

# Character Education Transformation through Science Technology Society (STM) Approach Towards Golden Indonesia 2045

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## ABSTRACT

The transformation of education in Indonesia towards the vision of Golden Indonesia 2045 is crucial in the context of character education, science, and technology within society. This transformation aims to shift the education system from being overly permissive without clear control to one that balances freedom and responsibility, guided by wise oversight. Technological advancements have reshaped learning methods in the digital era, making them more interactive and collaborative. Character education plays a vital role in shaping the nation's identity, emphasizing ethical values that should be taught from an early age through both formal and informal institutions. The Science, Technology, and Society (STS) approach integrates scientific knowledge with social issues, helping students connect learning with real-life situations. The vision of Golden Indonesia 2045 requires the younger generation to be not only intellectually intelligent but also emotionally and spiritually grounded, creating well-rounded and wise individuals. Thus, education is expected to shape a generation capable of facing global challenges and becoming the key to the nation's success in the future.

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## INTRODUCTION

Character education in Indonesia is part of one of the main focuses to support the achievement of the vision of “Golden Indonesia 2045”, which targets Indonesia as a highly competitive nation with significant progress. In this regard, character education not only serves to form individuals who have academic knowledge, but also to instill solid moral and ethical values. Character education is expected to produce a generation with integrity, responsibility, and the ability to face global challenges, especially in the ever-evolving digital era. Character education is a step directed at fostering good attitudes and behaviors in individuals. According to the Ministry of Education and Culture (Kemendikbud), the values in character education include religiosity, nationalism, independence, integrity, and empathy by internalizing these values early on, it is hoped that the younger generation will contribute as agents of transformation who are able to contribute to nation building (Yulianti, 2021).

Indonesia faces various challenges in realizing this vision, especially in the context of education. In the digital era, children are exposed to diverse information, including negative content that can affect their

character formation (Seran, 2024). Therefore, innovative approaches in character education are needed, one method is through Science Technology Society (STM). This approach combines technology with community-centered learning to create a more appropriate and engaging learning environment for the younger generation.

The Science Technology Society (STM) approach can be an effective alternative to solve challenges in character education. By utilizing digital technology, students can learn through more interactive and collaborative methods. For example, the use of digital platforms for social projects can help students understand the importance of values such as cooperation and social responsibility (Anggriawan, 2023). In addition, Science Technology Society (STM) also encourages curriculum development that is adaptive to changing times and the needs of society.

The transformation of character education by utilizing the Science Technology Society (STM) approach is an essential effort to achieve the vision of the Golden Indonesia 2045. Through the integration of technology in character education, it is expected that the younger generation will not only succeed in the academic realm, but also have strong moral capabilities. Cooperation between the government, educational institutions, parents, and the community is needed to produce an atmosphere that supports the growth of character for the younger generation. Therefore, this journal will outline the importance of character education transformation by utilizing the Science Technology Society (STM) approach as an effort to support the vision of a Golden Indonesia 2045.

Previous research on “Transformation of Character Education Through Science Technology Society (STM) Approach Towards Golden Indonesia 2045” highlighted the importance of character education in shaping a resilient generation to face future challenges. Character education is seen as a key element to create individuals who not only excel academically but also have strong integrity and ethics. Moral values rooted in Indonesian culture, such as Pancasila, are the main foundation in this education, as affirmed by Belferik Manullang's (2013) research on the grand design of character education for the 2045 golden generation (Manullang, 2013). To support the vision of a Golden Indonesia 2045, the younger generation needs to have a positive attitude, critical mindset, and commitment to norms that build an inclusive and civilized society.

The Science Technology Society (STM) approach is a relevant strategy in supporting the transformation of character education. This approach integrates science and technology with human values to equip students with the digital skills needed in the modern era, while instilling ethical awareness of the impact of technology on society. Anggriawan's research (2023) shows that through this approach, students are not only able to understand the impact of technology in depth but also learn to use technology responsibly (Anggriawan, 2023). Thus, the STM approach contributes to forming a generation that is not only technically competent but also has a high moral awareness, so that they are able to become good citizens and contribute positively to nation building towards the Golden Indonesia 2045 (Anggriawan, 2023).

## **METHOD**

This research was conducted using the literature study method, which includes the process of collecting and in-depth analysis of various academic journals, scientific articles, and reference books that focus on the topic of character education. Specifically, this research highlights the transformation of character education through the Science Technology Society (STM) approach in order to support the achievement of the 2045 Golden Indonesia vision. The research phase began with a search for relevant academic sources, followed by a selection process of journals, articles and books that were considered to have high relevance to the research theme. All sources were accessed from various trusted academic platforms, including digital libraries, to ensure that the data analyzed had sufficient validity and credibility. Through this method, the research seeks to present a comprehensive picture of the integration of the STM approach in character education as an important strategy to prepare ethical and competent future generations in the modern era.

## **RESULTS**

### **1. Science Technology Society (STM) Approach**

The Science Technology Society (STM) approach integrates learning theories, particularly cognitive and social constructivism, to help learners understand social issues related to technology. What follows is an explanation of both theories and how they support each other in a learning context. Cognitive constructivism, developed by Jean Piaget, underlines that knowledge is developed by individuals through concrete experiences with the environment. Piaget argued that children's cognitive development occurs in sequential stages, where each stage has different characteristics and ways of thinking. This process involves an active interaction between the individual and the environment, where the individual assimilates new information into the pre-formed knowledge structure and makes accommodation if the information does not fit (Ilham, Arba'iyah, & Tiodora, 2023). Key Principles of Cognitive Constructivism:

- a. Learning Activity: Students need to be actively involved in learning activities to build their knowledge.
- b. Stages of Development: The learning process follows certain stages that must be passed sequentially.
- c. Interaction with the Environment: Physical experience and manipulation of the environment are essential for cognitive development (Ilham et al., 2023).

In contrast, the social constructivism theory proposed by Lev Vygotsky highlights the importance of social interaction in the learning process. Vygotsky argued that cognitive development is not only influenced by individual experiences but also by the social and cultural context in which the individual exists. A key concept of Vygotsky is the Zone of Proximal Development (ZPD), which describes the range between an individual's ability to complete a task independently and their ability when assisted by others (Ilham et al., 2023). Key Principles of Social Constructivism:

- a. Social Interaction: Learning takes place through interaction with others, be it classmates or adults.
- b. Scaffolding: The process by which educators or peers provide support to students as they learn, then gradually reduce that support as students improve.
- c. Cultural Context: The social and cultural context in which individuals are situated has a major impact on the learning process (Ilham et al., 2023).

These two theories support contextual learning by emphasizing that knowledge should be learned in a real and relevant context. In the Science Technology Society (STM) approach, learners are invited to explore technology-related social issues through hands-on experience and collaboration with others. This helps them understand how science and technology affect society and vice versa. As a result, the Science Technology Society (STM) approach that integrates cognitive and social constructivism theories can create a rich and relevant learning environment, helping learners not only understand technology but also the social issues that come with it.

## 2. Character Education

The concept of character education is very relevant in the context of moral and ethical development, especially through the theories proposed by Lawrence Kohlberg. Kohlberg's theory of moral development emphasizes that individual moral reasoning develops through sequential stages, which are influenced by cognitive maturity and social interaction (Ibda, 2023). In this context, values such as honesty, responsibility and empathy can be effectively taught through the Science Technology Society (STM) approach. Lawrence Kohlberg developed a theory that divides moral development into three main levels:

- a. Preconventional Level: At this stage, moral reasoning is based on the direct consequences of actions. Children judge actions as right or wrong based on the punishment or reward that may be received.
  - Stage 1: Punishment and order orientation.
  - Stage 2: Naive orientation or instrumental hedonism.
- b. Conventional Level: Here, moral reasoning focuses on social norms and the role of the individual in society.
  - Stage 3: "Good boy" orientation where individuals want to be accepted by others.
  - Stage 4: Morality defends social authority and rules.
- c. Post-Conventional Level: At this stage, individuals absorb moral principles deeply and can decide between various moral standards.
  - Stage 5: Morality of social contracts and individual rights.
  - Stage 6: Morality of universal principles.

Kohlberg argues that growth in moral reasoning is a complex process and depends not only on direct teaching, but also on the experience of social interaction (Ibda, 2023).

The Science Technology Society (STM) approach can be used to teach values such as honesty, responsibility, and empathy in a contextualized and relevant way. Here are some strategies:

- a. Practical Experience: Through technology-based projects involving social issues, students can learn about honesty by facing real ethical dilemmas. For example, in an app development project to help the community, students must consider how user data is managed ethically.
- b. Moral Dilemma Discussion: Using moral dilemmas in the context of technology (such as data privacy) can encourage students to think critically about their responsibilities as technology users. This is in accordance with Kohlberg's method of using stories to trigger discussions about moral reasoning (Nabila Hasna D, 2023).

- c. **Social Collaboration:** Collaborative learning allows students to share perspectives and understand the importance of empathy in a social context. In groups, they can discuss how their actions affect others, thus developing a sense of social responsibility.
- d. **Personal Reflection:** Encouraging students to reflect on their own experiences with these values can help them internalize honesty and responsibility. For example, they could be asked to journal about an experience when they had to choose between honesty and personal gain.

By applying the Science Technology Society (STM) approach in character education, values such as honesty, responsibility and empathy are not only taught as abstract concepts but also practiced in real contexts relevant to students' daily lives. This helps them to understand the impact of technology on society and form strong character and good ethics.

Character education plays a crucial role in building a generation that not only has scientific knowledge, but also solid ethics, in line with the vision of Indonesia Emas 2045. This vision aims to make Indonesia a sovereign, developed, and socially just country by 2045, coinciding with the centenary of Indonesia's independence. There are four main pillars in this vision: Human resource development and mastery of science and technology, sustainable economic development, equitable distribution of development, and strengthening national resilience and governance (Jatim Newsroom, 2024).

### 3. Education Transformation for Golden Indonesia 204

Character education that emphasizes the importance of democratic and inclusive education is very relevant in the context of educational transformation in Indonesia, especially to support the vision of the Golden Indonesia 2045. This vision demands a young generation that is not only intellectually intelligent but also emotionally and spiritually. In this regard, the theory of educational change provides a framework for understanding how education can contribute to the formation of a more just and inclusive society.

Educational change theory highlights the importance of adapting education systems to meet the evolving needs of society. One important approach is democratic education, which emphasizes students' active participation in teaching-learning and decision-making processes. Through democratic education, students are encouraged to engage in discussions, develop leadership skills through activities such as class leader elections or collaborative projects, and increase their social awareness. This helps students understand their rights and obligations as citizens and the importance of tolerance and cooperation in a diverse society (Alfani et al., 2024).

Inclusive education is another important approach to education transformation. It involves providing equal access to education for all students, including those who have special needs or come from diverse backgrounds. Some important aspects of inclusive education include:

- a. **Accessibility:** Using technology to make learning materials more accessible to all students, including those with special needs (Sakti, 2023).
- b. **Adaptive curriculum:** Adjusting the curriculum to include a variety of perspectives and experiences, so that all students can see themselves in the learning process (Maskuroh & Ningsih, 2023).
- c. **Supportive Learning Environment:** Creating an atmosphere where all students feel welcome and valued, encouraging social interaction and collaboration between students.

Transforming education through democratic and inclusive approaches is closely aligned with the vision of a Golden Indonesia 2045. Here are some ways in which character education can support this vision:

- a. **Holistic Character Development:** Character education that prioritizes values such as honesty, responsibility and empathy helps create individuals who are not.
- b. **Readiness for Global Challenges:** By developing critical and analytical thinking skills through democratic education, the younger generation will be better equipped to face global challenges and contribute to nation building.
- c. **Building a Tolerant Society:** Inclusive education teaches students about diversity and the importance of respecting differences, thus creating a more harmonious and tolerant society.
- d. **Active Participation in Social Development:** Democratically educated young people will be more motivated to participate in social and political development processes, strengthening democracy in Indonesia.

Thus, the transformation of education towards a more democratic and inclusive system not only improves the quality of education itself but also prepares the younger generation to become agents of change capable of realizing the vision of a Golden Indonesia 2045. Through character education, they will be equipped with scientific knowledge as well as strong ethics to build a better future for the nation.

#### 4. Practical Implementation and Impact of Science Technology Society (STM) in Character Education

The Science Technology Society (STM) approach is one of the effective learning strategies in integrating social and technological issues, especially in the context of project-based learning. Through Science Technology Society (STM), students not only learn theory, but are also directly involved in solving real problems that exist in society. Here are some concrete applications of Science Technology Society (STM) in the classroom that show how students can solve real problems. Application of Science Technology Society (STM) in Project-Based Learning.

##### a. Renewable Energy Project

One example of the application of Science Technology Society (STM) can be seen in a project that focuses on renewable energy. In this project, students are invited to investigate energy use in their neighborhood and find solutions to problems related to inefficient energy consumption. Steps:

- 1) Invitation Phase: The teacher introduces energy use issues in the school or community, such as the high cost of electricity or dependence on fossil energy sources.
- 2) Exploration Phase: Students conduct research on renewable energy sources, such as solar panels or wind turbines. They can visit locations that use renewable energy or conduct simple experiments in the classroom.
- 3) Solution Phase: Students design a plan to implement renewable energy solutions in their school, including estimated costs and benefits.
- 4) Application Phase: Students present their plan to the school or community, and if possible, implement a small project, such as installing solar panels.

The results of the study show that the Science Technology Society (STM) approach increases students' awareness of energy and how it is utilized, as well as building awareness of social responsibility for the environment (Hasjunianti, n.d.).

##### b. Waste Management Project

Another project that demonstrates the application of Science Technology Society (STM) is waste management. In this project, students learn about the impact of waste on the environment and look for ways to reduce waste in their school. Steps:

- 1) Invitation Phase: Discussion about the problem of waste in the neighborhood, including its impact on health and hygiene.
- 2) Exploration Phase: Students conduct a survey on the types of waste generated at school and how it is currently managed.
- 3) Solution Phase: Students design a recycling program or waste reduction campaign, including gathering information on good waste management methods.
- 4) Application Phase: Implementation of the program at school by involving all students and teachers, and evaluate the results.

Research shows that students involved in waste management projects using the Science Technology Society (STM) approach are able to understand science concepts better and have more concern for the environment (Senisum, 2014).

##### c. Public Health Project

Public health is also an example of a relevant application of Science Technology Society (STM). In this project, students can explore health issues such as infectious diseases or healthy lifestyles. Steps:

- 1) Invitation Phase: Introduce a specific health issue relevant to the community, such as the high number of dengue fever cases.
- 2) Exploration Phase: Students conduct research on the causes of the disease and how to prevent it, including interviews with medical personnel or direct observation.
- 3) Solution Phase: Design a health awareness campaign in the school or community to educate others about disease prevention.
- 4) Application Phase: Implement the campaign by creating posters, educational videos, or health seminars.

Through this project, students not only learn about health science but also develop communication and cooperation skills (Hasjunianti, n.d.).

Thus, the implementation of Science Technology Society (STM) approach in project-based learning allows students to engage in active learning process through real experiences. By integrating social and technological issues, students can understand the relevance of science in everyday life as well as improve their

critical and creative thinking skills. These projects not only improve the understanding of science concepts but also shape students' characters as individuals who care about society and the environment.

## CONCLUSION

Character education implemented through the Science Technology Society (STM) approach has an important role in realizing the vision of a Golden Indonesia 2045. This educational transformation that focuses on character development aims to create a young generation that not only excels academically, but also has strong moral and ethical values. With the Science Technology Society (STM) approach, students are invited to understand the role of science and technology in social life through interactive and project-based learning, so that they are able to link knowledge with reality in society.

To strengthen the implementation of character education, it is recommended that schools and educational institutions integrate more Science Technology Society (STM) based projects in their curriculum. This will allow students to be more active in learning and improve their critical, collaborative and empathy skills. In addition, it is important to involve families and communities in the character education process so that the values instilled in schools receive support from the surrounding environment.

The implementation of Science Technology Society (STM)-based character education will have a broad impact on the development of the nation, especially in creating a generation that is ready to face global challenges with critical, innovative and ethical thinking skills. The long-term implication is the creation of a more harmonious, ethical and competitive society in the international arena, supporting the realization of Indonesia as a developed, sovereign, just and prosperous country in 2045.

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