

ANALYSIS OF THE DEVELOPMENT OF MATHEMATICS LEARNING COMPETENCY ACHIEVEMENT WITHIN THE MERDEKA CURRICULUM PLATFORM

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Abstract

This study aims to examine and analyze the development of mathematics learning competency outcomes, what are the strategies for achieving them, and how assessments can be carried out to monitor the achievement of these competencies in the independent curriculum platform. This research is a descriptive qualitative research with a literature review approach. Data collection techniques through various reading sources such as journals, books, articles, and so on are needed to support this research. The data that has been collected is then analyzed, interpreted and restated clearly through discussion in descriptive form. The results of the analysis can be summarized as follows: 1) Development of mathematics learning competency outcomes to form critical and creative thinking, mathematical problem solving, communication, mathematical representation and mathematical connections; 2) Development of learning strategies adapted to the stages of student learning achievements, tasks that are meaningful and relevant to the real world; 3) the development of formative assessments is used as feedback to design learning including objectives, materials, and activities to be carried out in achieving learning outcomes.

Keywords: *Competency Achievement, Mathematics Learning, Independent Curriculum*

1. INTRODUCTION

Referring to the objectives and functions of education as stipulated in Law No. 20 of 2003 on the National Education System, national education functions to develop individuals' abilities and shape the character and civilization of a dignified nation in order to educate the life of the nation. It aims to develop students' potential so that they become individuals who have faith in and devotion to God Almighty, possess noble character, are healthy, knowledgeable, competent, creative, independent, and capable of becoming democratic and responsible citizens.

To achieve these educational objectives and functions, the Indonesian government continues to undertake efforts to develop and innovate the curriculum at all levels and types of education. These efforts are based on the principle of diversification according to the characteristics of educational units, regional potential, and students' needs. Curriculum development is carried out by taking into consideration: (1) the enhancement of faith and devotion to God Almighty; (2) the development of noble character; (3) the improvement of students' potential, intelligence, and interests; (4) the diversity of regional and environmental potential; (5) regional and national development needs; (6) demands of the world of work; (7) developments in science,

technology, and the arts; (8) religious values; (9) the dynamics of global development; and (10) national unity and values.

The curriculum is defined as a set of plans and arrangements concerning educational objectives, content, learning materials, and methods used as guidelines for implementing learning activities to achieve specific educational objectives (Law No. 20 of 2003 on the National Education System). The curriculum can also be understood as an educational program provided for students through various learning activities aimed at supporting their development and growth in accordance with educational objectives (Oemar Hamalik, 2012). As a guideline for teaching and learning at all levels and types of education, the curriculum serves to establish educational objectives directed toward the achievement of competencies. By understanding these competencies, educators can appropriately select teaching methods, learning materials, instructional techniques, media, and assessment instruments (Sahyar et al., 2019).

However, the curriculum implemented in Indonesia has often been perceived as rigid and overly focused on content. There have been limited opportunities for students to develop a deeper understanding of learning materials and to engage in meaningful reflection on the learning process. The curriculum content has also been considered overly theoretical, making it difficult for teachers to translate it into practical and operational learning materials and classroom activities. Consequently, learning outcomes and student engagement in learning have remained relatively low.

This situation is further supported by the performance of Indonesian students in the Programme for International Student Assessment (PISA), which has remained relatively low compared with that of students from other participating countries. These results indicate the need for greater flexibility, improvement, and innovation in curriculum development and implementation. Therefore, curriculum reform is necessary to create a learning environment that places greater emphasis on students' competencies, active participation, critical thinking, problem-solving skills, creativity, and the application of knowledge in real-life contexts. One of the major curriculum reforms undertaken by the Indonesian government is the implementation of the Merdeka Curriculum, which is designed to provide greater flexibility in learning and to support the development of students' competencies according to their potential, needs, and learning contexts.

The following table presents Indonesia's scores and rankings based on the results of the PISA assessments.

Table 1. Indonesia's PISA Performance

Tahun	Materi Yang diujikan	Skor rata-rata Indonesia	Skor rata-rata internasional	Peringkat Negara
2012	Membaca	396	500	64 dari 65
	Matematika	375	500	
	Sains	382	500	
2015	Membaca	397	500	63 dari 69
	Matematika	386	500	
	Sains	403	500	

2018	Membaca	371	500	72 dari 78
	Matematika	379	500	
	Sains	396	500	

Source: Processed from the PISA report (OECD, 2018b)

PISA places strong emphasis on 21st-century skills that can be integrated into education systems. In the OECD publication *The Future of Education and Skills: An OECD 2030 Framework*, it is stated that 21 countries did not have curricula that adequately focused on the future-oriented planning skills required by the global industry, particularly in mathematics education. However, the skills required by industries in the 21st century include critical and creative thinking, research-based thinking, initiative, information literacy, systematic thinking, communication, and reflection (OECD, 2018c).

The Merdeka Belajar Curriculum, which has been developed since 2020, was introduced as a response to global competition and the demands of the labor market for the development of 21st-century skills and life competencies. The curriculum established through the *Merdeka Belajar* policy is characterized by flexibility and a competency-based approach, with a strong focus on character development and soft skills, while also accommodating the needs of the business and industrial sectors. Globally, 21st-century competencies can be broadly categorized into four dimensions: (1) ways of thinking, including creativity and innovation, critical thinking, problem-solving, decision-making, and learning to learn; (2) ways of working, including communication and collaboration; (3) tools for working, including general knowledge and information and communication technology (ICT) skills; and (4) ways of living, including career development, personal and social responsibility, cultural awareness, and cultural competence (Binkley et al., 2018).

Mathematics education in schools plays an important role in developing 21st-century skills. Through mathematics learning, students have opportunities to develop essential competencies such as problem-solving, reasoning, critical thinking, creativity, collaboration, and mathematical communication (Ahonen & Kinnunen, 2015; Hesse et al., 2015). Mathematics is a discipline concerned with learning and logical thinking that is essential for human life and serves as a foundation for the development of modern technology. Mathematics education equips students with the ability to think logically, analytically, critically, and creatively, as well as to reason and apply logical processes through specific mental activities. These activities establish a continuous chain of thought that ultimately leads to an understanding of mathematical learning content, including facts, concepts, principles, operations, relationships, problems, and specific mathematical solutions that are formal and universal in nature. Mathematics education is therefore intended to foster students' independence, critical reasoning abilities, and creativity (BSKAP, Ministry of Education, Culture, Research, and Technology, 2022).

Based on the foregoing discussion, the researchers were motivated to conduct a study entitled "Analysis of the Development of Mathematics Learning Competency Achievement within the Merdeka Curriculum Platform." The purpose of this study is to analyze the development of mathematics learning competency achievement, the strategies used to attain these competencies, and the assessment processes employed

to monitor students' achievement of the competencies within the framework of the Merdeka Curriculum.

2. METODE PENELITIAN

This study employed a literature review method aimed at describing the development of mathematics learning competency achievement within the Merdeka Curriculum framework. Data were collected from various sources, including academic journals, books, articles, and other relevant references needed to support the study. Snyder (2019) explains that a literature review is a research method intended to synthesize and extract insights from previous studies while analyzing various perspectives presented by scholars.

The data collected were subsequently analyzed, interpreted, and presented clearly through a descriptive discussion. The analysis process followed the stages proposed by Creswell (2018), namely: (1) organizing and preparing the data for analysis; (2) reading and reviewing all the data; (3) coding the data; (4) using the codes to develop descriptions; (5) connecting the themes; and (6) interpreting and assigning meaning to the identified themes.

3. RESULTS AND DISCUSSION

The following section presents and discusses theories and research findings that support the ideas underlying this study, as follows:

3.1 Merdeka Curriculum Platform

The main foundation for the design of the Merdeka Curriculum is the philosophy of *Merdeka Belajar* (Freedom to Learn), which also underpins other educational policies, as stated in the Strategic Plan of the Ministry of Education and Culture for 2020–2024. The Strategic Plan encourages a paradigm shift, including changes in perspectives on curriculum and learning. The intended paradigm shifts include strengthening teachers' autonomy as key decision-makers in the learning process, reducing excessive control through rigid standards that require learning processes to be homogeneous across all educational institutions in Indonesia, and strengthening student agency, namely students' rights and abilities to determine their own learning processes by setting learning goals, reflecting on their abilities, and taking proactive and responsible actions to achieve their own success (Minister of Education and Culture Regulation No. 22 of 2020).

Hamalik (as cited in Hidayat, 2017) explains that curriculum development has at least three major roles: (1) the conservative role, which involves transmitting and interpreting the social heritage to younger generations; (2) the critical or evaluative role, which involves actively participating in social control and emphasizing critical thinking; and (3) the creative role, which involves creating and developing something new in accordance with the needs of present and future society. Thus, the curriculum can respond to the demands of changing times and circumstances while preparing students to contribute to the culture and civilization of the future.

The principles underlying the development of an operational curriculum at the educational-unit level include: (1) student-centeredness, in which the *Pancasila Student Profile* serves as a reference throughout all stages of developing the

school's operational curriculum; (2) contextuality, in which the curriculum reflects the distinctive characteristics of the educational institution and is aligned with its sociocultural and environmental context; (3) essentiality, in which the curriculum contains all essential and relevant information needed and applied within the educational institution; (4) accountability, meaning that the curriculum can be justified because it is based on actual and relevant data; and (5) stakeholder involvement, which ensures the participation of various stakeholders in curriculum development (Dwi Nurani et al., 2022).

One of the major developments introduced through the Merdeka Curriculum is the formulation of Learning Outcomes (Capaian Pembelajaran/CP) using a different approach. In this approach, students' understanding, attitudes or dispositions toward learning, character development, and observable or measurable skills are formulated as an integrated sequence. This approach reflects a broader understanding of competency, which goes beyond the mere acquisition of knowledge and skills. Competency also involves processing and applying knowledge, skills, attitudes, and values acquired through learning to address complex situations or problems (OECD, 2019; Glaesser, 2018).

Accordingly, Learning Outcomes are expected to demonstrate the progression of the learning process within a particular field of knowledge, ranging from understanding a concept to applying knowledge and skills to meet increasingly complex cognitive demands. For example, students are expected not merely to answer questions correctly but also to develop and propose creative solutions to problems. This approach emphasizes the development of meaningful and applicable competencies rather than simply the mastery of factual knowledge.

3.2 Mathematics Learning Competency Achievement

Mathematics is regarded not only as a body of knowledge that students need to understand but also as a conceptual tool for constructing and reconstructing students' understanding, as well as developing and strengthening their logical, analytical, systematic, critical, and creative thinking skills to solve problems encountered in everyday life (BSKAP, Ministry of Education, Culture, Research, and Technology, 2022).

This perspective is also described in detail by *The Partnership for 21st Century Skills* (2007), which identifies the competencies and skills that students need to develop, as follows: (1) life and career skills, consisting of *flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility*; (2) learning and innovation skills, consisting of *critical thinking, communication, collaboration, and creativity*; and (3) information, media, and technology skills.

These competencies are essential for enabling learners to acquire, manage, and utilize information effectively in order to adapt and thrive in an ever-changing, uncertain, and competitive environment. Therefore, mathematics education is designed to help students develop: (1) mathematical understanding and procedural fluency; (2) mathematical reasoning and proof; (3) mathematical problem-solving; (4) mathematical communication and representation; (5) mathematical connections; and (6) mathematical disposition.

Mathematics education is organized around five content elements and five process elements. First, the content elements reflect the view of mathematics as a body of subject matter that students need to understand. Mathematical understanding is closely associated with developing a coherent understanding of mathematical content, including facts, concepts, principles, operations, and formal and universal relationships. The content elements include numbers, algebra, measurement, geometry, data analysis and probability, and calculus. Second, the process elements reflect the view of mathematics as a conceptual tool for constructing and reconstructing mathematical knowledge. These processes involve mental activities that develop students' thinking processes and mathematical competencies. The process elements include mathematical reasoning and proof, mathematical problem-solving, mathematical communication, mathematical representation, and mathematical connections. Through these process elements, students are expected not only to acquire mathematical knowledge but also to apply, reason with, communicate, represent, and connect mathematical concepts in various contexts. Learning Outcomes (Capaian Pembelajaran/CP) refer to the minimum competencies that students are expected to achieve in each subject. Learning Outcomes are designed with reference to the Graduate Competency Standards (Standar Kompetensi Lulusan/SKL) and Content Standards (Standar Isi). The Mathematics Graduate Competency Standards at each educational level, as stipulated in Minister of Education, Culture, Research, and Technology Regulation No. 5 of 2022, include the following:

- 1) At the primary education level, students are expected to demonstrate numeracy skills by reasoning using mathematical concepts, procedures, facts, and tools to solve problems related to themselves and their immediate environment.
- 2) At the lower secondary education level, students are expected to demonstrate numeracy skills by reasoning using mathematical concepts, procedures, facts, and tools to solve problems related to themselves, their immediate environment, and the surrounding community.
- 3) At the general upper secondary education level, students are expected to demonstrate numeracy skills by reasoning using mathematical concepts, procedures, facts, and tools to solve problems related to themselves, their immediate environment, the surrounding community, and the global community.

When examined closely, several of the future competencies described above share similarities with those reflected in mathematics learning competency outcomes. To navigate life and achieve success in the future, students need more than strong cognitive abilities demonstrated through effective thinking and reasoning skills. They also need positive attitudes and character traits, as reflected in the **Pancasila Student Profile**.

The development of these skills and competencies requires an appropriate **support system**, consisting of: **(1) curriculum and instruction; (2) standards and assessment; (3) learning environment; and (4) professional development**. These four components work together to create a learning ecosystem that enables students to develop the mathematical competencies,

character, and 21st-century skills needed to respond effectively to the demands of an increasingly complex and rapidly changing world.

3.3 Learning Strategies and Assessment of Mathematics Learning Competency Achievement

Effective learning process planning is an essential activity in determining learning outcomes, identifying appropriate ways to achieve learning objectives, and establishing methods for assessing the extent to which these objectives have been achieved. Learning should be conducted in an interactive, inspiring, enjoyable, and challenging environment that motivates students to participate actively and provides sufficient opportunities for initiative, creativity, and independence in accordance with their talents, interests, physical development, and psychological development (Government Regulation No. 57 of 2021).

The learning principles developed within the Merdeka Curriculum are as follows:

- 1) Learning is designed by considering students' developmental stages and current levels of achievement, in accordance with their learning needs, while reflecting the diverse characteristics and development of students so that learning becomes meaningful and enjoyable.
- 2) Learning is designed and implemented to develop students' capacity to become lifelong learners.
- 3) The learning process supports the holistic development of students' competencies and character.
- 4) Learning is relevant, meaning that it is designed according to students' contexts, environments, and cultures, while involving parents and the community as learning partners.
- 5) Learning is oriented toward a sustainable future (Decree of the Minister of Education, Culture, Research, and Technology No. 56 of 2022).

Flexibility is essential for educational institutions to develop learning competency outcomes that provide students with opportunities to establish connections between the concepts they learn and their local contexts, while also allowing them to progress through each concept at an appropriate pace. Therefore, to strengthen the achievement of mathematics learning competencies, teachers' instructional strategies should provide students with opportunities to connect the concepts and theories they learn with their surrounding environment and everyday lives (Glaesser, 2018; Eggen & Kauchak, 2016).

The Merdeka Curriculum emphasizes the importance of integrating learning and assessment, particularly formative assessment, as part of a continuous learning cycle. According to Black et al. (2002), formative assessment refers to any form of assessment whose primary purpose is to improve the quality of students' learning processes. Feedback is a crucial component of formative assessment because it enables both teachers and students to evaluate their own learning and assess one another's progress. Teachers can subsequently modify their instructional plans and students' learning activities based on the results of formative assessment feedback (Lambert & Lines, 2000). Thus, feedback obtained from formative assessment serves as a foundation for designing subsequent learning activities, including the formulation of learning objectives, selection of learning materials, and planning of learning activities.

Authentic assessment is considered appropriate for assessing essential competencies and monitoring complex thinking skills because it connects the knowledge and skills acquired by students with real-world contexts. Authentic assessment is developed based on the understanding that, to become competent, students need to develop the ability to respond to, solve, and take appropriate action in relation to issues that occur in the real world (BSKAP, Ministry of Education, Culture, Research, and Technology, 2021).

In alignment with learning outcomes, the principles of learning and assessment are influenced by constructivist learning theory. According to this theory, learning is a continuous process of constructing and reconstructing understanding. This process can be described through three interconnected processes: learning, relearning, and unlearning. *Learning* refers to the process of acquiring new knowledge or understanding, while *relearning* involves strengthening and refining knowledge that has previously been acquired. Meanwhile, *unlearning* refers to the process of acquiring new understanding that corrects previously held misconceptions or reconstructs existing knowledge structures (Eggen & Kauchak, 2016).

4. CONCLUSION

Based on the findings of the literature review presented and discussed above, it can be concluded that the development of mathematics learning competency achievement within the Merdeka Curriculum emphasizes the development of a coherent understanding of mathematical content, including facts, concepts, principles, operations, and formal and universal relationships. It also aims to develop students' thinking processes and competencies in mathematical reasoning and proof, mathematical problem-solving, communication, mathematical representation, and mathematical connections.

Within the Merdeka Curriculum, the principles of learning and assessment emphasize the importance of developing instructional strategies that are aligned with students' levels of learning achievement, commonly referred to as Teaching at the Right Level (TaRL). This approach involves providing differentiated learning materials and activities based on students' levels of understanding and learning needs. Formative assessment is also conducted periodically to monitor each student's progress and provide teachers with evidence for determining whether individual students are ready to engage with more complex learning materials. Thus, the integration of competency-based learning, differentiated instruction, and continuous formative assessment supports the development of students' mathematical competencies in a more meaningful and sustainable manner.

5. REFERENSI

Ahonen, A. K., & Kinnunen, P. (2015). *How do students value the importance of twenty-first century skills?* Scandinavian Journal of Educational Research, 59(4), 395-412. <https://doi.org/10.1080/00313831.2014.904423>

- Becker, J.P. & Shimada, S. (1997). *The Open- Ended Approach: A New Proposal for Teaching Mathematics*. Reston, Virginia
- BSKAP Kemendikbudristek. (2022). Panduan Pembelajaran dan Asesmen Pendidikan Anak Usia Dini, Sekolah Dasar, dan Menengah.
- Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 453.
- Eggen P & Kauchak D. (2016). *Strategis and Models for Teachers Teaching Content and Thinking Skills*. Boston. Pearson
- Glaesser, Judith. (2018). *Competence in educational theory and practice: a critical discussion*. Oxford Review of Education. (45)1. 70-85.
- Hesse, F., Care, E., Buder, J., Sassenberg, K., & Griffin, P. (2015). *A framework for teachable collaborative problem-solving skills*. In *Assessment and teaching of 21st century skills* (pp. 37- 56). Dordrecht: Springer.
- Howey, K.R. (2001). *Contextual Teaching and Learning*. New York: ERIC
- Kepmendikbudristek Nomor 56 tahun 2022 tentang Pedoman Penerapan Kurikulum Dalam Rangka Pemulihan Pembelajaran
- Lambert, D., & Lines, D. (2000). *Understanding Assessment: Purposes, Perceptions, Practice*. Routledge Falmer.
- OECD. (2018a). PISA Result in Focus. <https://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf>.
- OECD. (2018b). What Is PISA? <http://www.oecd.org/pisa>
- Oemar Hamalik, Manajemen Pengembangan Kurikulum, Bandung: PT remaja Rosdakarya, 2012
- Peraturan Menteri Nomor 22 Tahun 2020 tentang Rencana Strategis Kementerian Pendidikan dan Kebudayaan Tahun 2020-2024
- Permendikbudristek Nomor 16 Tahun 2022 Tentang Standar Proses Pada Pendidikan Anak Usia Dini, Pendidikan Dasar, dan Menengah
- Permendikbudristek Nomor 21 Tahun 2022 Tentang Standar Penilaian Pendidikan Anak Usia Dini, Pendidikan Dasar, dan Menengah
- Permendikbudristek Nomor 5 Tahun 2022 Tentang Standar kompetensi Lulusan Pada Jenjang Pendidikan Anak Usia Dini, Pendidikan Dasar, dan Menengah
- Permendikbudristek Nomor 7 Tahun 2022 Tentang Standar isi Pendidikan Anak Usia Dini, Pendidikan Dasar, dan Menengah
- Ruseffendi, H.E.T. "RME dalam Pembelajaran Matematika," Makalah disampaikan pada Penataran Dosen UIN Syarif Hidayatullah – Mc.Gill Project, 2 Oktober 2003.
- The Partnership for 21st Century Skills. 2007. Framework for 21st Century Learning. Dapat diakses di www.p21.org.
- Undang-Undang Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional