Enhancing Primary Education in Indonesia: Integrated Learning Policies And Artificial Intelligence Utilization

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Abstract : *Primary schools have a central role in the formation of young individuals and set an important foundation for their progress in the educational process. One of the main approaches in the elementary school context is integrated learning. This approach provides students with the opportunity to learn through themes that integrate various scientific disciplines in one learning series. Recent changes in primary school policy in Indonesia have raised concerns regarding teachers' understanding and implementation of these practices. This article outlines the concept and urgency of a deep understanding of integrated learning, which includes its four main strengths: active student involvement, holistic approach, authenticity, and meaningfulness in learning. This also explains the potential of integrated learning as a scientific background for teachers at the elementary school level. Even though education policies are constantly changing, this article emphasizes the importance of maintaining the continuity of integrated learning. Government policy support is key. This article also discusses the management of AI support as a solution to the challenges of implementing integrated learning policies in Indonesia. By utilizing AI, educators can anticipate and optimize the characteristics and advantages of integrated learning so that it is more efficient and impactful..*
Key Words*: AI; integrated learning; interdisciplinary education; primary education policy*

Introduction

Primary school is the initial phase in every individual's educational journey, and its role is very significant as a foundation for student development (Aini, 2018). Primary school provides a solid foundation for children's intellectual, social, and emotional growth (Jone, Barnes, Bailey, & Doolittle, 2017; Katz, 2003). This stage students acquire foundational knowledge in various disciplines such as maths, language, science, and more. Primary school is not only about imparting knowledge, but also students' skills, shaping students' character, ethics, and positive attitudes. Therefore, a strong understanding of the importance of primary school is key to achieving sustainable student development.

One of the key characteristics of primary schools is their interdisciplinary nature. Interdisciplinarity refers to the integration of various disciplines in the curriculum. Although it requires a lot of extra time and effort to integrate concepts, interdisciplinary learning can develop students' lifelong learning skills (Jones, 2009). Interdisciplinary learning allows students to see the connections and interrelationships between different aspects of knowledge. Research has shown that interdisciplinary education positively impacts student learning outcomes by tailoring the approach to each specific discipline and elevating interdisciplinary learning to a higher level of maturity (Oudenampsen et al., 2023). With this

approach, students not only understand each discipline separately, but also how to integrate knowledge concretely and meaningfully, this is in accordance with Piaget's theory. Knowledge integration does make learning more relevant (Beane, 1997).

Implementing the concept of integration in primary schools brings great benefits to students. The concept can enhance knowledge authentically, research on curriculum integration shows that it allows students to make connections between disciplines, enhances their learning content, and aligns with brain research that shows that individuals process learning through patterns and connections, rather than fragmentation (Brand & Triplett, 2012; Duran, Ballone Duran, & Worch, 2009). Through this concept, students learn to think critically, explore concepts more broadly, and hone thinking skills that can be applied in a variety of contexts (Beane, 1997). In addition, it also enhances students' communication skills and collaboration abilities, skills that are invaluable in their daily and future lives (Beane, 1997).

Other study, interdisciplinary learning integrates fields like artificial intelligence, mathematics, and quantum machine learning into traditional subjects, enhancing comprehensive understanding and fostering an interdisciplinary mindset (Bhagwandas, 2020). This approach not only boosts students' self-efficacy and motivation but also prepares them for science-related careers (Semilarski et al., 2019). It is increasingly embedded in educational curricula to promote collaborative learning and leverage diverse epistemological views (Kucirkova, 2019; Montagna et al., 2010; Turner et al., 2022). By embedding interdisciplinary learning into the curriculum, students are engaged in meaningful learning experiences that bridge different disciplines and promote collaboration (Obi et al., 2022). It also allows students to face real challenges, and active learning, as well as encouraging active student participation, are all relevant in dealing with the dynamics of the 21st century and the VUCA era (Aka & Afandi, 2023; S. Drake & Reid, 2018; Fraker, 1995).

Primary school policies governing thematic integrated learning have become a major focal point in Indonesian education in recent years. Previously, primary schools Indonesia, implemented an integrated learning approach that was mandatory for grades 1 to grade 3 in the “Education Unit Level Curriculum” (*2006 Curriculum,* 2006 until 2013) and mandatory for all grades 1 to grade 6 in the "2013 Curriculum"*,* (2013 until 2022) (Minister of Education and Culture, 2013; Minister of National Education, 2007). This approach, which allows students to learn various curricular subjects through integrated themes, has been considered an effective method to facilitate more meaningful and enjoyable understanding for students.

However, discussions arose when there was a change in primary school policy in Indonesia, where integrated curricula in learning is no longer a compulsory subject in the current curriculum, the "Independent Curriculum" (*Kurikulum Merdeka,* starting from mid-2022) (Minister of Education Culture Research and Technology, 2022). From the aforementioned decision, actually integrated-based learning is not completely removed, some examples of theme-based learning designs are still provided by the government, but only focus on phases one and two, grades one to grade four of primary school, and, examples of "Independent Curriculum" learning designs in primary schools are still dominated by subject-based learning designs *(Platform Merdeka Mengajar/PMM* application*)*. This raises

concerns regarding the pragmatic potential of primary school teachers in implementing learning in their classrooms.

Apart from that, in the current policy, integrated learning in curricular aspects is not mentioned, integration only takes the form of co-curricular aspects or is called a project strengthening the profile of "*Pancasila*" students (*Projek Penguatan Profil Pelajar Pancasila*) (Minister of Education Culture Research and Technology, 2024). From this condition, we can guess the direction of learning management that will be implemented by primary school teachers.

The above changes in primary school policy have triggered discussions about the field of scientific disciplines of the primary school community, especially primary school teachers. In Indonesia, primary school teachers, as classroom teachers, have the responsibility of teaching various subject areas in their classes. This is different from secondary school teachers and above who have the responsibility of being subject teachers. During the "2013 Curriculum", primary school teachers already had the field of scientific disciplines background to **"integrate"** various disciplines using an integrated thematic concept. However, now that integrated learning is not compulsory, there is a lack of clarity about the field of scientific disciplines background of primary school teachers, and it is feared that there is no provision for the scientific background or academic qualifications that entitle them to teach in primary schools.

In the context of policy changes and problems with the field of scientific disciplines background of primary school teachers, it is worth considering efforts to re-explore the concept of integrated learning. Integrated learning is an approach that is proven to integrate various disciplines and present a more comprehensive understanding for students (Fogarty, 2009a). Therefore, the main objectives of this article are to analyse (1) the advantages of integrated learning; (2) integrated learning as a scientific characteristic of learning in primary schools; (3) Utilization of AI technology to anticipate integrated learning; and (4) the urgency of integrated learning policy in Indonesia. This analysis will provide a deep insight into the concept of integrated learning can be a valuable solution in addressing these challenges.

Advantages of Integrated Learning (Active, Holistic, Authentic, Meaningful)

An integrated approach to learning has a number of advantages that have a positive impact on student development. Firstly, this approach helps students learn more actively (McCowan & Knapper, 2002; Setiawan et al., 2020). By combining the characteristics of various subjects into one theme or topic, students are invited to think more deeply and be actively involved in the learning process. In the concept of integrated learning, a theme is an idea or topic that can be explored by teachers and children in various ways. Themes are based on the child's culture, environment and experiences (Harmon & Jones, 2005). Using themes, students can see connections between various concepts, actively link information from different subjects, and solve more complex problems.

Another study which examined the application of integrated learning in several subjects, including physical education (Stidder & Hayes, 2010). The results show that theme-based integrated learning, which integrates cross-disciplinary subjects, such as physical

education with literacy, numeracy, science, and information and communication technology, provides opportunities for students to see the link between physical activity and knowledge-based learning. The results of this study are highly relevant, especially at the primary school level, where students are undergoing important physical and intellectual development. As such, it offers valuable insights into how a theme-based approach can stimulate students' interest and engagement in a variety of subjects, even in subjects such as physical education that tend to be physically based and have different characteristics to other subjects.

Secondly, integrated learning makes the learning process more holistic (Coyle, 2007; Fogarty, 2009a; Silver, Strong, & Perini, 2000; Widyaningrum, 2012). Students not only understand the theory from one discipline's point of view, but also how everything is related in a theme (Mufaridah, Santoso, & Madjdi, 2020; Şimşek, 2008). This helps them develop a deeper understanding of a particular topic, which in turn, facilitates a more rounded understanding. Multiple disciplinary concepts can be effectively addressed simultaneously (Drake & Burns, 2004).

Thirdly, integrated learning can be adapted according to students' needs, making it more meaningful (Beane, 1997; Fogarty, 2009a; Jacobs, 1999). Using themes, teachers can design learning that relates to students' interests, backgrounds and experiences, so that students feel more involved and motivated (Jang, 2017; Setiawan et al., 2020). This makes learning more relevant and meaningful to them.

Fourth, integrated learning makes learning content more contextualised (Beane, 1997). Students can see how the knowledge and skills they learn in different subjects can be applied to real life. This helps them recognise the relevance of what they are learning and how it can be used in various situations in their lives. As Beane (1997) argues, most humans take an interdisciplinary approach to life (Beane, 1997; Campbell & Henning, 2010). Thus, an integrated approach not only advances students' understanding of the subject matter, but also better prepares them to deal with the real world.

Integrated Learning as a Characteristic of Learning in Primary Schools

In addition to the above, the integrated learning approach can also be an interesting alternative in an effort to build a field of scientific disciplines characteristics for the community in primary schools, especially primary school teachers. The integrated concept allows learning to integrate various disciplines through thematic approaches that are interesting and relevant to students (S. M. Drake, 2007; Fogarty, 2009a; Jacobs, 1999). It provides a more holistic and comprehensive way of combining knowledge in different subjects, replacing the paradigm of learning based on separate subjects. With this approach, students can see how different aspects of science relate to each other in real-world situations, which in turn enhances their understanding of the interconnectedness of science.

The integration of curricula has been recognized as a valuable approach in education, promoting interdisciplinary knowledge creation and dissemination. For instance, entrepreneurship education is often integrated into primary and secondary school curricula, either as a standalone subject or integrated into other subjects, fostering entrepreneurial skills among students (Walter & Block, 2016). This integration approach not only enhances

students' understanding of entrepreneurship but also promotes creativity and innovation across different disciplines. Moreover, integrated curricula have been instrumental in promoting science and technology in primary education, emphasizing the importance of interdisciplinary approaches in enhancing students' enthusiasm for mathematics and science (Gresnigt et al., 2014). By integrating science and technology into the curriculum, students are exposed to real-world applications and problem-solving scenarios, fostering a deeper understanding of these subjects. Additionally, the integration of subject-specific content knowledge has gained traction in educational discourses, highlighting the growing interest in incorporating interdisciplinary approaches in curriculum design (Niemelä, 2021).

In addition, integrated learning allows primary schools to develop a more relevant curriculum, tailoring learning to students' needs and interests. As such, it creates a more enjoyable and meaningful learning experience, which can increase students' motivation and participation in the educational process.

As an alternative to the scientific background of primary school teachers, integrated learning helps to create a clearer vision of primary schooling that focuses on deep understanding and interdisciplinary skills, which is a valuable asset for primary school graduates and/or teachers in differentiating their knowledge. Through the importance of this approach in primary schools, it is not possible for just any graduate to enter the primary school profession. The ability to integrate the five fields of study in Indonesian primary schools (Language, Science, Social Studies, Civics, Mathematics) will be optimally possessed by graduates of primary teacher education.

Utilization of Artificial Intelligence Technology to Anticipate Integrated Learning

Integrated learning has significant characteristics and advantages, such as an interdisciplinary approach, student-centered learning, active student engagement, and authentic learning and evaluation. Despite some opinions suggesting that integrated learning faces challenges such as time constraints, difficulties with teaching materials, engaging students, and complex assessment systems (Jones, 2009; Septiana et al., 2018), AI can anticipate and optimize the characteristics, advantages, and challenges of integrated learning.

In an interdisciplinary context, AI can assist teachers in developing integrated materials from various disciplines (Hsu et al., 2021; Zhou et al., 2023), analyze data from different disciplines to provide deeper insights into how concepts are interconnected, and tailor learning content to ensure students understand the relationships between different fields (Bhatt & Muduli, 2022; Oudenampsen et al., 2023; Ouyang et al., 2023; Shah et al., 2019). AI can also personalize learning by analyzing individual student data, adapting learning materials to their needs and learning pace, and providing resources and guidance that enable students to learn independently and according to their interests (Chen et al., 2020; Hashim et al., 2022; Kim & Kim, 2020; Luckin & Cukurova, 2019; Pardamean et al., 2022). This aligns with the student-centered characteristic of integrated learning, placing students at the center of the learning process and encouraging them to actively explore and understand the material (Iasha et al., 2020).

Active student engagement can be further enhanced through AI-based interactive tools, such as simulations, educational games, and collaborative platforms. AI can provide real-time feedback to students on their performance, helping them correct mistakes and better understand the material (Bozkurt et al., 2021; Harry, 2023; Liu et al., 2022). In authentic evaluation, AI can assess student tasks and projects based on actual performance, using complex rubrics and in-depth data analysis (Akgün & Greenhow, 2021). Additionally, AI can track student progress over time, providing accurate insights into their development and helping teachers adjust teaching strategies for better outcomes (Pardamean et al., 2022).

The Urgency of Integrated Learning Policy in Indonesia

In the 2006 Curriculum and 2013 Curriculum (Late Indonesia curriculum), the government required primary schools to implement an integrated learning approach (Regulation of the Minister of National Education No. 41 of 2007 on Education Process Standards; and Regulation of the Minister of Education and Culture No. 65 of 2013 on Education Process Standards), but now the government no longer requires integrated learning (Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia No. 56/M/2022 on Guidelines for Curriculum Implementation in the Framework of Learning Recovery) and (Regulation of The Minister of Education, Culture, Research and Technology Republic of Indonesia No 12 Year 2024 About Curriculum in Early Childhood Education, Levels of Education Basic and Secondary Education Levels). Currently, integrated learning is not completely removed, but this policy has the potential to trigger primary school teachers to no longer concentrate on the concept of integrated learning.

Changes in integrated learning are actually a consequence of the increasingly complex demands of global education (Aka & Afandi, 2023; S. Drake & Reid, 2018). Along with technological development, social change, and global integration, the integrated approach, which integrates various subjects into a single theme or topic, has become increasingly relevant (John, 2015; Marsono, Yoto, Devi, & Mustakim, 2019). In the current context of global education, integrated learning allows students to develop a more thorough and in-depth understanding of concepts that relate to the real world. The positive impact is that students can learn more contextually and relevant to their environment.

The importance of an integrated approach in Indonesian primary school policy is to prepare students for global challenges that require a broader understanding and critical thinking skills. In addition, integrated learning can also increase students' engagement in the learning process, as they can see the linkages between various subjects in one theme (McCowan & Knapper, 2002). Therefore, policy support in the curriculum and improved teacher training to implement integrated learning are needed.

Education policy holds a pivotal role in shaping global education systems, serving as a guiding framework that influences various facets of educational practices and outcomes. Its significance lies in driving educational change, addressing learning challenges, and fostering equity and inclusivity in education (Beroš, 2020; Chase, 2016; Muñiz, 2021). These policies are crucial tools for engaging stakeholders, preparing students for modern challenges like digital

citizenship, and shaping practices within higher education (Alexiadou & Lange, 2013; Ashwin & Smith, 2014).

The impact of education policy transcends borders, evident in studies analyzing the European Union's influence and the implementation challenges faced by countries like Indonesia and Tanzania (Lei, 2020; Muhdi, 2019). Examining policy implementation in diverse contexts like China and Pakistan underscores the need for innovative approaches and dedicated commitment to improving education systems (Chase, 2016; Wang et al., 2020). Policies in education hold vast implications that reverberate across multiple domains. They not only impact educational methodologies but also extend their influence to broader societal arenas such as democracy, public health, social justice, and technological progress (Hahn & Truman, 2015; Mayer, 2016; Westheimer & Kahne, 2004; Wilcox, 2022).

Primary school policy in Indonesia should pay attention to customisation and flexibility in integrated learning. Each student has different needs and interests (Tomlinson, 2017), so policies should allow for customisation of learning based on individual student characteristics. Therefore, the policy should provide room for customisation of learning based on students' individual characteristics (Mills, Keddie, Renshaw, & Monk, 2016; Young, Piché, & Jones, 2020). This will make learning more meaningful and relevant to them, which in turn will improve overall educational outcomes.

By adapting interdisciplinary-based integrated learning as an integral part of primary school education policy, Indonesia can prepare young people who are better equipped to deal with the complexities of a globalised world, promoting critical thinking, creativity and a deeper understanding of the world, while still maintaining important cultural values and local traditions. In line with Seow's (2019) statement, one of the concepts of interdisciplinary learning is hands-on learning that reflects real-world problems (Seow et al., 2019).

Based on the above, the policy on non-compulsory integrated learning in Indonesia needs to be adjusted to the latest developments in the world of education, or at least the government can promote this concept again widely. The concern that primary school teachers are increasingly abandoning the application of integrated learning is one of the reasons, which in turn, the potential of primary school teachers who have scientific specialities as "integrators" of subject areas is lost.

Changes in global demands, such as the emphasis on contextual understanding, critical thinking, creativity and adaptability, strengthen the argument to reconsider the promotion of integrated learning policies. By integrating various subjects into a single theme or topic, this approach can help students develop a more thorough and applicable understanding. This is in line with the demands of global education which increasingly emphasises the application of knowledge in real-world situations.

However, while it is important to consider flexibility in education policy, it is also important to remember that each country has its own unique education context. As the world of education evolves, education policies must always be reassessed and adjusted to remain relevant and effective in preparing young people for the challenges of the future. With the right approach, integrated learning can be a powerful tool in improving the quality of education in Indonesia, especially in primary schools.

An integrated approach to learning in primary schools offers a unique and valuable scientific identity that graduates of other fields of study do not have. In the concept of integrated education, teachers must have the ability to integrate various disciplines into their learning. This means that teachers in primary schools need not only to have a deep understanding in one or a few disciplines taught in primary schools, but also the ability to see the connections and interrelationships between various disciplines. Integrated learning is advocated on the grounds that complex problems in real life often cannot be solved by approaches based on a single discipline (Eurydice, 2011). Thus, an integrated approach creates a unique scientific identity for primary school teachers that cannot be found in other fields of study.

Based on the above, it appears that there are a number of strong arguments that support the urgency to re-promote integrated learning policies in Indonesia. Firstly, an integrated approach can help students learn more actively, holistically, authentically and provide deeper meaning in learning. This is highly relevant to the demands of global education that emphasise deep and applied understanding and critical thinking. In addition, this approach can create a unique scientific identity for primary school teachers, which is not shared by other fields of study. Therefore, it is hoped that the government will continue to promote integrated learning on its various platforms.

The urgency of implementing an integrated learning policy in Indonesia is underscored by the numerous benefits it offers, such as fostering interdisciplinary understanding, promoting student-centered learning, and encouraging active student participation. Effective management of teaching materials and the utilization of AI can significantly enhance the implementation of integrated learning policies. By leveraging AI, educators can personalize learning experiences, provide real-time feedback, and create adaptive learning environments that meet the diverse needs of students. Moreover, AI can assist in the development and organization of integrated teaching materials, ensuring they are aligned with curriculum goals and student learning objectives. Thus, the combination of well-managed teaching materials and advanced AI technologies presents a promising solution to the challenges of implementing integrated learning policies in Indonesia, ultimately leading to a more holistic-effective education system, and of course offering scientific identity for elementary school teachers.

Conclusion

The study underscores the critical role of primary education in fostering holistic student development. It highlights the benefits of integrated learning, which promotes interdisciplinary understanding, critical thinking, and real-world application of knowledge. Despite recent policy changes in Indonesia that de-emphasize integrated learning, the findings argue for its reimplementation due to its proven advantages in enhancing student engagement and academic performance. The use of AI in creating and managing integrated learning materials presents a promising approach to overcoming existing challenges. Future policy adjustments should aim to reinforce integrated learning to better prepare students for

global educational demands and maintain the unique scientific identity of primary school teachers.

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