JPPIPA 9(2) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Validity of Science Module with the Collaborative Based Science Learning Model to Improve Critical Thinking Skills and Decision Making Skills

Muhammad Aditya Saputra[1*], Sutarto Hadi[1], Arif Sholahuddin[1], Ai Sulastri[1], Muhammad Hasbie[1], Mohamad Nor Aufa[1], Muhammad Awaluddin Fitri[1]

[1] Master Science Education, Lambung Mangkurat University, Indonesia.

Received: November 22, 2022
Revised: February 19, 2023
Accepted: February 25, 2023
Published: February 28, 2023

Corresponding Author:
Muhammad Aditya Saputra
aditspt30@gmail.com

DOI: 10.29303/jppipa.v9i2.2496

Abstract: Students in schools use techniques to keep up with the increasingly rapid development of the times. A module is the learning media. Lessons will be easier for students to understand if teaching materials are simple, practical, and relevant. However, activity in living things is still regarded as unsuitable learning material. This is because presenting the characteristics of objects to students in real terms can also be challenging. As a consequence, research and development of teaching materials for class VIII SMP/MTs based on critical thinking and decision-making skills are carried out in motion modules on living things. The goal of this research and development is to validate SMP/MTs class modules in order to improve critical thinking and decision-making skills. The Tessmer Formative evaluation development model is used in this type of research. Aspects of validity include content, presentation, and language. The research data were analyzed descriptively into categories. The results show that the CBSL module developed is in a very valid category with a value of 3.51, implying that this module appears to follow the objectives of learning science and is technically very feasible to be used as a science learning resource.

Keywords: CBSL; Critical thinking; Decision making; Module

Introduction

Education affects everyday life and the future. Although there are always changes in various areas of life along with the times, one field that is changing rapidly is education. The development of the world of education, of course, invites several problems, including the difficulty of changing the pattern of learning that has been teacher-centered to become student-centered in the 2013 curriculum (Puspita, 2016).

This framework is a foundation of competencies that students must master as a provision for success in life and careers in the future (Ariyana et al., 2018), namely mastering learning and innovation skills (critical, creative, problem-solving, collaborative, communicative), life and career skills (responsible, social, tolerant, productive, adaptive, etc.), and skills in using media, information, and technology (Akilli et al., 2017; Pešaković et al., 2014; Redhana, 2019).

Based on Permendikbud No. 22 of 2016, the current 2013 curriculum requires teachers to apply learning that guides students to have 4C competencies: communication, creative thinking, critical thinking, and collaboration. Furthermore, the government has made various efforts and policies in order to improve the quality of education, including improving the curriculum, eliminating school fees for elementary and junior high school students, carrying out activities that can improve thinking skills, completing facilities and infrastructure such as science laboratories, computer laboratories, libraries, and many more supporting facilities and infrastructure, updating learning models and methods, holding certification, upgrading and teacher seminars. In addition, in 2010, the government

How to Cite:
Saputra, M.A., Hadi, S., Sholahuddin, A., Sulastri, A., Hasbie, M., Aufa, M.N., & Fitri, M.A. (2023). The Validity of Science Module with the Collaborative Based Science Learning Model to Improve Critical Thinking Skills and Decision-Making Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 639–644. https://doi.org/10.29303/jppipa.v9i2.2496

aggressively carried out Character Education activities future (Ariyana et al., 2018).

This indicates that there must be a change in the perspective of educators regarding the process of building a generation of thinkers who are adaptive to developments in life in the 21st century, where globalization occurs on a large scale, the development of automation, the rapid flow of information and an increasingly competitive work climate. The development of critical thinking skills and decision-making skills is one of the main objectives of learning science and one of the demands of the 2013 SMP/MTs Science Curriculum in order to produce a quality generation of Indonesians (Suryanti et al., 2018; Zulmaulida et al., 2018). At this time, students must have superior competence in the global era competition with various 21st-century skills, one of which is critical thinking skills and decision-making. Graduate achievements are carried out through a learning process that integrates students' critical thinking and decision-making skills in scientific investigations, decision-making, and solving real-life problems (Kemendikbud, 2016).

Critical thinking skills are a reflective thinking process that is logical and focuses on efforts to assist students in interpreting, analyzing, evaluating, and making inferences and Explanation (Mundilarto et al., 2017; Vong et al., 2017; Zulfaneti et al., 2018). As a result, critical thinking is a process for making decisions in order to be able to think at a high level in solving a problem by thinking seriously, actively, and carefully in analyzing all information received by including rational reasons (Prasasti et al., 2019).

One of the skills in solving problems is decision-making skills. The importance of decision-making skills has also become the goal of learning natural sciences (IPA) starting from the school level. Decision-making is a process of deciding what action to take or perform, usually involving a choice. Therefore, decision-making can be interpreted as a process of thinking by using reasoning to identify good choices from bad choices according to predetermined criteria to make decisions and act. The steps in decision-making, in general, are formulating problems, gathering relevant information, building options, evaluating options, and making decisions (Adair, 2007; Soenarko et al., 2018; Suryanti, 2012; Zakrah et al., 2015).

The findings of preliminary research on critical thinking abilities of SMPN 6 Banjarmasin students show that: (1) 48% of students have difficulty in giving simple explanations; (2) 37.33% of students experience difficulties in building basic skills; (3) 39.93% It is difficult for students to provide further explanations; (4) 45.17% of students have difficulty managing strategies and tactics (Aufa et al., 2021).

According to the findings of interviews and observations conducted by researchers with several science teachers at SMPN 6 Banjarmasin, in general, teaching materials prepared by teachers do not meet the demands of 21st-century learning competencies and the 2013 curriculum because developing teaching materials remains difficult. This is consistent with research. (Makhrus et al., 2019). The assessment results of teachers' teaching materials range from 33% to 66%, so there is still a need for improvement. The teaching materials already include ability to think critically in their presentation, but they do not cover all aspects of critical thinking skills. What's more, the study's findings Sari et al. (2019) show that several factors contribute to academic difficulties in science subjects for SMP/MTs, together with: (1) difficulty understanding school textbooks (35.76%); (2) a lack of learning media (10.22%); and (3) a lack of other book sources (5.84%).

To answer the challenges of the 21st century and solve students' problems in developing critical thinking and decision-making skills in scientific learning. One alternative solution is the existence of science teaching materials that can be used as learning media for teachers to carry out their roles in the learning process (Asrizal et al., 2017). Based on the explanation of the problems above, the researcher wants to conduct module development research using the CBSL model to improve the critical thinking and decision-making skills of SMP/MTs students.

Method

This type of research is education development research or Education Design Research (EDR). Educational Design Research is systematic research in designing, developing, and evaluating educational interventions (such as plans, learning strategies, teaching materials, products, and systems) to solve existing problems (McKenney et al., 2014). The population in this study were students of class VIII SMP, while the research sample was students of Public Junior High School 5 Banjarmasin. Sampling using non-probability sampling with purposive sampling technique.

The validators in this study consisted of two lecturers from Lambung Mangkurat University and one science teachers from Public Junior High School 5 Banjarmasin. Data collection techniques were carried out through documentation, walkthroughs, and questionnaires. This documentation aims to collect various supporting documents to develop science module. The walkthrough is the evaluation stage of the validator to determine the validity of the science module in terms of content, language, and presentation. Finally, a practicality questionnaire will be given to nine students to determine student assessments to identify

possible errors such as poor grammar, wrong spelling, punctuation, unclear instructions, material system, and ease of use, attractiveness, and student satisfaction. The data analysis technique consisted of descriptive data analysis, validation, and questionnaire. Descriptive data analysis was carried out by analyzing the data collected from the validation sheet and questionnaire documentation. Data analysis of validation sheets and questionnaires was carried out by processing the values obtained at the expert validation stage and product practicality testing. A formula can determine the validity of the science module.

Module Validation with the CBSL Model

Analysis of the results of expert validation was implemented in order to determine the module's validity from three points of view, namely content, presentation, and language. The module is said to be valid if it obtains at least 70%, while the calculation is as follows.

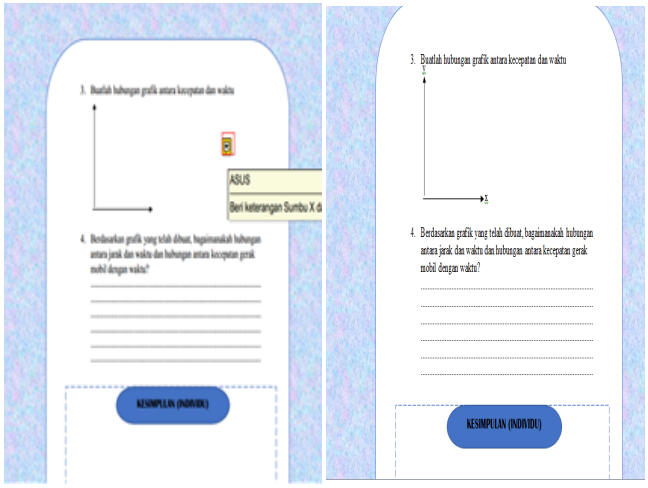
Table 1. Validity Criteria (Akbar, 2016)

Percentage Interval	Validation Description
3.25< P≤ 4.00	Very valid
2.50< P≤ 3.25	Valid
1.75< P≤ 2.50	Less valid
1.00≤ P≤ 1.75	Invalid

Result and Discussion

Developing the "movement in living things" module goes through certain stages and rules from Tessmer's development model. One of the important stages of developing teaching materials is testing product validity. Mulyatiningsih (2016) states that the development of learning resources must pass a content and readability test by the experts involved in assessing the design and the students who will use it. Product validation is carried out so that product deficiencies can be identified and appropriate teaching products can be produced (Andira et al., 2021; Rahmi et al., 2020). According to Sugiyono (2010) and Hidayati (2016), expert validation is helpful for obtaining input, suggestions, and comments so that product development can meet user needs.

The validity test is designed to evaluate the product's compatibility with the learning objectives that students must achieve. Three aspects are considered in the validity test, namely the content validity test, presentation validity test, and language validity test. Based on the suggestions and input from experts at the validity test stage, module revisions still need to be carried out on the aspects of meaningfulness, clarity, and way of presentation.



(a) (b)

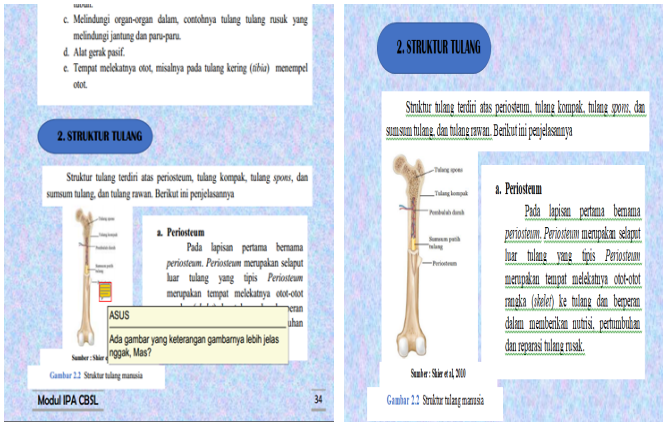
Figure 1. Changes to the CBSL module. (a) Before revision; (b) After revision

The data processing results from expert validation of the CBSL module product "movement in living things" to improve critical thinking skills and decision-making show very valid criteria with a value of 3.77. This shows that the module developed follows the learning objectives to be achieved by students. Furthermore, according to Mulyadi (2016), the material's suitability increases the interest in learning, motivation, and the user's desire to learn the material presented in the developed teaching materials.

Table 2. The Result of the Validity of the Module with CBSL

Module Validation	Validity	Category
Content	3.49	Very Valid
Presentation	3.73	Very Valid
Language	3.30	Very Valid
Average	3.51	Very Valid

Shows module validation results on content, presentation, and language aspects with very good categories. In general, suggestions from the validator contain improvements to writing and displaying images. Thus, the developed module meets content validity criteria, presentation, and language. The module is defined as one of the teaching materials that are systematically arranged and designed so that students achieve specific learning goals. In this case, the learning objectives are described in learning indicators (Mensan et al., 2020; Sesya et al., 2014; Wiwita et al., 2020). Validation results the table shows that the module meets the validity criteria.



(a) (b)

Figure 2. Revision replaces a clearer and more real image. (a) Before revision; (b) After revision

Figure 2 is changed to a picture or photo that is contextual, real, and close to the lives of educators and students. The image or photo is useful so that the module is meaningful to the user. Using real, colorful, and well-known images in teaching materials will provide real experience in improving students' critical thinking skills (Riefani et al., 2020).

The process of making and developing this module pays attention to the characteristics that a module must have: self-instructional, self-contained, stand-alone, adaptive, and user-friendly, in addition to paying attention to the principles of developing a teaching material including needs analysis, development of teaching material design, implementation, assessment, evaluation, and validation as well as quality assurance. The module also includes the CBSL model syntax, which is expected to improve students' critical thinking skills and decision-making.

The developed module is intended as additional reference material for students to enrich their knowledge. In line with Siska et al. (2015) that the purpose of the module is so that learning objectives can be achieved effectively and efficiently; students participate in educational programs according to their learning speed, each learning independently, assessing and knowing their learning outcomes continuously and systematically. As a result, the module is regarded as an effective teaching tool that teachers and students can use to ensure that learning proceeds in a systematic manner. Modules can also work on improving the pedagogical aspects of teaching' and students' independence in teaching science items.

Conclusion

The validity of authentic learning-based modules on energy material in living systems to train science process skills and scientific attitudes in material, language, presentation, and graphic aspects is in the valid category. Further research can be conducted to look at science process skills, scientific activities, and responsibilities. This is because the CBSL model is designed to improve critical thinking skills, decision-making and science process skills, scientific activity, and responsibility.

References

Adair, J. E. (2007). *Decision making & problem solving strategies*. Kogan Page Publishers.

Akbar, T. N. (2016). Pengembangan multimedia interaktif IPA berorientasi guided inquiry pada materi sistem pernapasan manusia kelas V SDN Kebonsari 3 Malang. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *1.6*(6), 1120–1126. https://doi.org/10.17977/jp.v1i6.6456

Akilli, M., & Genç, M. (2017). Modelling the effects of selected affective factors on learning strategies and classroom activities in science education. *Journal of Baltic Science Education*, *16*(4), 599–611. https://doi.org/10.33225/jbse/17.16.599

Andira, N., Noorhidayati, N., & Riefani, M. K. (2021). Kelayakan Buku Panduan Lapangan "Keanekaragaman Pohon di Lingkungan Kampus Universitas Lambung Mangkurat" sebagai Sumber Belajar Mandiri Konsep Keanekaragaman Hayati. *Wahana-Bio: Jurnal Biologi Dan Pembelajarannya*, *13*(1), 19. https://doi.org/10.20527/wb.v13i1.11318

Ariyana, Y., Pudjiastuti, A., Bestary, R., & Zamromi. (2018). *Buku Pegangan Pembelajaran Berorientasi pada Keterampilan Berpikir Tingkat Tinggi: Program Peningkatan Kompetensi Pembelajaran Berbasis Zonasi*. Direktorat Jendral Guru Dan Tenaga Kependidikan.

Asrizal, A., Festiyed, F., & Sumarmin, R. (2017). Analisis Kebutuhan Pengembangan Bahan Ajar IPA Terpadu Bermuatan Literasi Era Digital untuk Pembelajaran Siswa SMP kelas VIII. *Jurnal Eksakta Pendidikan (JEP)*, *1*(1), 1. https://doi.org/10.24036/jep/vol1-iss1/27

Aufa, M. N., Hadi, S., Syahmani, Hasbie, M., Fitri, M., Saputra, M. A., & Isnawati. (2021). Profile of students' critical thinking, creativity, and collaboration skills on environmental pollution material. *Journal of Physics: Conference Series*, *1760*(1), 012027. https://doi.org/10.1088/1742-6596/1760/1/012027

Hidayati, N. (2016). Pengembangan Perangkat Pembelajaran Ipa Topik Energi Dalam Sistem Kehidupan Di Madrasah Tsanawiyah. *JINoP (Jurnal Inovasi Pembelajaran)*, *2*(2), 389. https://doi.org/10.22219/jinop.v2i2.3283

Kemendikbud. (2016). *Salinan lampiran peraturan menteri pendidikan dan kebudayaan nomor 21 tahun 2016*

tentang Standar Isi Pendidikan Dasar Dan Menengah. Kemdikbud.

Makhrus, M., Harjono, A., Syukur, A., Bahri, S., & Muntari, M. (2019). Identifikasi Kesiapan LKPD Guru Terhadap Keterampilan Abad 21 Pada Pembelajaran IPA SMP. *Jurnal Ilmiah Profesi Pendidikan*, *3*(2), 124–128. https://doi.org/10.29303/jipp.v3i2.20

McKenney, S., & Reeves, T. C. (2014). Educational Design Research. In *Handbook of Research on Educational Communications and Technology* (pp. 131–140). Springer New York. https://doi.org/10.1007/978-1-4614-3185-5_11

Mensan, T., Osman, K., & Majid, N. A. A. (2020). Development and Validation of Unplugged Activity of Computational Thinking in Science Module to Integrate Computational Thinking in Primary Science Education. *Science Education International*, *31*(2), 142–149. https://doi.org/https://www.icaseonline.net/journal/index.php/sei/article/view/194

Mulyadi, E. (2016). Penerapan Model Project Based Learning untuk Meningkatan Kinerja dan Prestasi Belajar Fisika Siswa SMK. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *22*(4), 385. https://doi.org/10.21831/jptk.v22i4.7836

Mulyatiningsih, E. (2016). *Pengembangan Model Pembelajaran*. http://staffnew.uny.ac.id/upload/131808329/pengabdian/7cpengembangan-model-pembelajaran.pdf

Mundilarto, & Ismoyo, H. (2017). Effect of problem-based learning on improvement physics achievement and critical thinking of senior high school student. *Journal of Baltic Science Education*, *16*(5), 761–780. https://www.ceeol.com/search/article-detail?id=969855

Pešaković, D., Flogie, A., & Aberšek, B. (2014). Development and evaluation of a competence-based teaching process for science and technology education. *Journal of Baltic Science Education*, *13*(5), 740–755. https://doi.org/10.33225/jbse/14.13.740

Prasasti, D. E., Koeswanti, H. D., & Giarti, S. (2019). Peningkatan Keterampilan Berpikir Kritis Dan Hasil Belajar Matematika Melalui Model Discovery Learning Di Kelas Iv Sd. *Jurnal Basicedu*, *3*(1), 174–179. https://media.neliti.com/media/publications/278114-peningkatan-keterampilan-berpikir-kritis-3456168c.pdf

Puspita, H. J. (2016). Implementasi Pembelajaran Tematik Terpadu Pada Kelas Vb Sd Negeri Tegalrejo 1 Yogyakarta. *Jurnal Pendidikan Guru Sekolah Dasar*, *5*(9), 884–893. https://journal.student.uny.ac.id/index.php/pgsd/article/view/1344

Rahmi, F., Noorhidayati, N., & Riefani, M. K. (2020). The Validity of the Human Circulatory System Concepts Handout at Class XI IPA SMAN 6 Banjarmasin. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan*, *2*(1), 14. https://doi.org/10.20527/bino.v2i1.7885

Redhana, I. W. (2019). Mengembangkan Keterampilan Abad Ke-21 dalam Pembelajaran Kimia. *Jurnal Inovasi Pendidikan Kimia*, *13*(1). https://journal.unnes.ac.id/nju/index.php/JIPK/article/view/17824

Riefani, M. K., & Mahrudin. (2020). Validitas Panduan Lapangan (Field Guide) Matakuliah Zoologi Vertebrata Materi Aves. *Prosiding Seminar Nasional Lingkungan Lahan Basah*, *5*(April), 63–69. https://snllb.ulm.ac.id/prosiding/index.php/snllb-lit/article/view/371

Sari, N. F., Ritonga, N., & Gultom, H. S. (2019). Analisis kesulitan belajar peserta didik SMP Negeri Se-Kecamatan Medan Kota pada materi biologi melalui peta konsep dan angket. *Jurnal Pendidikan Biologi Nukleus*, *5*(2), 40–48. https://doi.org/10.36987/jpbn.v5i2.1331

Sesya, P. R. A., & Lisdiana. (2014). Pengembangan Modul Fenotif materi sistem pertahanan tubuh di SMA. *Unnes Journal of Biology Education*, *1*(1), 1–8. https://doi.org/10.15294/jbe.v3i3.4531

Siska, P., & Jumadi. (2015). Pengembangan Modul IPA SMP Berbasis Guided Inquiry untuk Meningkatkan Keterampilan Proses dan Sikap Ilmiah. *Jurnal Pendidikan Matematika Dan Sains*, *3*(1), 79–90. https://journal.uny.ac.id/index.php/jpms/article/view/7239/6238

Soenarko, I. G. K., Andayani, Y., & Junaidi, E. (2018). Keterampilan Pengambilan Keputusan dan Hasil Belajar Kimia Siswa di SMA/MA Negeri Mataram Ditinjau Dari Penerapan Metode Pembelajaran. *Jurnal Pijar Mipa*, *13*(2), 86–89. https://doi.org/10.29303/jpm.v13i2.462

Sugiyono. (2010). *Pendidikan Dekat Kualitatif, dan R&D*. Alfabeta.

Suryanti. (2012). *Profil Kemampuan Berpikir Pengambilan Keputusan Berdasarkan IPA Ssiwa SD*. Unesa University Press.

Suryanti, Arifin, I. S. Z., & Baginda, U. (2018). The Application of Inquiry Learning to Train Critical Thinking Skills on Light Material of Primary School Students. *Journal of Physics: Conference Series*, *1108*(1), 1–8. https://doi.org/10.1088/1742-6596/1108/1/012128

Vong, S. A., & Kaewurai, W. (2017). Instructional model development to enhance critical thinking and critical thinking teaching ability of trainee students at regional teaching training center in Takeo

province, Cambodia. *Kasetsart Journal of Social Sciences*, *38*(1), 88–95. https://doi.org/10.1016/j.kjss.2016.05.002

Wiwita, L., Marice, & Hadi, W. (2020). Validation of Experts to the Module Writing Short Text Based on Character Education in Class XI Students of SMA Negeri 1 Pangkalan Susu. *Britain International of Linguistics Arts and Education (BIoLAE) Journal*, *2*(1), 422–435. https://doi.org/10.33258/biolae.v2i1.213

Zakrah, Z., Lestari, N., & Kusmiyati, K. (2015). Pengaruh Strategi Pembelajaran Discovery terhadap Kemampuan Berpikir Kritis Siswa pada Mata Pelajaran IPA Kelas VIII di SMPN 3 Gunungsari Tahun Ajaran 2014/2015. *Jurnal Pijar Mipa*, *10*(2). https://doi.org/10.29303/jpm.v10i2.31

Zulfaneti, Edriati, S., & Mukhni. (2018). Enhancing students' critical thinking skills through critical thinking assessment in calculus course. *Journal of Physics: Conference Series*, *948*, 012031. https://doi.org/10.1088/1742-6596/948/1/012031

Zulmaulida, R., Wahyudin, & Dahlan, J. A. (2018). Watson-Glaser's Critical Thinking Skills. *Journal of Physics: Conference Series*, *1028*, 012094. https://doi.org/10.1088/1742-6596/1028/1/012094