, through this study, it is hoped that a new understanding will emerge that STEAM is not a threat to Islamic education, but rather an opportunity to strengthen its relevance and competitiveness amidst changing times.

This research is based on the belief that STEAM and Islamic education do not have to be opposed, but can support each other (Dewi, Mariana, & Ekawati, 2023; Zidniyati, 2019) . The main argument put forward is that Islamic values can actually be a moral foundation that strengthens the STEAM-based learning process. For example, the concept of responsibility in Islam can be included in students' collaborative activities; the value of honesty can be instilled when students compile experimental reports; and awareness of God's creation can be a reflection of science learning. Early evidence from several Islamic schools that have begun to implement project learning shows that this integration is not impossible. There are indeed challenges, especially in the readiness of teachers and teaching materials,

but that does not mean it cannot be done. This research is based on the hypothesis that with the right understanding, the STEAM approach can not only be applied in Islamic education, but can also become a unique and superior model. Not as a duplication of an external system, but as a result of the thinking and experience of Islamic education itself.

2. METHODS

This type of research is a qualitative study based on a library research approach (Pringgar & Sujatmiko, 2020; Saefullah, 2024) . This approach is used to critically and deeply examine various concepts, theories, and discourses regarding the STEAM curriculum and their relevance in the context of Islamic education. This research is not intended to measure phenomena quantitatively, but rather aims to formulate a conceptual and integrative understanding through analysis of authoritative and relevant written sources.

The material objects of this study include the basic concepts of the STEAM curriculum as reflected in scientific works, educational documents, and Islamic educational literature containing values such as monotheism, trust, responsibility, and justice (Khosiah, Salsabila, Widodo, & Malang, 2024; Yuliana et al., 2024) . This object was chosen because it illustrates the core of the two approaches to be bridged, namely the science-based educational approach and the value-based educational approach.

The research design is arranged descriptively-analytical (Latukau & Mordekhai, 2021) . The purpose of this design is to describe the structure of STEAM curriculum thinking, analyze its suitability with the basic principles of Islamic education, and evaluate the possibility of integrative implementation in Islamic educational institutions. The analysis process is not only explanatory, but also interpretative, emphasizing the interconnectedness between concepts and values found in the literature.

The sources of information in this study consist of written materials that are primary and secondary (Hidayah, 2023) . Primary sources include books, scientific journals, and official documents that discuss the STEAM curriculum and Islamic education. Secondary sources include articles, research reports, and other academic publications that support conceptual and implementative studies of the topics studied. The selection of sources is carried out selectively based on relevance, depth of content, and academic authority.

The data collection process was carried out through a systematic literature search, by identifying main themes, compiling content notes, and classifying data based on key topics related to the problem formulation (Arief & Sugiarti, 2022) . Each document was reviewed to explore the conceptual substance and its practical implications for Islamic education based on the STEAM curriculum.

Data analysis was carried out using a thematic content analysis approach. (Rozali, 2022) . Data obtained from various sources are classified into themes such as STEAM curriculum structure, Islamic educational values, integration strategies, and implementation challenges. Furthermore, an argumentative synthesis process is carried out to build a systematic and relevant framework of thought. This analysis aims to produce a theoretical construction that is able to answer research questions consistently and in depth.

3. FINDINGS AND DISCUSSION

3.1. Basic Concepts of STEAM in Value-Based Curriculum

The paradigm shift in education in facing the 21st century demands a curriculum approach that is no longer linear, fragmentary, and teacher-centered. An increasingly complex, interconnected, and technologically dynamic world requires a generation of learners who are adaptive, creative, and able to think across disciplines. In this context, the STEAM (Science, Technology, Engineering, Arts, and Mathematics)-based learning approach is present as an answer to these needs. STEAM is not merely a

method of integrating five fields of science, but rather a comprehensive approach that emphasizes active, collaborative, and contextual learning experiences.

However, the implementation of STEAM is not enough to be adjusted to the needs of industry and technological developments, but must also be based on human, cultural, and spiritual values. The STEAM-Based Curriculum Book: Preparing the Future Generation places the value aspect as the core of the learning process. Values in this case are not only interpreted as moral content, but as guiding principles in formulating learning objectives, content, methods, and evaluations. This is what distinguishes the STEAM approach in this book from the models that have developed in Western countries.

To understand the foundation of the STEAM curriculum comprehensively, it is necessary to systematically explore how the definition, principles, structure, and objectives of this approach are built. The following explanation will outline the basic concepts of STEAM as explained in the book, with an emphasis on the integration of Islamic values and local wisdom as the main characteristics of the curriculum approach offered.

3.2 Definition and Scope of STEAM

The STEAM approach is a development of the STEM (Science, Technology, Engineering, Mathematics) approach which was then expanded to include Arts elements. The addition of this art aspect is not merely symbolic, but has a significant impact on the way education is viewed. If STEM tends to focus on logic, exact, and technicality, then STEAM opens up space for expression, empathy, creativity, and cultural awareness.

In the scope of learning, STEAM encourages students to think in an integrated way. The real world does not separate science from aesthetics, engineering from cultural expression, or mathematics from moral issues. Therefore, STEAM unites rational and emotional perspectives in responding to life's problems. This makes the STEAM approach more relevant to preparing the 21st century generation who are faced with the complexity of global, local, and personal issues simultaneously.

STEAM is not a rigid teaching method, but rather a flexible and adaptive paradigm, allowing the curriculum to be designed based on local needs, contexts, and potentials. The STEAM-Based Curriculum Book states that the essence of this approach lies in the ability to connect various disciplines in a meaningful learning experience, where students not only learn to know, but also to be and to live together.

3.3 Key Principles of STEAM Curriculum

In developing a STEAM-based curriculum, there are several basic principles that cannot be left behind. This book explains that the success of implementing a STEAM curriculum is highly dependent on the consistency of educational institutions in applying these principles in planning, implementing, and evaluating learning.

Here are the main principles of the STEAM curriculum according to the book:

a. Integration of Science

   Science is not learned fragmentarily. Each learning material should open up interconnected spaces between subjects, with an emphasis on cross-disciplinary thinking. Learning projects become a natural bridge to connect science, engineering, art, and values.

b. Contextual Problem Based

   STEAM-based learning begins with real problems experienced by students or their surroundings. This allows learning to be relevant and not abstract. Every project must be born from a concrete need or authentic question.

c. Collaborative and Participatory

Learning is no longer individualistic. STEAM encourages teamwork, discussion, collaborative problem solving, and collective decision making. Students learn from each other, and from teachers as facilitators, not just instructors.

d. Reflective and Humanistic

The learning process must provide space for deep thinking and connecting knowledge with life values. Reflection is an important part, where students are invited to realize the meaning and impact of the learning they do.

e. Inclusive of Local and Cultural Values

Not all projects have to be global or modern. In fact, simple projects that emerge from local cultural contexts are often more meaningful and down-to-earth. This book emphasizes the importance of utilizing local wisdom and religious values as an integral part of learning.

3.4 STEAM as Approach Value Based

The main strength of the STEAM approach in this book is the combination of cognitive and value dimensions. The STEAM curriculum is not only interpreted as a pedagogical strategy to deliver lesson content in an interesting way, but also as a way to build character and spirituality of students.

In the context of religious and culturally diverse Indonesian education, learning must touch all aspects of the human being: head, heart, and hands. The STEAM curriculum discussed in this book specifically emphasizes that learning must lead to character building— not just academic achievement. Therefore, values such as responsibility, honesty, social piety, and love for the environment are instilled not through lectures, but through students' direct involvement in projects that contain these values.

Each learning activity is designed to raise ethical questions: “Why is this important?”, “What impact does it have on others?”, “How does this relate to my religious teachings or the values of my society?”. In this way, students become not only technically ‘smart’, but also morally and socially.

3.5 Implementation of Values in Every STEAM Elements

In this book it is explained that each element in STEAM has potential value that can be integrated systematically. Learning projects are not enough to only develop students' technical abilities, but must be a medium to instill noble values.

The following are examples of relationships between STEAM elements, cognitive outcomes, values, and contextual implementation:

STEAM Components	Cognitive Objectives	Emphasized Values	Example Implementation Contextual
Science	Observation , analysis , experiment	Accuracy, contemplation, curiosity	Researching river water quality local
Technology	Application tools , programming	Benefit , efficiency	Making a water purifier from simple materials
Engineering	Design and construction	Creativity , responsibility answer	Design a mini bridge from wood or cardboard
Arts	Visual expression and presentation	Aesthetics , empathy , compassion	Designing environmental cleanliness campaign posters
Mathematics	Calculation , modeling , graphing	Logic, precision , calculation	Count estimate need material project

Table 1. Relationship between STEAM Elements and Islamic Educational Values.

3.6 The Role of Teachers in Value-Based STEAM Curriculum

This book emphasizes that teachers are no longer the only center of information. The role of teachers in the STEAM curriculum shifts to being learning designers, exploration facilitators, and value sowers. Teachers do not only teach content, but create a learning ecosystem that allows students to actively explore, discuss, create, and reflect.

For this reason, teachers need to have broader competencies, including:

a. Meaningful and locally relevant project planning
b. Ability to build collaboration with other teachers across subjects
c. Sensitivity to value issues, in order to be able to guide students in reflective and ethical learning.
d. Innovative in using simple media and tools that are appropriate to the school context
    i. Evaluation in this approach also places more emphasis on authentic assessment, such as:
e. Process assessment (observation and participation),
f. Product assessment (project results),
g. Reflective assessment (student journal),
h. Social assessment (teamwork and contribution).

3.7 STEAM Curriculum Approaches and Strategies

In implementing a STEAM-based curriculum, the approach used cannot be separated from the principles of flexibility, meaningfulness, and cultural values that surround students. The STEAM-Based Curriculum Book consistently emphasizes that learning should not only be oriented towards cognitive outcomes, but should also facilitate the formation of cross-disciplinary understanding, social awareness, and spiritual maturity. Therefore, the STEAM implementation strategy must be built through an approach that not only touches on the technical aspects of education, but also philosophical and contextual.

The implementation of the STEAM curriculum needs to be seen as a gradual, dynamic, and reflective process. This means that the implementation strategy does not have to be uniform, but must be adjusted to the conditions, potential, and culture of each educational unit. This makes the STEAM curriculum not just a model that is "applied," but an approach that is "brought to life" contextually. The following subsections explain the main approaches and strategies offered by the book in detail.

3.8 Approach Holistic and Interdisciplinary

A holistic approach in the context of STEAM means seeing students as whole human beings—not just as information processors, but as beings who think, feel, interact, and have values. Therefore, the learning process is not enough if it only conveys separate knowledge between subjects. Learning must integrate all aspects of science with real life, and relate it to values, meaning, and social responsibility.

Interdisciplinary integration in this approach is not merely combining several subjects in one theme, but more than that, it is a comprehensive way of thinking. Students are not invited to understand science partially, but rather systemically. For example, when studying the topic "Floods and the Environment," students not only learn the water cycle from a science perspective, but also calculate rainfall and water flow (mathematics), create simple solutions such as mini dams (engineering), design educational posters (art), and discuss Islamic values about nature conservation.

This approach requires close collaboration between teachers from different subjects. Teachers no longer work alone, but together design projects or learning units across fields. This is where the importance of building a collaborative culture and mutual learning among teachers, including through thematic learning planning, cross-subject evaluation, and joint reflection, lies.

3.8 Learning Based on Project (Project-Based Learning)

The learning model that is the backbone of the STEAM approach as detailed in this book is project-based learning. This model allows students to experience the learning process actively, collaboratively, and contextually. Students do not only solve problems in books, but also compile, work on, and present real projects that have an impact on the surrounding environment.

In this model, projects are designed from challenging, open-ended trigger questions, such as: "What are the solutions to overcome drought in our area?", or "How to make an earthquake-friendly house from recycled materials?" These questions trigger exploration, discussion, experimentation, and decision-making based on data and values.

Characteristics of STEAM projects:

a. Starting from real problems in the environment around students
b. Combines at least two STEAM elements
c. Contains messages of values (social, spiritual, cultural)
d. Encourage collaborative and reflective work

To support a more applicable understanding, the *STEAM-Based Curriculum book* presents a number of examples of thematic projects that integrate various STEAM elements with educational values. These projects are designed to foster students' critical thinking skills, creativity, and social awareness, while encouraging their active involvement in solving real problems in the surrounding environment. Each project not only contains academic content, but is also full of meaning and ethical messages that can strengthen students' characters. Some examples of recommended project themes can be seen below:

Project Theme	STEAM Elements Involved	Reinforced Values	Example Final Product
Clean water For All	Science, Engineering, Mathematics	Trust, conservation , justice social	Simple filter tool, water test report
Anti -Waste Campaign Plastic	Art, Technology , Language	Responsibility, ihsan, environmental etiquette	Digital posters, educational videos, creative podcasts
Earthquake Friendly House	Engineering, Science, Mathematics	Social empathy, safety, caring for others	Miniature earthquake resistant house, structure presentation
Hydroponic Garden	Biology , Engineering, Mathematics , Economics	Independence , usefulness , mutual cooperation	Mini hydroponic system, harvest yield calculation

Table 1. Examples of STEAM Project Themes in Values-Based Curriculum.

One of the strengths of this model is the ability to foster learning ownership or ownership of the learning process. Students feel that the knowledge they learn is not just a curriculum requirement, but part of real life that they must face and solve.

3.9 Contextualization Strategy Curriculum

One of the main emphases in this book is the importance of contextualization, which is the process of structuring learning based on local social, environmental, economic, and cultural conditions. A good curriculum is not the most sophisticated or complex, but the one that best suits the needs and realities of the learners. The contextualization process includes:

a. Adaptation of project themes to local realities
b. Selection of affordable and available materials and tools
c. Emphasis on culture and local wisdom in discussions and practices
    a. Example of contextualization:

d. In schools near mining areas, the project could be themed "The Impact of Mining Waste on Public Health."
e. In Islamic boarding schools, the project could examine "Environmentally Friendly Ablution Wastewater Disposal System."
f. In coastal areas, students can make models of breakwaters from local materials as a form of abrasion mitigation.

This strategy ensures that learning does not float, but is down to earth, integrated with the students' lives, and strengthens their love for their own environment.

3.10Reflective and Value-Based Approach

The STEAM approach as formulated in the STEAM-Based Curriculum book not only emphasizes the integration of disciplines, but also prioritizes reflective and value-based learning. This means that learning does not stop at achieving skills and knowledge, but must bring students to understand the meaning, feel the impact, and internalize the life values of what they have learned and done.

Reflective learning is a process in which students are given the opportunity to review their learning experiences, both personally and collectively. This process is important because it provides space for students to realize the changes in attitudes, ways of thinking, and values that they experience during the learning process. Reflection is not only done at the end of the project, but should be inserted gradually in each stage of learning. Some reflective strategies that can be applied include:

a. Write a personal journal about the project process, challenges faced, and values discovered during the learning journey.
b. Develop reflective presentations, where students not only showcase the final product of the project, but also share the process and learning they experienced.
c. Open group discussions facilitated by the teacher to explore students' understanding of contribution, dynamics of cooperation, and social values such as empathy, tolerance, or responsibility.

Through this reflective approach, values such as trustworthiness, honesty, fairness, or concern for others are not taught verbally or dogmatically, but grow naturally through the emotional and social involvement of students in their learning experiences. In the context of Islamic education, this approach is very much in line with the principle of tarbiyah, namely the formation of character through a continuous and meaningful internalization process.

3.11Implementation Strategy Gradual and Adaptive

Adopting a STEAM-based curriculum comprehensively is not an easy task. Many schools face obstacles in the early stages, ranging from limited human resources, facilities, to concerns about incompatibility with the applicable curriculum. Therefore, this book recommends a gradual, flexible, and adaptive implementation strategy, so that the transition process to STEAM-based learning can take place naturally and sustainably.

The phased implementation strategy begins with building teacher awareness and readiness for STEAM concepts and practices. Internal training, collaborative workshops, and good practice studies are important first steps. Teachers are not required to master all aspects of STEAM right away, but can start with a simple project involving two subjects or one thematic unit. Suggested implementation stages include:

a. Phase Exploration

Start with a small thematic project in one subject, such as Science or Arts, to introduce students to the concept of projects and exploration.

b. Collaboration Phase

Increasing integration by combining two or three teachers from different fields. Projects are designed together, for example between Science, Mathematics, and Islamic Religious Education, which discuss environmental or energy themes.

c. Integrative Phase

Develop a full cross-disciplinary project, involving all elements of STEAM in one big theme that is worked on over several weeks or a semester.

d. Reflection and Revision Phase

Each project cycle ends with a comprehensive evaluation, both in terms of planning, implementation process, and value achievement. The results of the reflection are used to develop improvement strategies for the next project.

3.12 School Management and Environment Support

The success of STEAM curriculum implementation does not solely depend on teacher capacity or student enthusiasm, but is largely determined by systemic support from school management. The principal, curriculum team, and foundation have strategic roles in creating an ecosystem that encourages collaboration, innovation, and sustainability in STEAM-based learning practices.

This book emphasizes the importance of instructional leadership in school management. The ideal principal is not only an administrator, but also a primary facilitator in the curriculum innovation process. Some crucial forms of managerial support include:

a. Provide collaborative time and space between teachers. This includes dedicated weekly scheduling for cross-subject project planning.
b. Integrate projects into the school academic calendar, so that they are not additional or incidental, but rather part of core activities.
c. Facilitate documentation of learning, such as galleries of student work, digital portfolios, or exhibitions of community-engaged projects.

In addition, the school environment also needs to be designed in such a way as to encourage exploration and creativity. This does not always have to mean sophisticated infrastructure. The learning environment can be built through:

a. Exploration zone in the yard or classroom for simple experiments.
b. Art or expression corner to support the arts side of STEAM.
c. Access to digital devices, although limited, is used wisely and in a targeted manner.

Equally important is the school's partnership with external parties, such as local communities, businesses, education departments, or even parents. This collaboration can help bring real-world context into the classroom, open up access to resources, and foster a spirit of mutual cooperation as a living culture of innovation.

3.13 Challenge Implementation STEAM Curriculum

Although the STEAM curriculum approach promises relevant, meaningful, and 21st-century learning, in practice not all educational units are able to adopt this approach easily. The STEAM curriculum is not an instructional package that can be applied instantly, but rather requires readiness in terms of paradigms, school culture, teacher abilities, and comprehensive support systems. The STEAM-Based Curriculum Book acknowledges that in the reality of education in Indonesia, there are various challenges that must be mapped and solutions sought strategically and contextually.

These challenges are not meant to dampen the spirit of innovation, but rather as part of a reflective and realistic effort so that the learning transformation process can be carried out adaptively and sustainably. With a deep understanding of the existing obstacles, educational institutions can design appropriate mitigation strategies that are in accordance with their capacity.

The following is a description of the six main challenges in implementing the STEAM curriculum, accompanied by an explanation of the root of the problem and strategic solutions as recommended in the book.

3.14 Limitations of Teacher Competence in Integrated Learning

Teachers are the main actors in learning. However, in the context of implementing the STEAM curriculum, many teachers are still confused in understanding and designing cross-disciplinary learning. This is because the educational background of teachers is generally formed within a rigid and specialized subject framework. As a result, the interdisciplinary approach as required in STEAM is often considered difficult and confusing.

In addition, the STEAM approach requires teachers to be able to design project-based learning, which means facilitating open, collaborative, and problematic learning activities. Teachers must change their role from "content deliverers" to "facilitators of the learning process," a transition that is not easy to do without guidance. Strategic solutions offered include:

a. Teacher training that is not only theory-based, but also based on direct practice and project simulations.
b. Encourage collaboration among teachers in designing and implementing cross-subject projects.
c. Providing space for teachers to experiment with curriculum without burdensome administrative pressures.

3.15 Lack of Contextual Teaching Materials and Learning Resources

The STEAM curriculum requires teaching materials designed to integrate various disciplines in a contextual project. However, the reality on the ground shows that most teaching materials in schools are still based on single subjects. Available textbooks do not facilitate exploratory, reflective, and cross-theme learning. Teachers often have to find additional relevant materials themselves, and not all have access or time to do so.

Moreover, the STEAM approach demands learning resources that are not only text-based, but also visual media, practical materials, and digital instruments. In many schools, especially in remote areas, access to these resources is still very limited. Strategic solutions include:

a. Development of project-based teaching modules compiled by a team of teachers internally, using local resources.
b. The use of an ethnopedagogical approach, namely developing learning content from the social and cultural realities of the local community.
c. Encourage partnerships between schools or educational communities to share digital open resources (open source/open content).

3.16Fear of Loss of Value Identity in the Curriculum

This challenge is often found in religious or value-based educational institutions. The STEAM approach originating from the West is often suspected of carrying the agenda of secularizing education, or is considered to shift the orientation of education from values to purely technical skills. Such concerns create cultural resistance to new approaches that are considered "foreign".

In addition, technical terms in the STEAM approach such as "engineering design process" or "scientific inquiry" are considered not easily approachable by religious teachers or teachers without a

science background. As a result, cross-disciplinary collaboration—especially between science and religion—is limited. Suggested strategic solutions include:

a. Emphasizing that STEAM in a contextual approach is not just about technology, but about building an understanding of the world that is in line with Islamic values such as monotheism, trustworthiness, and maslahat.
b. Developing STEAM narratives with local religious and cultural frames, for example through project themes that are based on Islamic ethics, such as waste management as a form of environmental mandate.
c. Develop a guide to value integration in STEAM projects so that teachers can understand how spiritual and social values are included in each activity.

3.17 Limited Supporting Facilities and Infrastructure

The implementation of STEAM-based projects is ideally supported by the availability of tools, laboratories, digital devices, and collaborative spaces. However, many schools, especially in 3T (disadvantaged, frontier, and outermost) areas, do not have these facilities. Even for simple projects, schools must find or make their own practical tools from used goods or available materials.

This difficulty makes many teachers give up before trying. There is a perception that STEAM is only suitable for large or urban schools that have full financial and technological support. Strategic solutions include:

a. Encourage low-tech or low-cost STEAM models, namely projects that utilize local materials or recycled goods for learning activities.
b. Simple tool design training to support scientific experiments and engineering skills.
c. Collaborate with local communities, universities, or businesses to develop resource sharing.

3.18 Absence of Relevant and Authentic Assessment System

One aspect that is often overlooked in learning innovation is the evaluation system. Many teachers find it difficult to assess project results because there is no appropriate assessment format. The existing assessment system is still very focused on the final result in the form of numbers, not the thinking process, collaboration, and values that students learn.

The STEAM approach demands assessments that are qualitative, process-oriented, and allow for reflection and metacognition. However, such assessment mechanisms are not yet part of the school's broader quality assurance system. Strategic solutions include:

a. Preparation of authentic assessment instruments such as project assessment rubrics, reflection journals, group portfolios, and presentation evaluations.
b. Train teachers to develop process-based and collaborative assessment indicators.

Involving students in self-assessment and peer-assessment as part of democratic learning.

4 CONCLUSION

The implementation of STEAM (Science, Technology, Engineering, Arts, and Mathematics) based curriculum in the context of Indonesian education, especially Islamic education, presents a great opportunity to realize more complete, contextual, and character-oriented learning. The STEAM curriculum as formulated in the book STEAM-Based Curriculum: Preparing the Future Generation not only focuses on mastering science and technology content, but also emphasizes the importance of spiritual, cultural, and social values as the foundation of education. This approach allows students to become not only academically capable individuals, but also morally and socially whole.

Conceptually, the STEAM curriculum in this book is built on the principles of interdisciplinary integration, project-based learning, meaningful reflection, and strengthening local values. STEAM

elements are not only studied as separate domains, but are synergized in contextual projects that require students to think critically, work together, and solve real problems around them. Through this approach, learning activities become more relevant, rooted in social reality, and useful in the long term.

In terms of implementation, the STEAM curriculum strategy emphasizes a gradual and adaptive process. Starting from simple projects, cross-subject collaboration, to full integration with the support of school management. Learning is directed to not only produce cognitive products, but also form awareness of values, social responsibility, and ecological concern. Strengthening the reflective approach becomes an important space to internalize values and build students' character naturally and without being patronizing.

However, the implementation of the STEAM curriculum is not without challenges. Some of the obstacles that arise include limited teacher competence in interdisciplinary approaches, minimal contextual and valuable learning resources, concerns about the loss of Islamic education identity, limited facilities, and the unavailability of an assessment system that supports project-based learning. However, each of these challenges is not an absolute barrier, but rather an entry point for innovation if responded to collaboratively and contextually.

Thus, it can be concluded that the value-based STEAM curriculum has great potential in transforming Indonesian education towards a more relevant, participatory, and meaningful direction. This curriculum not only answers the demands of the times, but also integrates with the noble values of Islamic education that uphold monotheism, manners, and social responsibility. For this reason, a joint commitment is needed from all elements of the school—teachers, management, students, and the community—to make the STEAM approach a learning path that is not only intelligent, but also humane.

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