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ANALYSIS OF STUDENTS' SCIENCE TEXTBOOKS ON THE SECONDARY SCHOOL LEVEL FOR SCIENTIFIC LITERACY CONTEXT IN HEALTH AND DISEASE TOPICS

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ABSTRACT

Textbooks are one of the media used in learning science. This study aims to analyze the Indonesian textbooks on health and disease in terms of scientific literacy and socio-scientific issues in content, context, and assessment. The analysis used the review method in the food and digestive system sub-chapter found in eighth graders. It found that the content and context subchapter contains the scientific literacy competency and socio-scientific issues related to Indonesian students' daily lives. While the assessment contains scientific literacy with low to high cognitive demand, it lacks socio-scientific issues. Also, the inquiry aspect of this textbook only contains guided inquiry and lacks open inquiry. Therefore, teachers can adjust that guided inquiry to open inquiries because the curriculum does not prohibit this. This study proposes a learning strategy to improve the ability of students in the scientific literacy aspect to face PISA 2025, with some limitations on analyzing textbooks and the curriculum used nowadays.

Keywords: *students' science textbooks, book analysis, science education, kurikulum merdeka*

INTRODUCTION

Indonesian students get textbooks for every subject in all courses. The used of the textbooks as the representations of the content that students going to learn at their grade (Sikorová, 2011). The quality of the textbooks result on the output of the learning (Heyneman et al., 1981). The use of the textbooks is expected by the provider to assisst teachers to achieve the effectiveness and flexibility in teaching (Rachmawati, 2020). However, many teachers convinced the textbooks are not determine how they teach and they do not

believe that the textbooks must guarantee the content selection. Therefore, teachers developed the worksheets by themselves by considering of students needs (Stará et al., 2017). It is because there are the significant gap between the textbooks and practical infrastructure in the schools (Amalia et al., 2023).

By the textbooks, the education system can be improved by convinced the criteria of adopting a broader view of the curriculum, engaging in participatory decision-making processes, critically analyzing the values presented in textbooks, and fostering character education by embedding positive values within textbooks and other activities, both planned and those that shape the hidden curriculum (Jazadi, 2015).

The content analysis has been conducted by previous study. The analysis of the physics textbooks in high-school level about the presentation of the laboratory activities among grade X, XI, and XII (Gumilar & Ismail, 2023). In junior high school level of "*KTSP 2006*" and "*Kurikulum 2013*" among grade VII, VIII, and IX, the analysis of the image in science textbooks and the analyzing the types and functions of images used in science textbooks, the level of formality in the visuals, the genre of main text passages, and the types of processes represented. This paper also explores the interpersonal dimension of science by analyzing pronoun use to address readers, examining represented participants, including whether they engage the reader's gaze, and assessing the positioning of images in relation to their interactive participants (Hermawan & Rahyono, 2019). Therefore, this study analyze into junior high school students textbooks in health and disease topics. Nevertheless, the analysis of the textbooks conducted by Nomoto and Colleagues (2011) about content analysis on health topics shows that most of them provide insufficient content, lack information, and are outdated information. However, the content analysis not intend to national textbooks from national curriculum. Therefore, this study analyzes the national textbooks on science subjects regarding health and disease topics.

This study aims to identify the aspects of scientific literacy and socio-scientific issues in Indonesian science textbooks in relation to secondary health and disease topics. The benefits of this study are to provide the information to instructors that Indonesian secondary textbooks are the choices to improve students' scientific literacy, if the instructors follow the guidance from the teacher textbooks.

METHODS

This study used a qualitative approach, which analyzed the books that evaluated the aspect of scientific literacy and socio-scientific issues in health and disease topics. The topics align with future scientific literacy PISA 2025, and the content and assessment analyzed by considering the competency of PISA 2025 that requires students to have the ability to "Explain phenomena scientifically", "Construct and Evaluate Designs for Scientific Inquiry and Interpret Scientific Data and Evidence Critically", and "Research, Evaluate

and Use Scientific Information for Decision-Making and Action." (OECD, 2023).

RESULTS AND DISCUSSION

The chapter that focuses on health and disease is titled "Structure and Function of Living Organisms." This section highlights the significance of a healthy lifestyle, beginning with understanding calorie intake, eating habits, nutritional knowledge, and body functions. Adopting a healthy lifestyle greatly influences overall well-being. Additionally, the chapter stresses the importance of recognizing issues identified through scientific and technological advancements, as these impact society. Students are encouraged to conduct observations and research to create a practical guide promoting a healthy lifestyle.

The first sub-chapter on the structure and function of living organisms analyzes the food and digestive systems among humans. The analysis represents content, context, and assessment regarding the sub-chapter related to scientific literacy and socio-scientific issues. Also, PISA 2025 scientific literacy competencies analyze that aspect in this sub-chapter. Those aspects are analyzed in Table 1.

Table 1. The aspect of food and digestive system sub-chapter

	Content	*Context*	*Assessment*
Scientific literacy	yes	yes	yes
Socio-scientific issues	yes	yes	no

The textbooks started with the "you are what you eat" in the food and digestive system. In the textbooks, students are allowed to choose two types of food. Those types of food are related to most students' daily lives in Indonesia. After that, the food chosen by students is explained, along with the implications of each food. Also, students must be educated about the food they eat daily, including the nutrition and the consequences for the future. An example of the food and digestive system sub-chapters content related to socio-scientific issues is shown in Figure 1,

Figure 1. The content relates to scientific literacy and socio-scientific issues

This sub-chapter contains content related to scientific literacy, especially to PISA 2025 scientific literacy competencies. This content emphasizes interpreting nutrition information in packaged food. It explains how to interpret the data in terms of serving size, total energy, and percentage of daily nutritional value or percentage of daily recommended intake.

The scientific literacy competencies in this sub-chapter are analyzed based on PISA 2025 competencies. OECD (2023) state the scientific literacy competencies in PISA 2025 are "Explain phenomena scientifically", "Construct and Evaluate Designs for Scientific Inquiry and Interpret Scientific Data and Evidence Critically", and "Research, Evaluate and Use Scientific Information for Decision-Making and Action."

The competency of "Construct and Evaluate Designs for Scientific Inquiry and Interpret Scientific Data and Evidence Critically" is also required in this sub-chapter. Nevertheless, this student activity only required students to interpret the data based on the textbooks. Also, the students need to answer the questions provided by the worksheets. This activity concerns the percentage of egg whites digested by pepsin enzyme and HCL. Students were required to interpret the data about the percentage of egg whites digested in the stomach in eight hours and twenty hours and ask about the protein that was digested only in the stomach. Students' activity about "Construct and Evaluate Designs for Scientific Inquiry and Interpret Scientific Data and Evidence Critically" competency is shown in Figure 2.

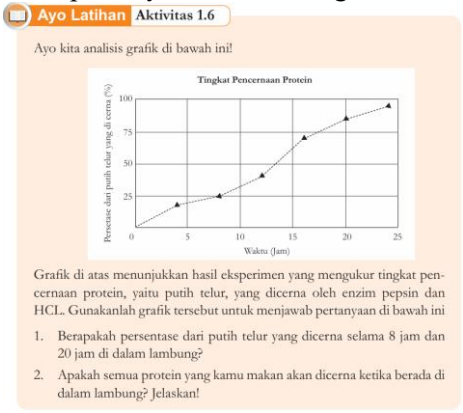
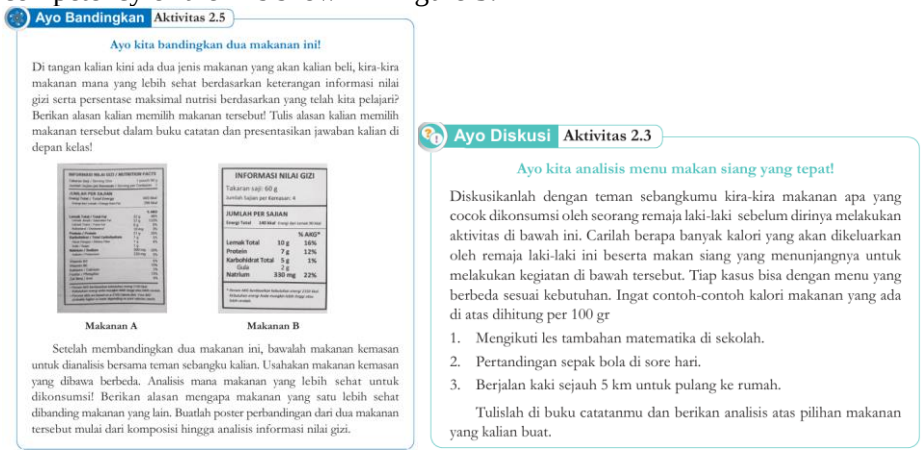


Figure 2. Students activity in "Construct and Evaluate Designs for Scientific Inquiry and Interpret Scientific Data and Evidence Critically" competency

The textbook does not ask students to construct and evaluate a design for scientific inquiry competency in this activity. Additionally, the activity in the food and digestive system sub-chapter lacks the emphasis on the inquiry skills of students and "explain phenomena scientifically" competencies. However, this sub-chapter have another PISA 2025 scientific literacy competency that more emphasize on "Research, Evaluate and Use Scientific Information for Decision-Making and Action". One of them is a student activity that compares

two kinds of food based on nutritional information and decides which food is better in terms of nutrition. The students' activity that relates to this competency of them is shown in Figure 3.



Ayo Bandingkan Aktivitas 2.5

Ayo kita bandingkan dua makanan ini!

Di tangan kalian kini ada dua jenis makanan yang akan kalian beli, kira-kira makanan mana yang lebih sehat berdasarkan keterangan informasi nilai gizi serta persentase maksimal nutrisi berdasarkan yang telah kita pelajari? Berikan alasan kalian memilih makanan tersebut! Tulis alasan kalian memilih makanan tersebut dalam buku catatan dan presentasikan jawaban kalian di depan kelas!

Makanan A Makanan B

Setelah membandingkan dua makanan ini, bawalah makanan kemasan untuk dianalisis bersama teman sebangku kalian. Usahakan makanan kemasan yang dibawa berbeda. Analisis mana makanan yang lebih sehat untuk dikonsumsi! Berikan alasan mengapa makanan yang satu lebih sehat dibanding makanan yang lain. Buatlah poster perbandingan dari dua makanan tersebut mulai dari komposisi hingga analisis informasi nilai gizi.

Ayo Diskusi Aktivitas 2.3

Ayo kita analisis menu makan siang yang tepat!

Diskusikanlah dengan teman sebangkumu kira-kira makanan apa yang cocok dikonsumsi oleh seorang remaja laki-laki sebelum dirinya melakukan aktivitas di bawah ini. Carilah berapa banyak kalori yang akan dikeluarkan oleh remaja laki-laki ini beserta makan siang yang menunjangnya untuk melakukan kegiatan di bawah tersebut. Tiap kasus bisa dengan menu yang berbeda sesuai kebutuhan. Ingat contoh-contoh kalori makanan yang ada di atas dihitung per 100 gr

1. Mengikuti les tambahan matematika di sekolah.
2. Pertandingan sepak bola di sore hari.
3. Berjalan kaki sejauh 5 km untuk pulang ke rumah.

Tulislah di buku catatanmu dan berikan analisis atas pilihan makanan yang kalian buat.

Figure 3. Students activity in "Research, Evaluate and Use Scientific Information for Decision-Making and Action" competency

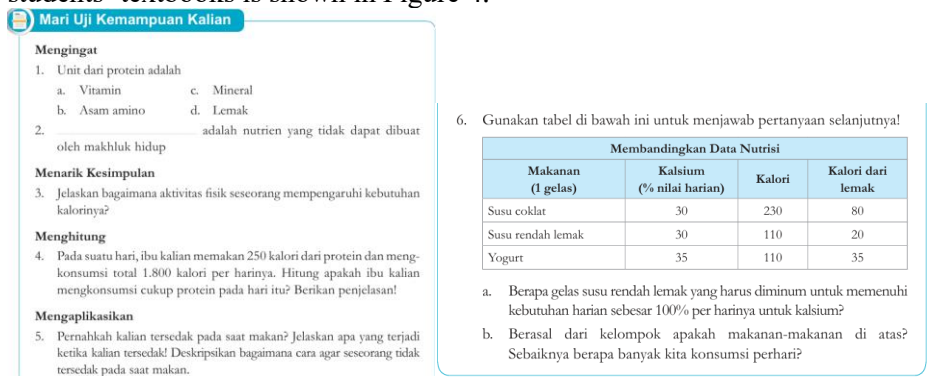
This student activity is suitable for "Research, Evaluate and Use Scientific Information for Decision-Making and Action" competency because before students choose better nutrition food, they must analyze the amount per serving, such as the amount of fat, protein, and carbohydrate. In this activity, students are required to analyze the reason that they chose the food.

Another student's activity that contains "Research, Evaluate and Use Scientific Information for Decision-Making and Action" competency also exists. In this activity, students discover the calories adolescents spend on several activities, such as mathematics courses after school, football competitions in the afternoon, and walking for 5 Km to go home. After that, students are required to find suitable food to fulfill the calories from the activities.

These student activities suit the "Research, Evaluate and Use Scientific Information for Decision-Making and Action" competency. In this activity, students are required to find the amounts of calories by the boy and choose the food that is suitable for his activity by researching finding the amounts of calories that are produced, evaluating each of the suitable food, until deciding the food that fulfills the quantities of calories requirements.

In the assessment aspect of this sub-chapter requires the students' ability in inquiry skills. Additionally, the assessment aspect includes lower-order thinking skills and higher-order thinking skills. The skills in the assessment are remembering, taking the conclusion, calculating, and applying. In the assessment, there is part of scientific literacy and socio-scientific issues. In scientific literacy, the assessment contains questions that match the PISA 2025 scientific literacy competencies, such as interpreting data, inquiry skills, and others. While socio-scientific issues do not exist in this assessment, it is

because there are no questions that highlight the societal issues that relate to Indonesia this question. The detail of the assessment of this sub-chapter in students' textbooks is shown in Figure 4.



Mari Uji Kemampuan Kalian

Mengingat

1. Unit dari protein adalah
   a. Vitamin c. Mineral
   b. Asam amino d. Lemak
2. _____ adalah nutrien yang tidak dapat dibuat oleh makhluk hidup

Menarik Kesimpulan

3. Jelaskan bagaimana aktivitas fisik seseorang mempengaruhi kebutuhan kalorinya?

Menghitung

4. Pada suatu hari, ibu kalian memakan 250 kalori dari protein dan mengkonsumsi total 1.800 kalori per harinya. Hitung apakah ibu kalian mengkonsumsi cukup protein pada hari itu? Berikan penjelasan!

Mengaplikasikan

5. Pernahkah kalian tersedak pada saat makan? Jelaskan apa yang terjadi ketika kalian tersedak! Deskripsikan bagaimana cara agar seseorang tidak tersedak pada saat makan.

6. Gunakan tabel di bawah ini untuk menjawab pertanyaan selanjutnya!

Membandingkan Data Nutrisi

Makanan (1 gelas)	Kalsium (% nilai harian)	Kalori	Kalori dari lemak
Susu coklat	30	230	80
Susu rendah lemak	30	110	20
Yogurt	35	110	35

a. Berapa gelas susu rendah lemak yang harus diminum untuk memenuhi kebutuhan harian sebesar 100% per harinya untuk kalsium?

b. Berasal dari kelompok apakah makanan-makanan di atas? Sebaiknya berapa banyak kita konsumsi perhari?

Figure 4. The assessment represented in the food and digestive system

CONCLUSION

The analysis shows that Indonesian students' science textbooks, provided by the government through the Ministry of Education, support their scientific literacy improvement. The textbook analysis of the textbooks is about content, context, and assessment, which contain the aspect of scientific literacy and socio-scientific issues. However, it found that there are several lackness of the sub-chapter, such as the inquiry aspect that most of them are guided inquiry and lack of open inquiry. Therefore, the Students are not given the opportunity to ask questions in the books to show their curiosity.

This study is limited to one of the sub-chapters: the food and digestive system in *Kurikulum Merdeka*, which is used by most national and private schools in Indonesia nowadays. Therefore, this study implicates researchers or teachers about their learning strategy, which used the Indonesian students' science textbooks. For future research, this is open to reviewing other topics regarding PISA 2025 to analyze other levels of students' textbooks and curriculum.

REFERENCES

Amalia, S. R., Fatkhurrohman, I., & Utaminingsih, S. (2023). Need Analysis of the Science Textbooks. *Asian Journal of Assessment in Teaching and Learning*, *13*(2), 102–105.

Gumilar, S., & Ismail, A. (2023). The Representation of Laboratory Activities in Indonesian Physics Textbooks: A Content Analysis. *Research in Science and Technological Education*, *41*(2), 614–634. https://doi.org/10.1080/02635143.2021.1928045

Hermawan, B., & Rahyono, F. X. (2019). Ideational Meanings of Science and Interpersonal Position of Readers in Science Textbooks for Basic Level in Indonesia. *Indonesian Journal of Applied Linguistics*, *9*(1), 38–47.

https://doi.org/10.17509/ijal.v9i1.15932

Heyneman, S. P., Farrell, J. P., & Sepulveda-Stuardo, M. A. (1981). Textbooks and Achievement in Developing Countries: What We Know. *Journal of Curriculum Studies*, *13*(3), 227–246. https://doi.org/10.1080/0022027810130306

Jazadi, I. (2015). Character-Based curriculum and Textbook Development in Indonesia: A Critical Review. *SOSIOHUMANIKA: Jurnal Pendidikan Sains Sosial Dan Kemanusiaan*, *8*(2), 313–330.

Nomoto, M., Nonaka, D., Mizoue, T., Kobayashi, J., & Jimba, M. (2011). Content Analysis of School Textbooks on Health Topics: A Systematic Review. *BioScience Trends*, *5*(2), 61–68. https://doi.org/10.5582/bst.2011.v5.2.61

OECD. (2023). *Pisa 2025 Science Framework*. *May 2023*, 1–93.

Rachmawati, U. (2020). Scientific Approach-Based Textbooks Evaluation: A Content Analysis of English Textbooks on Reflective Teaching in Indonesia. *1st Borobudur International Symposium on Humanities, Economics and Social Sciences*, *436*, 655–660. https://doi.org/10.2991/assehr.k.200529.137

Sikorová, Z. (2011). The Role of Textbooks in Lower Secondary Schools in the Czech Republic. *IARTEM E-Journal*, *4*(2), 1–22. https://ojs.bibsys.no/index.php/IARTEM/article/view/774

Stará, J., Chvál, M., & Starý, K. (2017). The Role of Textbooks in Primary Education. *E-Pedagogium*, *17*(4), 60–69. https://doi.org/10.5507/epd.2017.053