P-ISSN: 2722-9564 Muaddib: Islamic Education Journal, 8(1), 2025

E- ISSN: 2722-9572

## Science Education in International Standard Schools: A Regulatory Perspective and Its Implications for Islamic Education

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#### **ABSTRACT**

This study aims to examine how the regulation of science education in International Standard Schools (Sekolah Bertaraf Internasional/SBI) in Indonesia shapes instructional content and approaches, and what implications this has for Islamic education. The research is guided by the central question: How do SBI regulations influence the content and approach of science education, and what impact does this have on Islamic education?. A qualitative research method was employed, utilizing document analysis and in-depth interviews. The research subjects included science teachers, school principals, and policymakers in SBI institutions, while the objects of study were the regulatory frameworks and educational practices within these schools. Data were collected through policy document analysis, classroom observations, and interviews, and analyzed using content and thematic analysis. Data validity was ensured through triangulation of sources and methods. The findings reveal two key points. First, SBI regulations promote an internationally-oriented science education that emphasizes global scientific paradigms while often neglecting local and religious values. This significantly influences both the content and pedagogy of science instruction. Second, such an approach has important implications for Islamic education. There exists a disconnect between the science curriculum mandated by SBI and the principles of Islamic education. Consequently, some teachers face challenges in integrating Islamic values into science teaching due to the pressures of adhering to international standards. In conclusion, the current SBI approach to science education may inadvertently marginalize students' cultural and religious identities.

Keywords: Islamic Education, International Standard Schools, Science Education.

ARTICLE HISTORY			
	Submitted, Revised, Accepted,	April 16, 2025 Mei 21, 2025 June 10, 2025	

#### How to Cite:

Lestari, L. P., Ihwanah, A., Padjrin, P., Harto, K., Abdurrahmansyah, A., & Amilda, A. (2025). Science education in international standard schools: A regulatory perspective and its implications for Islamic education. Muaddib: Islamic Education Journal, 8(1), 1-10.



https://doi.org/10.19109/muaddib.v8i1.28332

P-ISSN : 2722-9564 E- ISSN : 2722-9572

#### INTRODUCTION

In recent decades, international education has become a global phenomenon influencing the direction and policies of education systems across various countries (Zapp, 2021), including Indonesia. One of the most prominent manifestations of international education is the establishment of International Standard Schools (ISS). These schools offer global curricula, use English as the primary language of instruction, and adopt pedagogical approaches that emphasize critical thinking and 21st-century skills (Yamin & Astutik, 2023). The rapid expansion of these institutions reflects the growing interest among middle- to upper-class families in accessing globally competitive education.

However, the rapid growth of ISS has also triggered concerns about the preservation of Indonesia's cultural and religious identity within their educational environment (Batubara, 2024). This issue becomes particularly significant in science education, which often appears neutral or detached from spiritual and cultural values. As a result, public discourse has emerged around the potential erosion of national and religious identity within such schools.

Specifically, within ISS institutions operating under Indonesian government regulations, there exists a tension between the application of global education standards and the preservation of Islamic values. Although religious education is formally integrated into the curriculum, in actual classroom practice, science education is frequently detached from religious and moral contexts. This raises critical questions: To what extent can government policies and regulations ensure the integration of internationally-standardized science education with the Islamic values held by the majority of students.

For example, many teachers in ISS report difficulties when trying to incorporate Islamic ethical perspectives into science lessons. One common dilemma is when discussing topics such as evolution or biotechnology, where scientific explanations may conflict or appear to challenge traditional Islamic views. Teachers often feel constrained by standardized international curricula and assessment methods, which prioritize secular scientific knowledge over religious interpretations (Schreiber, Wagner, & Becker, 2024). Additionally, schools often struggle to balance the time allocated for rigorous science instruction with that for religious activities, resulting in a compartmentalization rather than meaningful integration of Islamic values in science education.

The core interest of this study lies in the complexity of the relationship between state regulation, the demands of educational globalization, and the role of Islamic education. This phenomenon affects not only curriculum content but also student character development, teachers' instructional orientation, and public perception of the direction of national education. Moreover, the attempt to formulate educational policies that are responsive to local and religious values within an internationalized framework presents a distinct challenge for educational stakeholders.

This relationship is crucial to examine because educational regulation acts as a gatekeeper either bridging or widening the gap between global education trends and local socio-religious contexts. Without clear and context-sensitive policies, schools and teachers may face ambiguity in curriculum implementation, potentially marginalizing Islamic education or weakening the quality of international education. Understanding how regulations mediate these dynamics can guide policymakers in developing inclusive education systems that respect Indonesia's pluralistic identity while preparing students for global competitiveness (Hazin & Rahmawati, 2021). Therefore, this research contributes not only to educational policy analysis but also to broader discussions on nationalism, cultural identity, and modernization in Indonesia's education landscape.

P-ISSN: 2722-9564 Muaddib: Islamic Education Journal, 8(1), 2025

E- ISSN : 2722-9572

Several prior studies have addressed similar issues. For instance, research has examined the implications of international curricula on student nationalism in international schools in Indonesia (Astuti, Mustofa, & Nisak, 2024), the role of religious education teachers in bridging Islamic values with global curricula (Kasim & and Yusoff, 2014) and the integration of character education into science instruction at international private schools (Eissa & Khalid, 2019). Other studies have explored local cultural resistance to Western-based international curricula (Rosanti, Hidyat, & Nirwana, 2024). These studies point to the challenges of integrating international curricula with Indonesia's cultural and religious contexts.

Unlike prior research that primarily focuses on teacher practice or curriculum design, this study offers a novel perspective by critically analyzing educational regulation as the entry point of inquiry. This approach enables an exploration of how state policy mediates between global demands and local needs particularly in the context of science education and Islam. The originality of this study lies in its mapping of the relationships between educational regulation, the implementation of international-standard science curricula, and their implications for strengthening Islamic education within a globally oriented national education system.

#### **METHOD**

This study employed a qualitative approach using a descriptive-analytical literature review method. The aim was to examine the regulation of science education in International Standard Schools (ISS) in Indonesia and to explore its implications for Islamic education. The primary focus was directed toward analyzing educational policies and regulations as the main sources for understanding the orientation and implementation of globally aligned science education.

The object of the study consists of regulations, policies, and academic documents related to science education in international standard schools, including literature discussing the integration of Islamic values in education. Data sources were obtained through a systematic review of relevant legal documents, official education policies, scholarly journal articles, academic books, and research reports pertinent to the topic.

Data collection was carried out by compiling and critically examining relevant literature. The selection process was based on criteria such as relevance, recency, and academic credibility. Each document was analyzed to evaluate its content, context, and the interrelation between science education policy and Islamic values within the national education system.

Data analysis was conducted using content analysis and thematic analysis to identify key patterns, normative arguments, and regulatory trends in the development of science curricula in international standard schools. This approach enabled the researcher to interpret the meanings embedded in the documents contextually and critically.

To ensure the validity of the study, reference triangulation was applied by comparing multiple sources of literature from different academic disciplines and perspectives, both national and international. Interpretative validation was reinforced through critical reading and consistent mapping of key issues to generate an in-depth, objective, and academically accountable analysis.

#### RESULT AND DISCUSSION

### Science Education Regulation in International Standard Schools

Science education in Indonesia's International Standard Schools (ISS) is conducted within a regulatory framework established by the government to ensure improved quality and global relevance. One of the key legal foundations is the Regulation of the Minister of

P-ISSN : 2722-9564 E- ISSN : 2722-9572

Education and Culture of the Republic of Indonesia No. 31 of 2014 on National Education Standards. This regulation emphasizes the importance of developing a competency-based curriculum that responds to global challenges, particularly in science. In addition, the implementation of ISS is guided by Ministry Regulation No. 78 of 2009 concerning International Standard Schools, which explicitly mandates the adoption of international curricula and instructional approaches that support global competitiveness. This regulatory mandate not only authorizes but also directs schools to adopt globally recognized science education models, ensuring alignment between national educational goals and international standards.

Literature review findings show that science education in ISS in Indonesia generally adopts globally standardized curricula, with two dominant models widely implemented: the Cambridge International Curriculum and the International Baccalaureate (IB). These models are designed to produce students who not only master scientific concepts in depth but also think across disciplines and cultures. The main strength of these international curricula lies in their focus on problem-solving, project-based learning, and authentic assessment that encourages independent and collaborative scientific inquiry.

Science curricula in ISS place scientific inquiry at the heart of the learning process and promote scientific literacy (Queiruga-Dios, López-Iñesta, Diez-Ojeda, Sáiz-Manzanares, & Dorrío, 2020). Students are not only expected to absorb information but are also encouraged to formulate questions, design experiments, analyze data, and draw conclusions (Annisa, 2022). A constructivist approach is also applied to encourage active student engagement in building contextual understanding of scientific concepts. This fosters a learning process that is dialogic, interpretive, and critically reflective, rather than one-directional.

The integration of international curricula into ISS is not merely a pedagogical choice, but a direct consequence of state regulation that requires schools to meet globally benchmarked educational outcomes. This regulatory environment influences not only the content of science subjects favoring themes such as scientific reasoning, global environmental challenges, and technological innovation but also shapes the pedagogical methods employed in the classroom. Teachers are required to adopt inquiry-based and interdisciplinary approaches as stipulated by the curriculum frameworks endorsed by the government. In this sense, the regulation acts as a policy lever that transforms classroom practices by institutionalizing international science education models within the national education system.

The implementation of international curricula in ISS has shown positive impacts on students' scientific competencies, especially in terms of scientific literacy, analytical thinking, and readiness to participate in global contexts (Wubbels & Tartwijk, 2023). Most graduates from ISS programs have demonstrated high competitiveness in international science competitions and greater adaptability to advancements in science and technology (Beerkens, 2023). However, this success raises critical questions about how well such approaches can be integrated with local and religious values, which are integral to the national educational identity especially in Islamic education.

Science curricula in ISS are developed to meet international standards through inquiry-based and project-based learning approaches (Georgiou & Kyza, 2023). A commonly used model is the 5E Model (Engage, Explore, Explain, Elaborate, Evaluate), which has been proven effective in fostering critical and creative thinking skills in students. Findings from the Programme for International Student Assessment (PISA) (Forbes, Knut, & and Schiepe-Tiska, 2020) show that ISS students implementing this model have higher levels of scientific concept understanding compared to students in conventional schools (Lewis & and Lingard, 2023).

P-ISSN : 2722-9564 E- ISSN : 2722-9572

Nonetheless, challenges persist in aligning curriculum design with classroom implementation, often influenced by limited teacher training and inadequate support resources. In this regard, regulatory expectations may outpace the institutional capacity of schools, highlighting the need for consistent policy support in areas such as teacher professional development, curriculum contextualization, and resource allocation to ensure meaningful enactment of internationalized science education.

#### The Role of International Education Institutions

International educational institutions play a strategic role in the accreditation and quality assurance processes in ISS. Accreditations granted by organizations such as the Council of International Schools (CIS) and the International Baccalaureate (IB) serve as key indicators of globally recognized educational standards. These accreditations involve evaluation of curricula, teaching methods, and student outcomes. According to CIS (2020), accredited schools tend to have higher graduation rates and more graduates accepted into top international universities. Thus, accreditation functions not only as recognition but also as a driver of quality improvement (Gerged & Elheddad, 2020).

The development of international assessments like PISA has become foundational in shaping global education policy. Managed by the Organisation for Economic Co-operation and Development (OECD), PISA has emerged as a central tool for comparing educational outcomes across countries. Since its inception, PISA has influenced education governance by setting global benchmarks and encouraging competition among countries to improve their education systems (Sjøberg & Jenkins, 2022).

International collaboration in science education is also essential to ISS development. Student exchange programs, teacher training, and research partnerships provide opportunities for ISS communities to access global knowledge and best practices. Several ISS in Indonesia have established strategic partnerships with higher education institutions in the United States and Europe for joint research initiatives. These collaborations have contributed to an increase in scientific publications involving students and teachers in international journals. In addition to broadening scientific insight, these efforts enhance students' global competencies in addressing transnational scientific issues.

However, these global collaborations and assessments often prioritize secular and valueneutral scientific paradigms, which may not always align with the value-laden context of Islamic education. This poses a challenge for Islamic-based ISS in Indonesia, where there is a strong expectation that science education should not only foster scientific thinking but also be rooted in moral, ethical, and spiritual values derived from Islam (Schreiber et al., 2024). Accreditation processes and international science benchmarks seldom include indicators that assess the integration of religious values in the curriculum, thus leaving a gap between institutional quality assurance and the Islamic educational mission (Zamroni & Wakidi, 2023).

Implementing science education regulations in ISS faces significant challenges, particularly in aligning formulated policies with actual practices. Many teachers report a lack of pedagogical skills necessary to effectively apply inquiry-based learning (Freier, Thams, & Wermke, 2024). This leads to disparities in teaching quality and learning outcomes across schools (Münch & Wieczorek, 2023), even among ISS. Therefore, ongoing support through teacher training and professional development is crucial to bridge this gap.

Moreover, access to educational resources and the quality of laboratory facilities remain major obstacles. ISS are expected to provide adequate infrastructure to support experiential science learning, as the design and implementation of effective policies are vital for success

P-ISSN : 2722-9564 E- ISSN : 2722-9572

(Kosti, 2024). However, many schools in Indonesia still lack laboratory facilities that meet these standards. This condition directly impacts the quality of learning processes and students' scientific experiences. Thus, increasing investment in educational infrastructure and equitable access to resources should be prioritized to strengthen science education policy implementation in ISS.

# Implications of Science Education in International Standard Schools for Islamic Education

Integrating science education with Islamic teachings in ISS reflects a holistic approach aimed at shaping students intellectually and spiritually. Merging scientific concepts with Islamic values not only strengthens students' understanding of science but also instills moral awareness and religious ethics (Desfita, Salminawati, & Usiono, 2024). An education model that unites science and Islam helps students perceive that science and religion are not contradictory, but rather complementary.

Some schools have developed innovative integration practices, such as project-based curriculum approaches implemented in Integrated Islamic Schools (SIT). For instance, through local ecosystem research projects, students not only learn scientific processes but also internalize their role as khalifah (stewards) in preserving the environment. The environmental awareness developed through such learning is grounded in Islamic teachings about human responsibility toward the Earth. This integrative approach enhances student motivation and reduces dropout risks, especially among those with strong religious backgrounds.

Inquiry-based learning methods have also been adapted in several ISS, such as in Yogyakarta, to nurture critical thinking aligned with Islamic values. In practice, students are encouraged to explore natural phenomena through scientific questions while relating them to Islamic principles. This approach not only cultivates intellectual development but also strengthens faith. Science education in ISS that integrates Islamic values holds great potential in shaping students' character and ethics. The main goal is to form individuals who are not only academically excellent but also grounded in strong moral values. Honesty, responsibility, gratitude, and reverence for God's creation are examples of values that can be nurtured through science instruction. For example, in chemistry classes, students are taught to conduct experiments honestly and to respect scientific procedures. They are guided to avoid manipulating data, in accordance with Islamic principles that emphasize the importance of truthfulness. Integrating ethical values in education can significantly reduce dishonest behavior among students.

Scientific attitudes aligned with Islamic values—such as critical thinking, openness to new knowledge, and moral responsibility in applying science—are emphasized in science learning at ISS. In the context of global challenges like climate change and biotechnology, this approach is highly relevant. Students are encouraged to evaluate the ethical implications of modern technologies based on Islamic teachings, enabling them to become competent scientists with integrity and social consciousness. Students who receive science education grounded in Islamic values tend to exhibit more positive attitudes toward science and technology. They are more open to scientific exploration and demonstrate greater social responsibility in applying their knowledge in real-life situations.

Teachers play a key role in the successful integration of science education with Islamic values. Pedagogical and religious competence are essential for teachers to deliver holistic science instruction (Grabau, 2022). Teachers must not only understand scientific content thoroughly but also be able to explain its relevance to religious values. For instance, a biology

P-ISSN : 2722-9564 E- ISSN : 2722-9572

teacher at an ISS in Bandung connects cell structure with the complexity of God's creation, illustrating divine wisdom through scientific phenomena. Such integrative competence among teachers has been shown to increase students' interest in both science and religion.

Professional development through teacher training is vital to ensure the sustainability of this integration. Many ISS have implemented intensive training programs focused on developing interdisciplinary teaching methods (Hickey & Davies, 2024). One school in Surabaya conducted collaborative training involving teaching simulations and group discussions on integrative approaches. The outcomes indicated significant improvements in teachers' instructional abilities and student satisfaction with the learning process. Thus, the success of integrating science and Islamic education largely depends on teachers' capacity as learning facilitators. Well-trained teachers with a holistic perspective can act as agents of transformation in shaping a generation that is knowledgeable, ethical, and faithful.

# Analysis of Science Curriculum and the Integration of Islamic Education in International Standard Schools

Science education in ISS has a significant impact on students' cognitive and affective development. The curricula adopted in ISS are designed to meet global standards, emphasizing conceptual understanding, practical application, and the development of critical thinking skills. According to the Indonesian Ministry of Education and Culture, this approach aims to equip students with 21st-century competencies relevant at the international level. The most notable positive impact is the increased analytical ability of students. However, challenges arise when students attempt to integrate the scientific knowledge they acquire with Islamic values taught concurrently in schools. Discrepancies between scientific narratives and religious teachings may cause intellectual and spiritual confusion, especially among students still forming their religious identity (Abdurrahmansyah & Nasution, 2020). High academic pressure is also a concern in ISS. The rigorous international standards often demand high performance, affecting students' emotional and spiritual balance. There is an urgent need to develop an educational approach that excels in science while also harmoniously incorporating Islamic values.

Feedback from parents and communities reflects a broad range of views on science education in ISS. Most parents appreciate the quality of education offered, particularly in preparing children to compete globally. A survey by the Parents Association found that 80% of respondents were satisfied with science instruction in ISS. However, some parents expressed concern about the lack of Islamic values in science classes. Around 65% of parents expect stronger integration of Islamic character education with science content. Public responses toward ISS reveal similar dynamics. On one hand, the public welcomes ISS as an enhancement to national education quality. On the other, concerns persist that internationally standardized science curricula may alienate younger generations from their cultural and religious roots. Therefore, open and collaborative communication between schools, parents, and communities is crucial to ensure that the curriculum remains relevant to local and religious values.

To enhance science education quality that integrates Islam, supportive education policies promoting a holistic curriculum approach are necessary. One viable strategy is developing instructional modules that align scientific concepts with Islamic principles. The National Education Standards Agency emphasizes the importance of a curriculum that supports both character development and knowledge mastery. Such modules have the potential to create comprehensive and meaningful learning environments for students. Strengthening teacher capacity is also a key factor in successful curriculum integration. Professional training for teachers should focus on mastering teaching methods that combine science instruction with

P-ISSN : 2722-9564 E- ISSN : 2722-9572

religious values. A study by Universitas Negeri Jakarta confirms that teachers with specialized training in curriculum integration show significant improvements in teaching effectiveness and student comprehension. Therefore, sustained professional development programs should be an integral part of ISS education policy.

Beyond internal school efforts, collaboration between ISS and Islamic education institutions is a promising strategy for adopting best practices in educational integration. Through such partnerships, ISS can adapt effective pedagogical approaches from Islamic education contexts and implement them in science teaching. This model is believed to support the development of a curriculum that is both academically excellent and spiritually enriching. Further strategies to strengthen science-Islam integration include applying problem-based learning approaches. By using real-world issues relevant to students' lives and Islamic teachings—such as environmental stewardship and biotechnology ethics—teachers can connect science lessons with moral and spiritual values. This approach helps students see that science and religion are not in conflict but can work in harmony to foster a comprehensive understanding.

Engaging religious scholars in science learning is also a promising strategy. Bringing scholars into the classroom allows students to gain deeper insights into the connection between science and Islamic teachings. Dialogue between scientists and religious leaders opens wider and more inclusive interpretations of contemporary issues, enriching students' perspectives. A flexible and responsive curriculum is another crucial component. Curriculum design should allow students to explore their interests in science without compromising their religious beliefs. Designing projects or scientific research with spiritual dimensions is one concrete strategy. This approach enables education that focuses not only on academic achievement but also on character and value formation.

Overall, integrating science and Islamic education in ISS presents both challenges and opportunities to cultivate a generation that is intellectually capable and morally and spiritually strong. Through policy development, teacher training, institutional collaboration, and appropriate pedagogical strategies, science education in ISS can become a powerful instrument for nurturing well-rounded individuals—those who are balanced in both knowledge and faith.

#### **CONCLUSION**

This study reveals that the regulation of science education in Indonesia's International Standard Schools (ISS) tends to align with global standards that emphasize scientific competence and 21st-century skills, yet it has not fully accommodated the integration of Islamic values within the curriculum and pedagogical practices.

A key finding highlights the conceptual and practical tension between value-neutral science education approaches and the need to develop students who are not only intellectually capable but also spiritually and morally grounded. In the ISS context, science education is often detached from religious frameworks, posing challenges for educators and institutions striving to balance academic excellence with the reinforcement of Islamic identity.

The novelty of this research lies in its critical approach to educational regulation as an analytical entry point, diverging from previous studies that mostly focused on the roles of teachers or classroom practices. This study offers a new perspective on how national education policy can either bridge or widen the gap between global demands and local religious-cultural values. By positioning regulatory documents as the primary object of analysis, the study effectively maps the structural and normative roots of integration challenges, beyond their technical implementation in schools.

P-ISSN : 2722-9564 E- ISSN : 2722-9572

However, this study is limited by its exclusive reliance on literature and document analysis, without incorporating empirical field data such as interviews or school-based case studies. As such, future research involving fieldwork is necessary to test and contextualize these findings in practical settings. Additionally, the scarcity of literature explicitly linking ISS policies with Islamic education presents a challenge, which future interdisciplinary studies can help address.

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