



Biological Education in Indonesian Senior High School: Study in Textbook and Curriculum Policy

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Abstract

Background: Biology education has a vital role in scientific development, strengthening the position of biology education for sustainable development and advancing biological science. During this time, biology materials developed rapidly. **Methods:** Writing the word Abstract using Cambria 9pt, in italics. The Abstract consists of 150-250 words written in one paragraph, containing the essence of the manuscript, background, research objectives, methods, results, and conclusions. **Results:** Biology education material that has developed since there were three changes to the curriculum in Indonesia after the issuance of Law Number 20 of 2003 concerning the National Education System has yet to show any significant changes specifically in the subject matter for class X SMA. Curriculum policies and the development of textbooks in Indonesia focus more on and continue the material in the previous curriculum since the emergence of the competency-based curriculum (2004). **Conclusions:** The development of biology education in Indonesia from materials, textbooks, and curriculum policies shows a small change and development in the development of biology science for class X SMA. This study concludes that textbooks and curriculum policies have yet to be able to change the perspective and substance of the direction of learning biology in Indonesia. So the portrait of the capacity and insight of the Indonesian generation's knowledge about biology can be seen from the curriculum policies and the existing materials.

Keywords: Biological Education; Curriculum; Policy; Senior High School; Textbook



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Introduction

Biology is an essential subject in elementary to high school education. Biology is part of the natural science subject for the elementary education level and a separate topic for the senior high school level in Indonesia. As a primary subject to recognize and understand the ins and outs of living things, biology education is essential to seeing the development and dynamics of learning in schools. Changes in the curriculum of teaching materials and learning methods can affect students' understanding of biology. Biology education has a broad impact on students' knowledge of the surrounding environment; besides that, biology education is expected to support and encourage awareness of the younger generation or students in protecting and caring for the environment and the creatures around it (Council, 1970). Indonesia's biodiversity is one of the competencies in biology subjects at high school levels X, XI, XII. Artanti said that there are two essential points that class X students must master. First, analyze Indonesia's various levels of biodiversity and

its threats and conservation. Second, it can present the results of observations of different levels of biodiversity in Indonesia and proposed efforts to conserve it (Artanti, 2020). This aligns with Indonesia's standard biology curriculum policy stipulated in Permendikbud Number 59 of 2014 concerning Curriculum 2013 10b. In Chapter 3, it is stated that the competency standards for graduating class X and XI students include analyzing various biodiversity in Indonesia. These bioprocesses take place at different stages of cellular organization in living systems and analyze negative behavior and environmental changes' impact on life (Ministry 2013).

The study of biology education is interesting to review in line with the developments and dynamics of curriculum changes in Indonesia since the issuance of Law Number 20 of 2003 concerning the National Education System (Ministry, 2003). Since the distribution of this Law, Indonesia has experienced three changes to the curriculum: the 2004 Competency-Based Curriculum (KBK), the 2006 Education Unit Level Curriculum (KTSP), and the 2013 Curriculum, up to the 2022 Merdeka Learning program and curriculum. This study will analyze changes and developments in materials, curricula, and policies related to biology education at the senior high school level. Studies on changes in learning methods in natural sciences education have also changed from teaching-learning centers to student-learning centers, in addition to explicitly using various approaches to deepen further the material provided with a *contextual-based learning approach*, including in environmental education. Biology education has broad aspects to explore various issues related to nature, humans, and the life of organisms around the existing environment (Kateri, 2022).

For this reason, the materials and policies of the biology education curriculum need to be reviewed to see to what extent the depth of biology education material is taught and developed in schools. Research conducted by Zahra and Ridlo focused on the Minimum Competency Assessment to measure students' literacy abilities in high schools (Nurul, 2022). The study conducted by Trihastuti and Alimah explains the relationship between Technological pedagogical and content knowledge framework integrating technology into aspects of pedagogy and content from the perspective of a biological teacher (Trihastuti, 2022). This study aims to show teachers' views on understanding biology concepts to avoid students' conceptual errors in studying biology. The concept measured is the concept of biodiversity, the classification of 5 kingdoms, viruses, fungi, Plantae, Animalia, cells, plants, tissues, animal tissues, ecosystems, motion systems, digestive system, nervous system, growth and development, enzymes, genes, inheritance of traits, and evolution.

Analysis of the Biology textbook for higher secondary students published by the national book foundation Islamabad (Pakistan) showed that the textbook Biology for higher secondary school level needed to meet the requirements of the 21st century for students of secondary students. This research suggests updating the content and methodology of the Biology textbook at the higher secondary school level according to the life skills requirements of the 21st (Mubeshera, 2016).

Biology education curriculum policies and textbooks are essential to providing students with understanding and mastery of the material. Various studies show that in Indonesia, literacy still needs to be improved and improved. Based on a survey from the Program for International Student Assessment (PISA) in 2019 shows that the literacy level of students in Indonesia is ranked 62nd out of 70 countries (Ilham, 2022). Textbooks are essential in learning, increasing students' capacity to understand the knowledge they acquire (Ariningrum, 2013).

This research will focus on how the development and changes in Biology textbook materials are formulated and made by the government for high schools with various curriculum policy changes starting from the competency-based curriculum, the education unit level curriculum, the 2013 curriculum, and the independent curriculum. This research examines explicitly class X textbooks based on the four curricula.

Methods

This study used a qualitative approach by analyzing *textbooks* and biology education policies in Indonesia. This research uses policy analysis and *content analysis*. The data in this study used biology textbooks for the senior high school level published by private publishing under government supervision. Data analysis was conducted through three steps: inventory from main reference books. Secondly, data is categorized for selection, and thirdly, data is analyzed by content analysis and interpretation. Content analyses will use three criteria: textbook analysis through the content, meaning, and substance.

Result

National education policy

In the Results section, state what you found, but do not interpret the results. Education policy in Indonesia is based on Law Number 20 of 2003 concerning the National Education System. Various education policies based on Law Number 20 of 2003 concerning the National Education System have influenced Indonesia's teaching and learning system, including curriculum, textbooks, and learning evaluation. This Law generally regulates curriculum policies, arrangements regarding education administration, national education standards, roles and responsibilities of the central and regional governments, education evaluation, and the accreditation system. This regulation forms the basis for formulating educational policies, precisely curriculum policies and academic assessments. In Indonesia, they are implementing a single system for implementing education policies.

This *top-down* system was implemented to regulate the national education system so there would be no discrepancies between regions and different policy treatments between areas. This consideration was made because the territory of Indonesia is geographically large and has diverse demographic aspects in terms of culture, social systems, and governance. For example, the study conducted by Irawati and Susetyo, which discusses the implementation of Law Number 20 of 2003 concerning the National Education System in Blitar, relates to education funding. To implement Law Number 20 of 2003, the regional government of the city of Blitar provides an education budget allocation through the Regional Dutch Revenue Budget (APBD) for education with an APBD policy that is in favor of the people with free education for all levels of education in the city of Blitar, provision of accessible facilities for shoes, uniforms, books, stationery, school buses, bags, tablets, tuition fees, building fees, pocket money, and complimentary bicycles, as well as free educational programs. (Irawati, 2017).

Since the enactment of Law Number 20 of 2003 concerning the National Education System, the implementation process for this Law in each region has varied quite a bit. According to Mayangsari (2021), in implementing a policy, several aspects can be seen as whether the policy is effective, adequate, and can be appropriately implemented. Factors supporting the success of policies regarding implementing Law Number 20 of 2003 concerning the Education System include: 1. Human resources, 2. Understanding in understanding general provisions in existing laws, 3. Agreement with educational goals, 4. Clear division of tasks and authority, 5. Good and smooth communication and coordination (Mayangsari, 2021).

The enactment of Law Number 20 of 2003 became the basis for changing curriculum policies for the education unit level in Indonesia. Changing the curriculum policy in various situations and conditions in Indonesia is influenced by suggestions from multiple parties, especially the public, who want changes to the education curriculum in Indonesia. Since the publication of this Law in Indonesia, there have been four changes or additions to the curriculum. The first curriculum after the Law was made was the Competency-Based Curriculum (KBK) in 2004. The Research and Development Agency (Balitbang) of the Ministry of National Education published a document in the form of a book titled Competency-Based Curriculum in 2002. This curriculum's birth was a reflection and

assessment review of the 1994 curriculum and its implementation. The Competency-Based Curriculum (CBC) aims to prepare students to face educational challenges independently, intelligently, critically, and innovatively. This curriculum's orientation and objectives emphasize three aspects: 1. students' expected results and impact through meaningful learning experiences. 2. Emphasizes the diversity of learning and teaching methods (Ministry of Education and Culture, 2002). Second, the change in the curriculum in 2007 to the education unit level curriculum (KTSP) this curriculum is a development of the KBK, and the basis for this curriculum change is through the Regulation of the Minister of National Education Number 23 of 2006 concerning Graduate Competency Standards (SKL) for Elementary and Secondary Education Units. This curriculum policy is directed at realizing a curriculum that is by the characteristics of the conditions and potential of the region, as well as the needs and problems of the areas, academic units, and students concerning national education goals (Baedhowi, 2007).

In its development, this curriculum has become the 2013 Curriculum (K-13). This curriculum is the 3rd curriculum change after KBK and KTSP. According to the Deputy Minister of the Ministry of Education and Culture, explaining the reason for the need for curriculum development was due to several future challenges faced by the Indonesian nation, including: first, the development of globalization, which has changed the economic order, social and cultural interaction, advances in technology and information, and shifts in world economic power. Second, future competency needs include the ability to communicate, think, become citizens, have broad interests, have a sense of responsibility, and be ready to work. Third, the public's perception of the existing curriculum is that the current curriculum is too heavy, lacks character, and places too much emphasis on cognitive aspects. Fourth, the development of knowledge and pedagogy (Ministry of Education and Culture, 2014). After the 2013 curriculum was running, a curriculum renewal policy emerged in 2020, known as the independent curriculum.

The independent curriculum policy directs the paradigm to build capabilities and create solutions to problems based on local, national, or global issues related to understanding the diversity of living things and their roles. The benchmarks in the independent school policy emphasize Learning Outcomes. This is what distinguishes it from the KTSP curriculum and the 2013 Curriculum. In addition, what is seen are elements of process skills such as observing, questioning and predicting, planning and conducting investigations, and processing and analyzing data and information. Evaluate, reflect, and communicate results (Irnaningtyas, 2022).

Biology Curriculum Policy

The biology education curriculum policy follows the national curriculum policy. Since post-reformation, the issuance of Law Number 20 of 2003 concerning the National Education System began. Indonesia implements various kinds of curriculum policies nationally. In 2004, the Competency-Based Curriculum (KBK) was published. In 2006 it changed to the Education Unit Level Curriculum (KTSP), and in 2013 it changed again to the 2013 curriculum until 2020 a supporting curriculum appeared called the independent curriculum, independent schools. This change in curriculum policy has affected learning materials in each subject in senior high schools (SMA). One of the impacts that can be seen is the biology education materials in schools for grades X, IX, and XII. In the independent curriculum, the subject of biology in the independent curriculum, the measurement that is placed is learning outcomes which consist of two components: understanding and process skills. Understanding biology was the ability to solve problems based on local, national, or global issues, diversity of living things and their roles, viruses and their roles, technological innovations, ecosystem components, and environmental interactions. Meanwhile, the second component is process skills, including observing, questioning, predicting, planning and conducting investigations, processing and analyzing data and information, evaluating and reflecting, and communicating results (Irnaningtyas, 2022).

CBC Policy Related to Biology Education

Referring to the Regulation of the Minister of Education Number 22 of 2006, it is explained that secondary education aims to increase intelligence, knowledge, personality, noble character, and skills to live independently and participate in further education. This educational objective refers to the basic principles of a competency-based curriculum. Whereas competency standards and essential competencies, through the elucidation of the Minister of National Education Regulation Number 23 of 2006 concerning competency standards and critical competencies, the primary objectives of natural science subjects at the SMA/MA level in the science and technology subject group are directed at developing logic, thinking skills, and student analysis. The Competency-Based Curriculum (CBC) outlines students' cognitive targets, attitudes, and abilities. The KBK in Biology education for class X directs to competency standards and essential competencies following the expected learning materials as follows:

Table 1. Competency Standards and Basic Competency

Competency standards	Basic competencies
Students can understand the nature of biology as a science and find objects and various problems from various levels of life organization in the surrounding environment.	Study the scope of biology, benefits, and dangers.
Students can apply the principles of grouping living things to study diversity and the role of biodiversity in life.	3.1 Formulate the concept of biodiversity by observing the surrounding environment.
	3.2 Communicate their insights about biodiversity in Indonesia
	3.3 Classify biodiversity
	3.4 Describes the characteristics of the kingdom Monera and communicates its role in life
	3.5 3.5. presents data on the identification of Kingdom Prostita
	3.6 Describe the characteristics of Kingdom Function (fungi) based on body structure and its role in life
	3.7 Describe and communicate the aspects of Kingdom Plantae and their role in life
	3.8 Describe and display the characteristics of the kingdom Animalia and its role in life
	4.1 Describe the components of the ecosystem and its changes through observation.
	4.2 Describes the role of ecosystem components in energy flow and biogeochemical cycles
Analyzing the relationship between ecosystem components, changes in matter and energy, and the role of humans in the balance of the ecosystem	4.3 Linking the relationship of human activities with the problem of destruction and maintenance of the environment
	4.4 Describes the use of recycled waste for the benefit of life
	5.1 Explain the basic principles underlying the development of biotechnology
Students can explain biotechnology, its principles, roles, and implications for science, the environment, technology, and society.	5.2 Explain the role of biotechnology in science, environment, technology, and society
	5.3 Explain the implications of biotechnology for environmental science, technology, and culture.

Source: Syamsuri, 2002.

Based on the table above, it describes competency standards and essential competencies that direct students to understand biodiversity and technological developments that can affect the growth of living things. The KBK policy on biology education provides an emphasis on competency. The competence in question requires students to have basic and minimal abilities to understand biology material. The purpose of determining competency standards and minimum essential competencies is that it is hoped that every student from various regions, schools, and schools cultural characteristics and learning after getting biology material with standards set by the

government, students after completing learning material, are expected to have good insight and knowledge and standardized in the mastery of biology education materials.

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KTSP policy related to Biology education

KTSP (*Kurikulum Tingkat Satuan Pendidikan*) policy related to Biology education is based on content standards. The paradigm is placed in implementing content standards in the curriculum and subjects as an effort to put more emphasis on setting standards on material and competencies expected from a level of education to produce competent graduates. Developing this content standard concerns graduate competency consisting of attitudes, knowledge, and skills. So that every material given to students has been formulated into the authoritative content of each subject. In the Minister of Education Regulation Number 21 of 2016 concerning Content Standards for Elementary and Secondary Education Units. For example, the biology subject for class X high school has content standards.

2013 Curriculum Policy Related to Biology Education

When referring to the 2013 curriculum, the direction and philosophy of this curriculum seek to develop an active student learning process with three aspects of competency, namely attitude (affective), knowledge (cognitive), and skills (psychomotor). (Irnaningtyas, 2013). Core competencies and essential competencies based on the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 69 of 2013 concerning the Basic Framework and Curriculum Structure for Class X High School/Madrasah Aliya consist of core competencies and essential competencies.

Core and essential competencies in the 2013 curriculum policy are modifications and developments from the previous curriculum (Table 2), for the content of biology education material emphasizes core and essential competencies more on strengthening science process skills for students. Students are expected to have the ability and mastery of the primary material from the accepted biology subjects. Thus, the 2013 curriculum policy strengthens and complements what still needs to be contained in the KTSP.

Biology Education Materials

The content of the biology education subject matter in the 2013 curriculum is similar to that in the 2006 Education Unit Level Curriculum (KTSP). The themes raised in the KTSP have content including the scope of biology, classification of living things, Viruses, Archaeobacteria and Eubacteria, Prostista, Mushrooms (*Fungi*), Biodiversity, Plants (Plantae), Animals (Animalia), Ecosystems, and Humans and the Environment (Imaningtyas, 2006).

Table 2. Core Competencies and Basic Competencies in Biology Class X at K-13

Core Competency	Basic competencies
1. To live and practice the teachings of the religion he adheres to	1.1. Admire the order and complexity of God's creation 1.2. Recognizing and admiring the scientific mindset in the ability to observe bioprocesses 1.3. He is sensitive and concerned about environmental issues, caring for and caring for the environment as a manifestation of practicing the teachings of his religion.
2. Living and practicing honest behavior, discipline, caring responsibility (cooperation, cooperation, tolerance, peace), courtesy, responsiveness, and proactivity and showing attitude as part of the solution to various problems in interacting effectively with the social and natural environment and in placing themselves as a reflection of the nation and the association of the world.	2.1. Scientific behavior: conscientious, diligent, honest, according to data and facts, disciplined, responsible, and caring in observation and experimentation. Courageous and polite in asking questions and arguing. Caring for the environment, cooperation, working together, loving peace, opinionated scientific and critical, responsive and proactive in every action and in making observations and experiments in the classroom/laboratory and outside the classroom/laboratory. 2.2. Care for personal safety and the environment by applying occupational safety principles when observing and conducting experimental activities in the laboratory and the surrounding environment.
3. Understand, apply, and analyze factual, conceptual, and procedural knowledge based on curiosity about science, technology, art, culture, and humanities with insights into society, nationality, statehood, and civilization related to the causes of phenomena and events and apply procedural knowledge in the field of study specific according to their talents and interests to solve problems.	3.1. Understand the scope of biology (problems on various biological objects and levels of organization of life), scientific methods, and work safety principles based on observations in everyday life. 3.2. I am analyzing observational data on various levels of biodiversity (genes, species, and ecosystems) in Indonesia. 3.3. I am applying an understanding of viruses related to the characteristics, replication, and role of viruses in public health aspects. 3.4. They applied classification principles through careful and systematic observation to classify Archaeobacteria and Eubacteria based on their characteristics and shape. 3.5. We are applying classification principles to classify Protists based on the general characteristics of the class and its role in life through careful and systematic observations. 3.6. Applying classification principles to classify fungi based on their characteristics and ways of reproduction through careful and systematic observations 3.7. They applied classification principles to classify plants into divisions based on observations of plant morphology and <i>metagenesis</i> and linking their role in the continuity of life on Earth. 3.8. Applying classification principles to classify animals into species based on anatomical and morphological observations and linking their roles in life 3.9. It analyzes information/data from various sources about the ecosystem and all the interactions that take place in it. 3.10. They are analyzing data on environmental changes and the impact of these changes on life.
4. Processing, reasoning, and presenting in concrete realms and abstract realms related to the development of what one learns at school independently and being able to use methods according to scientific rules	4.1. Present biological objects and problems at various levels of life organizations following scientific methods, paying attention to work safety aspects and presenting them as written reports. 4.2. I am presenting the results of identifying proposed efforts to conserve Indonesia's biodiversity based on data analysis on the preservation of various diversity of typical Indonesian animals and plants communicated in multiple forms of information media. 4.3. Presenting data on characteristics, replication, and the role of viruses in health aspects in the form of models/charts 4.4. Presenting data about the characteristics and roles of Archaeobacteria and eubacteria in life based on the results of graduation in the form of a written report 4.5. Plan and observe the characteristics and roles of Protista in Life and present the results of words as models/charts/pictures. 4.6. Presenting observational data on the characteristics and role of fungi in life and the environment in the form of a written report 4.7. Presenting data on morphology and the role of plants in various aspects of life in the form of a written report 4.8. Presenting data on the comparison of the complexity of the tissues that make up the animal body and their role in various aspects of life in the form of a written report 4.9. Design a chart about the interactions between ecosystem components and food webs that take place in ecosystems and present the results in various forms of media. 4.10. Solve environmental problems by designing waste recycling products and environmental preservation efforts.

Source: [Irnaningtyas, 2013](#).

Table 3. Class X Biology Textbook Content

Chapter	Main Material
Chapter 1: Scope of Biology	I. Biology as Science, II. Scientific Work, III. Conducting Simple Biological Research and Experiments, IV. Working in the Laboratory, V. Making Practicum Reports, VI. Objects and Variety of Biological Problems.
Chapter 2: Biodiversity	I. Biodiversity level, II. Ecosystem Type, III. Indonesian Biodiversity, IV. Disappearance of Biodiversity, V. Efforts to Preserve Biodiversity. VI. Classification of Living Things, Summary, Competency Test.
Chapter 3: Viruses	I. History of the discovery of viruses, II. Characteristics of the Virus Body, III. Ways of life and reproduction of Viruses, IV. Classification of viruses, V. The role of viruses in life, VI. Prevention and treatment of viral infections, VII. Virus Cultivation, VIII. Viroids and Prions, Summary, Competency Test.
Chapter 4: Archaeobacteria and Eubacteria	I. Understanding Archaeobacteria, Eubacteria, and bacteria, II. Characteristics of Bacteria, III. Gram-Positive Bacteria and Gram-Negative Bacteria, IV. The way of life of bacteria, V. Defense of bacteria in a bad environment, VI. Bacterial Reproduction, VII. Classification of Bacteria, VIII. The Role of Bacteria in Human Life. IX. Human Efforts in Overcoming Bacterial Hazards, XI. Cyanobacteria (Blue-green bacteria).
Chapter 5: Protists	I. Definition of Protists, II. Animal-like Protists (Protozoa), III. Plant-like protists (algae/algae), IV. Fungus-like protists (protist fungi), V. The role of protists in human life.
SEMESTER EXAMINATION 1	
Chapter 6: Mushroom (Fungi)	I. Characteristics of the mushroom body, II. Mushroom way of life and habitat, III. Fungal Reproduction, IV. Classification of Fungi, V. Symbiosis of Fungi with Other Organisms, VI. The Role of Mushrooms in Human Life. VII. Mushroom Breeding.
Chapter 7: The Plants (Plantae)	I. Definition of plants, II. Moss plants (Bryophyta), III. Ferns (Pteridophyta), IV Seed plants (Spemartophyta)
Chapter 8: Animal World (Animalia)	I. Definition of Animalia, II. Invertebrates, III. Chordata, Summary, Competency Test
Chapter 9: Ecology	I. Ecosystem components, II. Ecosystem Intercomponent Interaction, III. Energy Flow, IV. Ecological Pyramid, V. Productivity, VI. Biochemical Cycle, VII. Community Dynamics.
Chapter 10: Environmental Change and Preservation	I. Definition of Environment and Pollution, II. Accumulation of Pollutants in the Food Chain, III. Waste Handling, Summary, Competency Test.
EXERCISE SEMESTER 2	

Source: [Irnaningtyas, 2013](#).

Discussion

Objects and Scope of Biological Studies

The object of study of biology experiences development and complexity along with the development of living things in the world. Based on the organization of life, objects of biological research can be divided into the smallest to the largest: molecules, cells, tissues, organs, organ systems, individuals, populations, communities, ecosystems, biomes, and the biosphere. Each level has issues which are the themes of research and biological studies ([Irnaningtyas, 2013](#)).

[Semedi \(2020\)](#) mentions that biological protection is the main thing that must be considered. This is because living natural resources are significant for humanity as a support for life. This effort has been widely agreed upon in international forums such as *the Convention on Biological Diversity (CBD)*, which emphasizes the contribution of ecosystem services to health, livelihoods, and well-being ([Semedi, 2020](#)). Besides that, an agreement on biology curriculum standards in Indonesia is determined nationally through the Ministry of Education and Culture. Specifically, the textbooks provided refer to books made in the 2006 competency-based curriculum period. The material developed was similar. There were many changes to the KTSP, 2013 curriculum, and the independent curriculum so that the expected competence is still the same and has no significant difference other than the change in terminology and the expected standard naming.

[Erin \(2021\)](#), it is stated that one must depend on more than the textbook to gain a student's competency in a particular subject area. Instead, it is a dynamic learning

combination process between conducting classroom learning and direct practice in the field. For example, to have competence in biology lessons, students study in class to get plant physiology theory directly from the class teacher, but there is also time allocation ($\pm 20\%$) for students to carry out direct activities in the form of direct observations of plant physiology in the surrounding environment. Another example of competence in mathematics, students get information from textbooks delivered by class teachers, but also competence will increase when students get allocated time to directly apply theoretical mathematical calculations by being shopkeepers in a school canteen for 20% of the total lesson hours (Elin, 2021)

Conclusions

This study shows that the curriculum policies and biology education textbooks developed in Indonesia for class X SMA level do not have a significant difference. The differences emphasized in each curriculum since the post-reform era began with the issuance of Law Number 20 of 2003 concerning the National Education System show the same core material pattern. The curriculum policy applied in Indonesia for biology subjects has yet to make any substantive changes to the learning materials. Thus, biology education material derived from textbooks published by the private Erlangga institution reflects more of the author's thoughts and the spirit of policymakers who emphasize normative and administrative aspects to shape attitudes and behavior, not solely on the development and deepening of substantive elements of books: texts and biology learning materials for class X high school. The findings from this study indicate that biology education materials for high schools in Indonesia reflect more on what is contained in textbooks, and curriculum policies reflect the knowledge of the younger generation of Indonesian students about the understanding of biology they receive.

Declaration statement

The authors reported no potential conflict of interest.

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