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Mathematical Knowledge Content in Junior High School Curriculum: A Comparative Study of the 2013 Curriculum and Merdeka Curriculum

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Abstrak

Tujuan dari penelitian ini adalah untuk mengidentifikasi materi matematika SMP pada kurikulum Merdeka, dan untuk mengetahui perbedaan materi matematika pada kurikulum Merdeka dan kurikulum 2013. Metode penelitian yang digunakan dalam penelitian ini adalah kualitatif dengan pendekatan tinjauan pustaka secara sistematik. Hal ini karena digunakan sebagai studi pengembangan awal yang dilakukan untuk penyusunan LKS. Sesuai dengan metode penelitian yang digunakan, peneliti menjadi instrumen utama. Langkah-langkah penelitian ini adalah (1) merumuskan pertanyaan tinjauan, (2) melakukan pencarian literatur secara sistematis, (3) menyaring dan memilih artikel penelitian yang sesuai, (4) menganalisis dan menyintesis temuan kualitatif, (5) menjaga kendali mutu, dan (6) menyajikan temuan. Data yang digunakan dalam penelitian ini diperoleh dari regulasi kurikulum merdeka, regulasi kurikulum 2013, dan mengidentifikasi artikel dari jurnal. Teknik analisis data mengacu pada reduksi data, display data dan verifikasi data. Hasil penelitian menunjukkan bahwa materi matematika yang dipelajari siswa pada kurikulum Merdeka sebagian besar sama dengan kurikulum 2013, namun terdapat perbedaan pada materi lingkaran. Untuk materi himpunan, dan aritmetika sosial belum dipelajari dalam kurikulum merdeka.

Kata Kunci: Konten Pengetahuan Matematika; SMP; Kurikulum Merdeka; Kurikulum 2013.

Abstract

This study aimed to identify junior high school mathematics material in the Merdeka curriculum and to find out the differences in mathematics material in the Merdeka curriculum and the 2013 curriculum. The research method used in this study was qualitative with a systematic literature review approach because it served as a preliminary development analysis carried out to prepare worksheets. According to the research method used, the researcher becomes the main instrument. The steps of this research are (1) formulating the review question, (2) conducting a systematic literature search, (3) screening and selecting appropriate research articles, (4) analyzing and synthesizing qualitative findings, (5) maintaining quality control, and (6) presenting finding. The Merdeka curriculum's regulation provided the data for this study, 2013 curriculum regulation, and identifying articles from journals. Data analysis techniques refer to data reduction, display, and verification. The results show that the mathematics material that students learn in the Merdeka curriculum is mostly the same as the 2013 curriculum, but there are differences in the circle material. The Merdeka curriculum excludes the study of set content and social math.

Keywords: Mathematical Knowledge Content; Junior High School; Merdeka Curriculum; 2013 Curriculum.

I. INTRODUCTION

A curriculum is a set of subjects and educational programs provided by an educational institution that contains lesson plans that will be given to lesson participants in one period of education (Ahmad, 2014; Dhawan, 2020; Richards, 2013; Effendi, Ummah, & Cahyono, 2023). Until now, Indonesia has undergone several curriculum changes, including the Cara Belajar Siswa Aktif curriculum, the curriculum of competency-based curriculum of 2013, and the latest Merdeka curriculum. The development of curriculum and the pursuit of objectives that facilitate students' understanding of various materials during daily learning processes are interrelated (Hodson, 2014; Nurfadhillah et al., 2021; Ulkhaq, 2023).

Problems related to the curriculum include the curriculum changing frequently, but learning in schools has not experienced significant changes (Boud & Feletti, 2013; Julaeha, 2019; Muhammedi, 2016; Voogt et al., 2013). Whereas curriculum changes should impact changes in classroom learning (Machali, 2014; Perdana, 2013; Ritonga, 2018; Wiliam & Thompson, 2017; Dewi & Afriansyah, 2022). This is because the learning objectives for each curriculum implemented in schools are different, so curriculum changes should affect teachers (including mathematics teachers) to prepare learning tools to achieve learning objectives.

From 2022 to 2024, three curriculum options from the Ministry of Education and Culture will be made available to academic institutions for use in learning, namely the curriculum of 2013, the emergency curriculum, and the curriculum of Merdeka (Anggraena et al., 2022; Annisa et al., 2022; Fatmawati, 2021; Sadewa, 2022; Syaputra, Hidayati, & Hasanah, 2023). The emergency curriculum simplifies the 2013 curriculum, which began to be implemented in 2020 during the Covid-19 pandemic (Dewi & Wajdi, 2021; Li et al., 2021; Yonafri & Gani, 2021). The prototype or Merdeka curriculum is a competency-based curriculum to support learning recovery by implementing Project Based Learning to support character development through the Pancasila Student Profile (Rachmawati et al., 2022; Sholikhah & Hartono, 2015; Rizti & Prihatnani, 2021; Solikhah & Purnomo, 2022).

The prototype curriculum is a new curriculum paradigm in Indonesia, which aligns with the independent learning program. The prototype curriculum is called the curriculum of Merdeka (Chandrasari Desianti & Rahayuningsih, 2022; Hadiyanto et al., 2021; Tedjokoesoemo et al., 2021). This curriculum focuses on student learning or learners. This curriculum is implemented in a limited and gradual manner through the Program of *Sekolah Penggerak* and the vocational school excellence program, which the government is currently executing (Anggraena et al., 2022). Although, for now, the curriculum of Merdeka is still an option that can be taken by every education unit, in the end, this curriculum will be applied to every academic unit throughout Indonesia (Abidah et al., 2020; Sihombing et al., 2021; Sadiah & Afriansyah, 2023). This is what Educational Institutions must prepare if they are still using the curriculum of 2013 or the emergency curriculum.

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Compared to the 2013 curriculum, the 2013 curriculum has undergone significant revisions. The learning targets refer to the core competencies and essential competencies set by the government through the Ministry of Cultural Education in each class and level of education (Nurhasanah, Syafari, & Nurfaidah, 2022). Still, in the Merdeka curriculum, the learning targets refer to the achievement of learning determined by the government through the Ministry of cultural education in each phase. In response to this, it is suspected that there is a change in material between the curriculum of 2013 and the curriculum of Merdeka. Moreover, curriculum developers determine learning outcomes based on the student's learning phase, not class and education level.

The different learning outcomes conditions in the curriculum Merdeka, compared to the learning outcomes in the 2013 curriculum, led to the need to identify mathematics materials in the curriculum Merdeka. This aims to see the hierarchy of mathematics material with learning outcomes. In addition, the differences in mathematics material between the 2013 and Merdeka curricula can be seen by identifying mathematical materials. Although it can be assumed that the learning outcomes are different in these two curricula, the mathematics material is also other in these two curricula. Therefore, the purposes of this research are (1) to identify mathematics material in the curriculum of Merdeka and (2) to find out the difference between mathematics material in the curriculum of Merdeka and the curriculum of 2013.

Given that the Merdeka curriculum being investigated by researchers will be adopted nationally in 2024, it is vital to undertake an examination of the subject matter that students will be studying, particularly the teaching materials for mathematics, which are the subject of this study. In addition, after the Ministry of Education and Culture approved the curriculum, the school's (in this case, the teacher's) duties included preparing teaching tools aligned with the new curriculum. In preparing learning tools, teachers need to identify learning outcomes and materials that must be given to students. This is done so that the material provided by the teacher is not given offside to students. In addition, the new curriculum regulation on mathematics subjects emphasizes the characteristics of learning that use Project Based Learning, problem-based learning, and the obligation of teachers to carry out mathematical learning projects. Therefore, the first step that the mathematics teacher must take is to identify the mathematics material that will be delivered to students before determining the mathematical project material given to students.

II. METHOD

This research is qualitative research with a literature study approach. This research is not intended to create research products or test the effectiveness of an intervention or treatment. Instead, it focuses on the Merdeka curriculum and 2013 Curriculum analysis regarding the content of teaching materials.

The research steps for this systematic review are (1) formulating the review question, (2) conducting a systematic literature search, (3) screening and selecting appropriate research articles, (4) analyzing and synthesizing qualitative findings, (5) maintaining quality control, and (6) presenting finding (Bandara et al., 2015; Francis-Baldesari, 2006; Paré & Kitsiou, 2017; Templier & Paré, 2015; Xiao & Watson, 2019).

Formulating the review question is a research question made by the researcher based on the needs of the chosen topic. In this study, the main question is what is the mathematical content contained in the phase D curriculum Merdeka (junior high school level), and the mathematical content contained in the 2013 curriculum? This is done in order to determine whether there are variations in the mathematics con tent between the Merdeka curriculum and the 2013 curriculum, which is the second q uestion in this study.

This research is part of a preliminary development research study to prepare student worksheets. In this regard, the researcher uses the primary source from the regulation head agency of the standard, curriculum, and assessment of education, the Ministry of Education, culture, research, and Technology No 008/H/KR/2022 regarding learning achievement in early childhood education, education level primary and secondary education levels in the Merdeka curriculum, and the regulation of the minister of education and culture of the Republic of Indonesia no. 24 of 2016 concerning core competencies and essential competencies of lessons in the 2013 curriculum in primary and secondary education. In addition to the two main sources, researchers used additional sources from journals and books related to the curriculum and mastery of content knowledge. The second and third steps of the systematic literature review stage involve doing this.

The data analysis technique carried out in this study refers to data reduction, data display, and verification of data (Miles et al., 2018). Data obtained from regulations issued by the Ministry of Education and Culture are further reduced to provide a clearer picture and make it easier for researchers to conduct further data collection and look for it when needed. Each researcher is directed by the objectives to be met when minimizing data. Next is to display the reduced data. Brief explanations, infographics, correlations between categories, flowcharts, and other visual representations of this data can be used. The final step in qualitative data analysis is drawing conclusions and verification. The initial conclusions are still temporary and will change if no substantial evidence is found to support the next data collection stage.

III. RESULT AND DISCUSSION

Mathematics subjects in the Merdeka curriculum generally consist of five main content elements (Numbers, Algebra, Measurement, Geometry, Data Analysis, and Probability) and one element choice (calculus). Elements of calculus in mathematics are given in the F+ phase or advanced mathematics, while others are given since elementary education. The provision of calculus elements in the F+

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phase is in line with TIMSS, which develops content domains for advanced levels (grade 12/pre-university), namely algebra, calculus, and geometry (Mullis et al., 2004, 2016, 2018; Mullis Martin, & Sainsbury, 2015; Mullis, Martin, Foy, et al., 2015). In addition, calculus elements require several other materials as prerequisites, such as Trigonometry, Algebra, and Geometry (Sembiring, 2017; Wahyuni, 2017).

Elements of calculus consisting of limit, integral and derivative material have abstract characteristics (Shodikin, 2017; Tasman & Ahmad, 2017), so it requires a variety of mathematical abilities and requires an analytical and geometric understanding, causing most students to find it difficult to solve calculus problems (Hartati, 2019). Calculus must be taught to students at the formal cognitive development level if it is relevant to one's cognitive growth. Although many experts state that Piaget provides an age limit of 12 years (the age of junior high school students) is the beginning of entering formal cognitive development (Lahti, 2013; Lubben et al., 2014; Ojose, 2008), research results in Indonesia state that the age of 12 years has not entered a period of formal development (Widodo, 2020; Widodo et al., 2018, 2019).

TIMSS also added that for grade 8, the dimensions of content in mathematics include numbers, algebra, geometry, data, and probability (Munaji & Setiawahyu, 2020; Murtiyasa, 2015). In this regard, at the junior high school level, which consists of one phase, namely Phase D, it is aligned with the dimensions of the content of TIMSS. It's just that in phase D, the measurement dimensions are raised because the concepts and skills in measurement in the mathematics curriculum are all related to comparing what is measured with what is the standard unit of measure, especially those in geometric elements.

From the achievement of learning mathematics phase D contained in the decision of the head agency of the standard, curriculum, and assessment of education, the Ministry of Education, culture, research, and Technology No 008/H/KR/2022 regarding learning outcomes in early childhood education, primary education levels and levels for secondary education in a Merdeka curriculum, the achievement of phase D mathematics learning based on elements can be seen in Table 1.

Table 1.
Description of learning achievement of each element in mathematics

Element	Description of Learning Achievement
Number	Students can read, write, and compare integers, rational and irrational numbers, decimal numbers, whole numbers and roots, and numbers in scientific notation. They can apply arithmetic operations to real numbers and provide estimates/estimates in solving problems (including those related to financial literacy). Students can use prime factorization and ratio (scale, proportion, and rate of change) in problem-solving.
Algebra	Students can recognize, predict and generalize patterns in the form of an arrangement of objects and numbers. They can express a situation in algebraic structure. They can use the properties of operations (commutative, associative, and distributive) to produce equivalent algebraic forms. Students can understand relations and functions

	(domain, codomain, range) and present them as arrow diagrams, tables, sets of ordered pairs, and graphs. They can distinguish some nonlinear functions from linear functions graphically. They can solve linear equations and inequalities of one variable. They can present, analyze, and solve problems using relations, operations, and linear equations. They can solve the system of linear equations of two variables through several ways to solve the problem
Measurement	Students can explain how to determine the area of a circle and solve related problems. They can explain how to choose the surface area and volume of geometric figures (prisms, cylinders, spheres, pyramids, and cones) and solve related problems. They can explain the effect of proportional changes from flat and spatial shapes to length, angle, area, and volume.
Geometry	students can make geometrical webs (prisms, cubes, pyramids, and cones) and make these shapes from the nets. Students can use the relationship between angles formed by two intersecting lines and by two parallel lines cut by a transverse line to solve problems (including determining a large number of angles in a triangle and determining the size of the unknown angle in a triangle). They can explain the properties of congruence and similarity in triangles and quadrilaterals and use them to solve problems. They can show the truth of the Pythagorean theorem and use it to solve problems (including the distance between two points on the Cartesian coordinate plane). Students can perform single transformations (reflection, translation, rotation, and dilation) of facts, lines, and plane figures on the Cartesian coordinate plane and use them to solve problems.
Data Analysis and Probability	students can formulate questions and collect, present, and analyze data to answer questions. They can use bar charts and pie charts to explain and interpret data. They can take a representative population sample to obtain data about them and their environment. They can determine and analyze the data's mean, median, mode, and range to solve problems (including comparing a data set against its group, comparing two data groups, predicting, and making decisions). They can investigate the possibility of changes in the measurement of the center due to changes in the data. Students can explain and use probability and relative frequency to determine the expected frequency of one event in a simple experiment (all experimental results can appear equally).

Learning outcomes are an expression of educational goals, which are statements about what students are expected to know, understand, and can do after completing a learning period (Azevedo et al., 2012; Chi & Wylie, 2014; Direktorat Jendral Pembelajaran dan Kemahasiswaan Kementrian Riset, Teknologi, 2015). Learning outcomes are usually used to determine the level of the qualification framework, set qualification standards, explain programs and courses, direct the curriculum, and assess assessment specifications (Alfauzan & Tarchouna, 2017; Sholikhah & Hartono, 2015; Tam, 2014). In addition, learning outcomes will indirectly affect teaching methods, understanding of environments, and assessment practices (Kartika et al., 2021). In addition, learning outcomes focus on what is expected of students at the end of the lesson (Hung & Chou, 2015; Paolini, 2015; Setiawan & Basyari, 2017). This is in line with learning objectives, which describe the knowledge, abilities, skills, and attitudes that students must possess as a result of learning outcomes expressed in the form of observable and measurable

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behavior (Meda & Swart, 2018; Rao, 2020; Schoenfeld-Tacher & Sims, 2013). For this reason, in general, the learning outcomes contained in each element are a description of the learning objectives that must be achieved by each student at the end of each non-class learning phase because students in the same class may study in different learning phases (Keputusan Kepala Badan Standar, Kurikulum, Dan Asesmen Pendidikan Kementrian Pendidikan, Kebudayaan, Riset, Dan Teknologi No 008/H/KR/2022 Tentang Capaian Pembelajaran Pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, Dan Jenjang Pendidikan Meneng, 2022; Tasman & Ahmad, 2017).

Based on Table 1, there are at least three learning objectives in the number element to achieve learning outcomes at the end of phase D. To achieve the three understanding objectives, at least students must study the material for real numbers, factors, and multiples until the end of phase D. The information concerning whole numbers, rational numbers, irrational numbers, decimal numbers, power numbers, root forms, and the fundamental operations of addition, subtraction, multiplication, and division on real numbers can all be provided as real numbers. This material is given so that learning outcomes (1) Students can read, write, and compare integers, rational and irrational numbers, decimal numbers, whole numbers and roots, and numbers in scientific notation, and (2) students can apply arithmetic operations on real numbers, and provide estimates/estimates in solving problems (including related to financial literacy). To achieve learning outcomes, students can use prime factorization and ratio (scale, proportion, and rate of change) in solving problems. Students can learn about factors, multiples, and ratios.

Based on Table 1, there are at least seven learning objectives in the algebraic element to achieve learning outcomes at the end of phase D. To achieve the seven learning objectives, at least students must study the material of number patterns, algebraic forms, relational functions, linear and non-linear functions, linear equations and inequalities of one variable, and systems of linear equations of two variables. In number patterns, the materials studied are (1) number patterns and (2) object configurations. In the form of algebra, the material investigated is (1) identifying coefficients, variables, constants, and terms, (2) algebra in mathematical sentences, (3) arithmetical operations, and (4) simplifying algebraic forms. Concerning functions, the material studied is (1) relations, (2) functions and mapping, (3) graphs of functions, and (4) problems related to functions. In linear and non-linear functions, the materials studied are (1) linear and non-linear functions, (2) graphs of linear and non-linear functions, (3) equations of lines, (4) slope, (5) points of intersection of lines, and (6) application of linear and non-linear functions. In linear equations and inequalities, the materials studied are (1) open statements and sentences, (2) linear equations, (3) linear inequalities, and (4) mathematical problems related to linear equations and inequalities. The material for a system of

linear equations with two variables, material studied is how to determine the solution set for a system of linear equations with two variables.

Based on Table 1, there are at least three learning objectives in the measurement element to achieve learning outcomes at the end of phase D. To achieve the three understanding objectives, at least students must study the material for circles, areas, and volumes of geometric shapes. Although there is little material that is analyzed on the measurement element, to achieve the third learning objective, students must study the ratio of angles and lengths to circles and shapes so that students can conclude the effect of changing sizes on area and volume.

Based on Table 1, there are at least five learning objectives in the geometric element to achieve learning outcomes at the end of phase D. To achieve the five understanding objectives, at least students must study material about the properties of geometric shapes, lines, and angles, congruence and similarity, the Pythagorean theorem, and transformation geometry. Differences in the form of the measurement elements talk about surface area and volume. This is what distinguishes the material from geometric elements. In the line and angle material, the material studied is (1) the position of two lines, (2) the comparison of line segments, (3) angles, (4) the relationship between angles, (5) the relationship between two parallel lines and angles, and (6) Problems with lines and angles. In congruence and congruence, the materials studied are (1) congruence, (2) congruence, and (3) problems related to congruence and congruence. In the Pythagorean theorem, the material studied is (1) the relationship of the sides of a triangle and (2) problems related to the Pythagorean theorem. In transformation geometry, the materials studied are (1) rotation, (2) reflection, (3) rotation, (4) dilation, and (5) problems related to transformation geometry.

Based on Table 1, there are at least six learning objectives in the data and opportunity analysis elements to achieve learning outcomes at the end of phase D. To achieve the six understanding objectives, at least students must study material about (1) data trends, (2) data presentation in tables, graphs, and diagrams, (3) opportunities, and (4) statistics with central tendency material and solve problems that arise—related to statistics.

From the mathematics material contained in phase D of the Merdeka curriculum, there are material shifts when compared to the 2013 curriculum. Some of these shifts include (1) sets, (2) social arithmetic, and (3) circles. Although there was a shift in 3 materials at the junior high school level, there was no new material from other groups.

The set in the 2013 curriculum contains subsets, empty backgrounds, complement sets, and binary operations on settings, but in the Merdeka curriculum, almost every phase is not given set material. Likewise, the social arithmetic material in the 2013 curriculum is found at the junior high school level, but the Merdeka curriculum is not provided in phase D (junior high school level). But in the Merdeka curriculum, financial literacy that is in the number

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element can be achieved by understanding social arithmetic such as profit, loss, profit, gross, and net. This is especially true in learning achievement, where students can apply arithmetic operations on real numbers and provide estimates/estimates in real numbers. Solve problems (including those related to financial literacy). Financial literacy is one of the six basic literacy agreed upon at the World Economic Forum: literacy, numeracy, scientific, digital, financial, and cultural and civic literacy (Zahro & Aprianti, 2022). Financial literacy is the ability to read, analyze, manage, and communicate about personal economic conditions that will affect material well-being (Soraya & Lutfiati, 2020). Financial literacy relates to managing finances (income and expenses) and knowledge and skills to apply concepts and risks to make effective and appropriate decisions. By having this financial literacy, students are expected to be able to manage their future finances to be more prosperous. In connection with this condition, although social arithmetic is not given at the junior high school level or phase D, junior high school students ability to estimate or forecast operations on real numbers must have adequate financial literacy so that students' future lives can manage their finances.

In the circle material, although there are elements of geometry in the Merdeka curriculum, in general, the denial material and the 2013 curriculum are very different. In the Merdeka curriculum, the material for a circle is to determine the area of a process, so students are expected to be able to explain how to choose the site of a circle and solve problems related to circles. In the 2013 curriculum, circle materials include central angles, circumference angles, arc lengths, squares, and processes of rings, not given at the junior high school level or phase D. Circle material other than the area of a circle, if observed in the Merdeka learning curriculum, is shown in phase F or class XI-XII in senior high school.

Based on this explanation, there are differences in the mathematics content in phase D (junior high school level), including the curriculum structure placing mathematics based on student characteristics based on students' abilities and cognitive development. This is in line with the results of previous research, which stated that learning mathematics must be carried out by the current needs of mathematics, including the needs of students (Wahyudi & Suyitno, 2018). For learning mathematics, a teacher must prepare the design of learning activities contextually and adapt to the hierarchical content of mathematics and the different characteristics possessed by students. By paying attention to this, it is expected that the teacher can implement the learning that is adjusted to the level of ability of students, not the class level that has been carried out so far in learning mathematics. This is done so that the learning carried out in learning mathematics is more meaningful.

IV. CONCLUSION

Based on the results and discussion, it can be concluded that there are differences in mathematics material in the Merdeka curriculum phase D or junior high

school level compared to the curriculum of 2013. The difference is that students do not learn the material for sets, social arithmetic, and circles when using the Merdeka curriculum. The main finding in the Merdeka curriculum analysis of the D phase is the existence of financial literacy in the algebraic elements. This requires teachers to apply the concept of real numbers in everyday life related to finance so that students can manage their finances appropriately and usefully in the future.

In addition, this curriculum analysis can be used to develop learning tools such as teaching modules, the flow of learning objectives, and student worksheets to assist teachers in preparing mathematics lessons using a Merdeka curriculum.

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REFERENCES

Abidah, A., Hidaayatullaah, H. N., Simamora, R. M., Fehabutar, D., & Mutakinati, L. (2020). The impact of covid-19 on indonesian education and its relation to the philosophy of "merdeka belajar." *Studies in Philosophy of Science and Education*, *1*(1), 38–49.

Ahmad, D. (2014). Understanding the 2013 curriculum of English teaching through the teachers' and policymakers' perspectives. *International Journal of Enhanced Research in Educational Development (IJERED)*, *2*(4), 6–15.

Alfauzan, A. A. H., & Tarchouna, N. (2017). The role of an aligned curriculum design in the achievement of learning outcomes. *Journal of Education and E-Learning Research*, *4*(3), 81–91.

Anggraena, Y., Felicia, N., Eprijum, D., Pratiwi, I., Utama, B., Alhapip, L., & Widiaswati, D. (2022). *Kajian akademik kurikulum untuk pemulihan pembelajaran*.

Annisa, N., Nurfadilah, A., & Maharani, C. (2022). Kesiapan Sekolah Dasar Dalam Menerapkan Kurikulum Prototipe Untuk Menciptakan Generasi Yang Kreatif dan Inovatif. *Equilibrium: Jurnal Pendidikan*, *10*(2), 175–184.

Azevedo, A., Apfelthaler, G., & Hurst, D. (2012). Competency development in business graduates: An industry-driven approach for examining the alignment of undergraduate business education with industry requirements. *International Journal of Management Education*, *10*(1), 12–28. https://doi.org/10.1016/j.ijme.2012.02.002

Bandara, W., Furtmueller, E., Gorbacheva, E., Miskon, S., & Beekhuyzen, J. (2015). Achieving rigor in literature reviews: Insights from qualitative data analysis and tool-support. *Communications of the Association for Information Systems*, *37*(1), 8.

Boud, D., & Feletti, G. I. (2013). Changing problem-based learning. In *The challenge of problem-based learning* (pp. 9–22). Routledge.

p-ISSN: 2086-4280
e-ISSN: 2527-8827

Chandrasari Desianti, L., & Rahayuningsih, T. (2022). Sekolah Penggerak and Guru Penggerak Evaluation Policy as Pioneers of Changes in The Education System in The New Paradigm Curriculum. *Pedagonal: Jurnal Ilmiah Pendidikan*, *6*(1), 128–140.

Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, *49*(4), 219–243.

Dewi, M. P., & Wajdi, M. B. N. (2021). Distance learning policy during pandemic COVID-19. *EDUTEC: Journal of Education and Technology*, *4*(3), 325–333.

Dewi, R. P., & Afriansyah, E. A. (2022). Pembelajaran Matematika Berbasis Aplikasi Google Classroom pada Materi Bangun Ruang Sisi Datar. *Plusminus: Jurnal Pendidikan Matematika*, *2*(1), 39-52.

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22.

Direktorat Jendral Pembelajaran dan Kemahasiswaan Kementrian Riset, Teknologi, dan P. T. R. I. (2015). *Paradigma Capaian Pembelajaran*.

Effendi, M. M., Ummah, S. K., & Cahyono, H. (2023). Teacher Perspective and Performance in Curriculum Prototype Implementation through the Development of Innovative Project-Based Learning Modules. *Mosharafa: Jurnal Pendidikan Matematika*, *12*(1), 47-58.

Fatmawati, E. (2021). Kebijakan Kurikulum di Masa Pandemi. *MATAAZIR: Jurnal Administrasi Dan Manajemen Pendidikan*, *2*(1), 158–173.

Francis-Baldesari, C. (2006). *Systematic Reviews of Qualitative Literature*.

Hadiyanto, H., Noferdiman, N., Syamsurizal, S., Muhaimin, M., & Krisantia, I. (2021). Students' soft skills, hard skills, and competitiveness (SHC): A suggested model for Indonesian higher education curriculum. *International Journal of Learning, Teaching and Educational Research*, *20*(2), 218–234.

Hartati, L. (2019). Analisis Kemampuan Pemahaman Matematis Mahasiswa pada Mata Kuliah Kalkulus Integral dengan Strategi Small Group Discussion. *Diskusi Panel Nasional Pendidikan Matematika*, *5*(1).

Hodson, D. (2014). Learning science, learning about science, doing science: Different goals demand different learning methods. *International Journal of Science Education*, *36*(15), 2534–2553.

Hung, M. L., & Chou, C. (2015). Students' perceptions of instructors' roles in blended and online learning environments: A comparative study. *Computers and Education*, *81*, 315–325. https://doi.org/10.1016/j.compedu.2014.10.022

Julaeha, S. (2019). Problematika kurikulum dan pembelajaran pendidikan karakter. *Jurnal Penelitian Pendidikan Islam*, *7*(2), 157.

Kartika, A., Kismartini, K., & Rahman, A. Z. (2021). Implementasi Kebijakan Kuliah

Daring di Universitas Diponegoro. *Journal Of Public Policy And Management Review*, *10*(4), 79–98.

Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementrian pendidikan, Kebudayaan, Riset, dan Teknologi No 008/H/KR/2022 Tentang Capaian pembelajaran Pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Meneng, Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan (2022).

Lahti, R. (2013). Does Attainment Of Piaget's Formal Operational Level Of Cognitive Development Predict Student Understanding Of Scientific Models? In *Graduate Student Theses, Dissertations, & Professional Papers*. University of Montana.

Li, Y., Zhang, X., Dai, D. Y., & Hu, W. (2021). Curriculum innovation in times of the COVID-19 pandemic: the thinking-based instruction theory and its application. *Frontiers in Psychology*, *12*, 601607.

Lubben, F., Braund, M., Koopman, R., Scholtz, Z., & November, I. (2014). The Piaget theory of cognitive development: An educational implications. *Educational Psychology*, *1*(1), 9.

Machali, I. (2014). Kebijakan perubahan kurikulum 2013 dalam menyongsong Indonesia emas tahun 2045. *Jurnal Pendidikan Islam*, *3*(1), 71–94.

Meda, L., & Swart, A. J. (2018). Analysing learning outcomes in an Electrical Engineering curriculum using illustrative verbs derived from Bloom's Taxonomy. *European Journal of Engineering Education*, *43*(3), 399–412.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2018). *Qualitative data analysis: A methods sourcebook*. Sage publications.

Muhammedi, M. (2016). Perubahan Kurikulum Di Indonesia: Studi kritis tentang upaya menemukan Kurikulum Pendidikan islam yang ideal. *Jurnal Raudhah*, *4*(1).

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2015). TIMSS 2015 International Results in Mathematics. In *IEA*. TIMSS & PIRLS.

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2016). *TIMSS Advanced 2015 International Results in Advanced Mathematics and Physics*. Boston College, TIMSS & PIRLS International Study Center.

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2018). TIMSS. In *TIMSS 2015 International Result in Mathematics*. IEA. https://doi.org/10.4135/9781506326139.n704

Mullis, I. V. S., Martin, M. O., Gonzalez, E. J., & Chrostowski, S. J. (2004). TIMSS 2003 International Mathematics Report. In *IEA*. Lynch School of Education, Boston College.

Mullis, I. V. S., Martin, M. O., & Sainsbury, M. (2015). PIRLS 2016 Assessment framework. In *PIRLS 2016 Assessment Framework*.

Munaji, M., & Setiawahyu, M. I. (2020). Profil kemampuan matematika siswa smp di kota cirebon berdasarkan standar timss. *Teorema: Teori Dan Riset Matematika*, *5*(2), 249–262.

p-ISSN: 2086-4280
e-ISSN: 2527-8827

Murtiyasa, B. (2015). Tantangan pembelajaran matematika era global. *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika UMS 2015*.

Nurfadhillah, S., Fazriandina, A., Hidayah, A., Yolawati, N. N., Maghfiroh, N., Arlita, N. D., & Dewanti, R. R. (2021). Analisis Mekanisme Kurikulum dan Evaluasi (Aphasia) serta (Diskalkulia) pada Siswa Kelas 1 SDN Sukasari 5 Kota Tangerang. *ANWARUL*, *1*(1), 153–166.

Nurhasanah, A., Syafari, R., & Nurfaidah, A. R. (2022). Kesesuaian Buku Teks Matematika Berdasarkan Kurikulum 2013. *Mosharafa: Jurnal Pendidikan Matematika*, *11*(2), 227-236.

Ojose, B. (2008). Applying Piaget's Theory of Cognitive Development to Mathematics Instruction. *The Mathematics Educators*, *18*(1), 26–30.

Paolini, A. (2015). Enhancing Teaching Effectiveness and Student Learning Outcomes. *Journal of Effective Teaching*, *15*(1), 20–33.

Paré, G., & Kitsiou, S. (2017). Methods for literature reviews. In *Handbook of eHealth Evaluation: An Evidence-based Approach [Internet]*. University of Victoria.

Perdana, D. I. (2013). Kurikulum dan Pendidikan di Indonesia: Proses Mencari Arah Pendidikan yang Ideal di Indonesia atau Hegemoni Kepentingan Penguasa Semata? *Jurnal Pemikiran Sosiologi*, *2*(1).

Rachmawati, N., Marini, A., Nafiah, M., & Nurasiah, I. (2022). Projek Penguatan Profil Pelajar Pancasila dalam Impelementasi Kurikulum Prototipe di Sekolah Penggerak Jenjang Sekolah Dasar. *Jurnal Basicedu*, *6*(3), 3613–3625.

Rao, N. J. (2020). Outcome-based education: An outline. *Higher Education for the Future*, *7*(1), 5–21.

Richards, J. C. (2013). Curriculum approaches in language teaching: Forward, central, and backward design. *Relc Journal*, *44*(1), 5–33.

Ritonga, M. (2018). Politik dan Dinamika Kebijakan Perubahan Kurikulum Pendidikan di Indonesia Hingga Masa Reformasi. *Bina Gogik: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *5*(2).

Rizti, T. M., & Prihatnani, E. (2021). Efektivitas Model Pembelajaran 3CM (Cool-Critical-Creative-Meaningfull) terhadap Kemampuan Berpikir Kritis Siswa SMP. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(2), 213-224.

Sadewa, M. A. (2022). Meninjau Kurikulum Prototipe Melalui Pendekatan Integrasi-Interkoneksi Prof M Amin Abdullah. *Jurnal Pendidikan Dan Konseling*, *4*(1), 266–280.

Sadiah, D. S., & Afriansyah, E. A. (2023). Miskonsepsi siswa ditinjau dari tingkat penyelesaian masalah pada materi operasi pecahan. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *2*(1), 31-44.

Schoenfeld-Tacher, R., & Sims, M. H. (2013). Course goals, competencies, and instructional objectives. *Journal of Veterinary Medical Education*, *40*(2), 139–144.

Sembiring, R. K. B. (2017). Analisis Kesalahan Mahasiswa dalam Mata

Kuliah Analisis Kompleks. *Jurnal Ilmiah MBP*, *5*(2), II–69.

Setiawan, A., & Basyari, I. W. (2017). Desain Bahan Ajar yang Berorientasi pada Model Pembelajaran Student Team Achievement Division untuk Capaian Pembelajaran pada Ranah Pemahaman Siswa pada Mata Pelajaran IPS Kelas VII SMP Negeri 1 Plered Kabupaten Cirebon. *Edunomic: Jurnal Ilmiah Pendidikan Ekonomi Fakultas Keguruan Dan Ilmu Pendidikan*, *5*(1), 17–32.

Shodikin, A. (2017). Pengembangan Bahan Ajar Kalkulus Integral Berbasis Animasi. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, *6*(1), 1–11.

Sholikhah, M., & Hartono. (2015). Perbandingan keefektifan antara problem- based learning seting numbered head together dan setting jigsaw. *Riset Pendidikan Matematika*, *2*(November), 162–174.

Sihombing, A. A., Anugrahsari, S., Parlina, N., & Kusumastuti, Y. S. (2021). " Merdeka Belajar" in an Online Learning during the COVID-19 Outbreak: Concept and Implementation. *Asian Journal of University Education*, *17*(4), 35–45.

Solikhah, P. I., & Purnomo, P. (2022). The Opportunity and Challenges of Implementing a Prototype Curriculum. *Nazhruna: Jurnal Pendidikan Islam*, *5*(2), 407–421.

Soraya, E., & Lutfiati, A. (2020). Analisis faktor-faktor yang mempengaruhi literasi keuangan. *Kinerja*, *2*(02), 111–134.

Syaputra, A., Hidayati, D., & Hasanah, E. (2023). Mathematics Curriculum Management of Distance Learning Program in Junior High School. *Mosharafa: Jurnal Pendidikan Matematika*, *12*(1), 71-80.

Tam, M. (2014). Outcomes-based approach to quality assessment and curriculum improvement in higher education. *Quality Assurance in Education*, *22*(2), 158–168.

Tasman, F., & Ahmad, D. (2017). Pemahaman mahasiswa terhadap integral sebagai anti turunan, suatu desain riset pada kalkulus integral. *Jurnal Eksakta Pendidikan (JEP)*, *1*(1), 9–16.

Tedjokoesoemo, P. E. D., Nilasari, P. F., & Sari, S. M. (2021). *Addressing The Independent Learning Curriculum (Kurikulum Merdeka Belajar) as a Form of Positive Disruption to Empower the Community*. Petra Christian University.

Templier, M., & Paré, G. (2015). A framework for guiding and evaluating literature reviews. *Communications of the Association for Information Systems*, *37*(1), 6.

Ulkhaq, M. M. (2023). Determinan pencapaian siswa bidang matematika: Perbandingan antara indonesia dan singapura. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *2*(1), 9-16.

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning*, *29*(5), 403–413.

Wahyudi, W., & Suyitno, H. (2018). Dampak Perubahan Paradigma Baru Matematika Terhadap Kurikulum dan Pembelajaran Matematika di

p-ISSN: 2086-4280
e-ISSN: 2527-8827

Indonesia. *INOPENDAS: Jurnal Ilmiah Kependidikan*, *1*(1).

Wahyuni, A. (2017). Analisis Hambatan Belajar Mahasiswa Pada Mata Kuliah Kalkulus Dasar. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *1*(1). https://doi.org/10.33603/jnpm.v1i1.253

Widodo, S. A. (2020). *Pengembangan Mathematical Comic Untuk Pencapaian Kemampuan Pemecahan Masalah Matematis Dan Konfirmasi Norma Sosiomatematika (Doctoral dissertation, Universitas Pendidikan Indonesia*.

Widodo, S. A., Turmudi, T., & Dahlan, J. A. (2019). An Error Students In Mathematical Problems Solves Based On Cognitive Development. *International Journal of Scientific & Technology Research*, *8*(07), 433–439. https://www.ijstr.org/final-print/july2019/An-Error-Students-In-Mathematical-Problems-Solves-Based-On-Cognitive-Development.pdf

Widodo, S. A., Turmudi, T., Dahlan, J. A., Istiqomah, I., & Saputro, H. (2018). Mathematical Comic Media for Problem Solving Skills. *International Conference on Advance & Scientific Innovation*, 101–108.

Wiliam, D., & Thompson, M. (2017). Integrating assessment with learning: What will it take to make it work? In *The future of assessment* (pp. 53–82). Routledge.

Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Journal of Planning Education and Research*, *39*(1), 93–112.

Yonafri, C., & Gani, E. (2021). The Effectiveness of Online Learning on the Implementation of the 2013 Curriculum. *Ninth International Conference on Language and Arts (ICLA 2020)*, 246–250.

Zahro, I. F., & Aprianti, E. (2022). Penyuluhan Literasi Anak Usia Dini sebagai Pembelajaran Abad 21 pada Guru PAUD di Desa Paas Kabupaten Garut. *Nusantara Berdaya: Jurnal Pengabdian Kepada Masyarakat*, *1*(1), 1–8.

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