Inovasi Kurikulum *- p-ISSN 1829-6750 & e-ISSN 2798-1363*
Volume 21 No 1 (2024) 455-466

Inovasi Kurikulum
https://ejournal.upi.edu/index.php/JIK

A comparative curriculum analysis from the perspective of data science

Adi Susanto[1], Dian Endang Lestari[2], Maulina Fakhrunnisa Salsanabila[3]
[1,2,3]Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
adi0208fmipa.2022@student.uny.ac.id[1], dianendang.2022@student.uny.ac.id[2],
maulinafakhrunnisa.2022@student.uny.ac.id[3]

ABSTRACT

The importance of data science in the mathematics curriculum at the elementary school level is to encourage data literacy from an early age and support the increasing demand for a data-literate society. This study aims to determine how and to what degree data science and related abilities are taught in Indonesian mathematics curricula, especially at the elementary school level. The research method used in this research is a qualitative research method with a literature study approach. Data was collected through documents obtained from the 2013 curriculum and Kurikulum Merdeka. The research results show that data material in the Kurikulum Merdeka has been given to students in phase A, or generally grades 1 and 2. However, in the 2013 curriculum, data material is given to grade 3 or phase B students. Moreover, the data material used in the Kurikulum Merdeka is explicitly related to data from many objects and data from measurements. In contrast, the 2013 curriculum relates to student data and their environment. Additionally, in representing data and material in the field of study, there are differences in the order between the curriculum of 2013 and the Kurikulum Merdeka.

ARTICLE INFO

Article History:
Received: 4 Nov 2023
Revised: 21 Jan 2024
Accepted: 25 Jan 2024
Available online: 28 Jan 2024
Publish: 21 Feb 2024

Keyword:
Comparative study; data science; elementary school; Mathematics curriculum

Open access
Inovasi Kurikulum is a peer-reviewed open-access journal.

ABSTRAK

Pentingnya ilmu data dalam kurikulum matematika di tingkat sekolah dasar untuk mendorong literasi data sejak dini dan mendukung peningkatan permintaan masyarakat yang melek data. Penelitian ini memiliki tujuan untuk memahami bagaimana dan sejauh mana pengetahuan dan keterampilan data dipelajari dalam kurikulum matematika di Indonesia utamanya di tingkat sekolah dasar. Metode penelitian yang digunakan dalam penelitian ini adalah metode penelitian kualitatif dengan pendekatan studi literatur. Data dikumpulkan melalui instrumen dokumen yang diperoleh dari dokumen yang berkaitan dengan kurikulum 2013 dan kurikulum merdeka. Hasil penelitian menunjukkan bahwa materi data dalam kurikulum merdeka sudah diberikan kepada siswa pada fase A atau umumnya kelas 1 dan 2, namun dalam kurikulum 2013 materi data baru diberikan kepada siswa pada kelas 3 atau setara dengan fase B. Selain itu, materi data yang digunakan dalam kurikulum merdeka secara eksplisit terkait dengan data dari banyak benda dan data hasil pengukuran, sedangkan dalam kurikulum 2013 terkait data diri peserta didik dan lingkungannya. Tidak hanya itu saja, dalam merepresentasikan data dan juga materi bidang kajian, terdapat perbedaan urutan dalam kurikulum 2013 dan kurikulum merdeka.

Kata Kunci: *Ilmu data; kurikulum Matematika; sekolah dasar; studi komparatif.*

How to cite (APA 7)
Susanto, A., Lestari, D. E., & Salsanabila, M. F. (2024). A comparative curriculum analysis from the perspective of data science. *Inovasi Kurikulum, 21*(1), 455-466.

Peer review
This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.

https://doi.org/10.17509/jik.v21i1.66317

INTRODUCTION

Literacy is part of the development of children's language skills, which is very important to stimulate from an early age (Afnida & Suparno, 2020), for example, data literacy. Data literacy is an essential skill in the current era because it is related to digital literacy, which is one form of development in the 4.0 revolution era, where elementary school students can access various desired information quickly (Kailani et al., 2021; Kuntarto & Prakash, 2020; Masyhura & Ramadan, 2021). So, there need to be essential considerations to design better ways of educating children, and one of them is through curriculum development.

The education curriculum in Indonesia itself has undergone many changes. This curriculum change results from a curriculum analysis carried out by policymakers. It is necessary to do curriculum analysis to address shortcomings in the prior curriculum. Curriculum analysis has a positive impact on changes for the better. Curriculum analysis has the same goals and functions to achieve national education goals. Curriculum analysis will continue to go hand in hand with implementing the curriculum. Curriculum analysis does not just exist; it has scope so that good curriculum analysis can be carried out. When we want to carry out curriculum analysis, we also need to know what is contained in the analysis and the output of the analysis (Nurhasanah et al., 2021). The curriculum analysis carried out in this research is related to data literacy in the 2013 curriculum and the Kurikulum Merdeka.

Data is a group of numbers in a particular context that provides meaning beyond their abstract representation. Data is also broadly defined as information collected or generated from the world from which conclusions about various phenomena can be drawn. Data can be interpreted as evidence when choosing a specific explanation about something compared to other evidence (Wise, 2019). The study of data is a scientific discipline in the field of statistics (Peng & Parker, 2022). Nonetheless, for several reasons, it is widely acknowledged that the nascent area of data science involves a synthesis of fields other than statistics (Hassani et al., 2021). The first reason is that managing, processing, and mining large amounts of data, or data mining, calls for computational techniques (Sarker, 2021). The second reason is that there is a shift towards work that deals with real-world data, which is still messy in various domains, so it is essential to improve skills in data processing and data visualization (Peng & Parker, 2022).

According to Shilton et al. (2021), nowadays, data concerns people at all social levels and is not just the domain of data scientists. Furthermore, it is critical to comprehend how data might result in disinformation, given the abundance of data in today's culture. Therefore, for the general people to accurately evaluate and comprehend data, they must possess data literacy. An ever-more-important skill in today's data-driven society is data literacy. In many educational systems, data is first formally taught to students in elementary school as part of the mathematics curriculum rather than as a stand-alone subject. This was carried out due to the necessity of researching primary mathematics data literacy compared to other curriculum areas (Ow-Yeong et al., 2023). This is in line with Sarker (2021), who stated that in an era where digital data is being produced exponentially, producing new knowledge requires an understanding of vast amounts of data. As a result, data science has recently garnered much attention as a developing field.

Reading data, including graphs and other data visualizations, as well as fundamental numerical values like percentages and probabilities, is necessary for data literacy. It also entails interpreting the data correctly and critically evaluating what it indicates and what inferences can and cannot be made. Digital media has increased public access to data in today's digital age, highlighting the significance of accurately evaluating and comprehending data and examining how poorly presented data can result in misinformation (Shilton et al., 2021).

According to Börner et al. (2019), many adults and kids struggle to identify and understand data visualizations beyond the fundamentals. This is a significant discovery because it demonstrates that most adults and kids cannot comprehend the typical representations found in newspapers, on the internet, and

https://doi.org/10.17509/jik.v21i1.66317

in society. In addition, research conducted by Firat et al. (2022) elaborated that teachers felt that students were not yet ready for more statistical analysis. However, they also thought visual data presentations were generally "intuitive" and did not matter how much time students spent comprehending the data representations.

However, educators have recently called for the importance of data science in mathematics curricula at the elementary level to encourage data literacy from an early age and support the increasing demand for a data-literate society (Wise, 2019). In addition, the results of survey research conducted by Bakker et al. (2021) on mathematics education researchers reported that data literacy was one of the most frequently mentioned goals of future mathematics education. This is in line with Fadillah and Munandar (2021), which states that the essential ability that students must possess an understanding related to the data because they see that in the current era of technology, many students only have the ability to read, write, and count, but understanding related to the understanding of the data literacy is still less. Hence, students need to be literate in technology and understand the information displayed in numerical and graphic form so that students can think critically about the information or data that is read. Moreover, Azita et al. (2023) discussed comparing the implementation of the 2013 curriculum and the Kurikulum Merdeka in senior high schools in their research. The comparison is focused on goals, content or materials, facilities and infrastructure, teaching and learning processes, and evaluation.

As for this study, researchers discussed comparing the basic competencies and learning achievements of the 2013 curriculum and the Kurikulum Merdeka on the competency of data analysis and probability of elementary school students. Since learning about data is typically integrated into basic mathematics curricula in many countries, mathematics curricula that offer additional learning opportunities in the data domain are therefore necessary (Davies & Sheldon, 2021). Therefore, this research was conducted to understand how and to what extent data knowledge and skills are studied in the mathematics curriculum in Indonesia, especially at the elementary school level. Thereby, it is essential to carry out a more profound study regarding the importance of data science in the mathematics curriculum in Indonesia, with the hope that the findings of this research can become a valuable resource for education policymakers, especially for mathematics curriculum developers at the elementary school level, especially in the domain of data analysis and opportunities.

LITERATURE REVIEW

Mathematics learning is a conscious effort made by educators and students, as well as learning resources that exist in a learning environment, with the aim that students can understand the concepts, procedures, and mathematics applications. Mathematics learning for students involves forming a mindset for understanding a concept and drawing conclusions related to the relationship between these concepts. According to research conducted by Nurhandayani in 2021, mathematics learning is considered a key element in the primary education curriculum, especially in teaching various fields of study. Learning mathematics is important because it develops calculation skills and thinking abilities essential for solving various challenges and problems.

Mathematics Learning in Elementary School

Mathematics learning has been considered a significant challenge for many students (Hwang & Tu, 2021), for example, at the elementary school level. According to the Ministry of Education, Culture, Research, and Technology, mathematics is a science that improves human thinking and contributes to many other scientific disciplines. Mathematics is a universal science and the basis for the development of modern

https://doi.org/10.17509/jik.v21i1.66317

technology, which has an essential role in various disciplines and in advancing human thinking (Juliyanti et al., 2021).

Mathematics is a science that is deductive and very abstract. However, teachers must make mathematics a concrete and enjoyable science in elementary school learning. This is because elementary school students are generally aged 7 to 12 and are still in concrete operations (Huan et al., 2022). Students can only describe something abstract at this stage by connecting it to concrete things. Therefore, teachers providing mathematics learning in elementary schools must pay attention to these things (Shafiee & Meng, 2023).

Mathematics learning at the elementary school level focuses on mastering mathematics material and emphasizes that mathematics material is used to help students achieve specific abilities. Students still have difficulty thinking about abstract concepts at this level, so they need more concrete or accurate representations to develop their conceptual understanding through experience (Wiryanto, 2020). Success in learning mathematics in elementary school can be seen from students' understanding of the material. One of the keys to success in the learning process is the teacher's ability to plan and implement effective teaching methods so that students can understand mathematics material well (Kim et al., 2019).

The Kurikulum Merdeka

The curriculum constantly undergoes development every five years following current developments. Because the curriculum is a tool in educational activities and a source of education in Indonesia. Thus, the curriculum is considered very important in education in Indonesia (Insani, 2019). Currently, Indonesia is implementing the Kurikulum Merdeka. Kurikulum Merdeka is a curriculum intended to evaluate the implementation of the 2013 curriculum. According to Sadewa (2022), the Kurikulum Merdeka has the following characteristics:

1. Project-based learning;
2. Focus on essential material based on discussions discussing a problem in depth And
3. Flexibility in designing the school curriculum and learning design.

Kurikulum Merdeka constantly adapts to developments in society, science, technology, and the world of work. Implementing the curriculum in schools is always designed according to needs in the world of work or can be said to be problem-based learning. However, in practice, many schools still do not equip their students with the skills needed in the world of work (Rahmadayanti, 2022). Thus causing an inactive economy due to the large number of unemployed people in a country. This is based on the opinion that the quality of children who graduate from vocational schools who are unemployed is one of the symptoms of being economically inactive or less profitable for a country (Cholilah, 2023).

The Kurikulum Merdeka is designed as a more flexible curriculum structure but still emphasizes crucial material substance while promoting character formation and the development of students' competencies. Kurikulum Merdeka design refers to several principles, including 1) respecting the principles of focus, unity, and consistency in disciplinary performance standards; 2) the ability to transfer knowledge and consider interdisciplinary options; 3) valuing originality, flexibility, and direction in curriculum approaches; and 4) empowering students and teachers through participation, independence, and active involvement (Rohmatulloh et al., 2023). This Kurikulum Merdeka approach is in line with the vision of the national education figure, Ki Hajar Dewantara, who emphasizes the importance of learning that provides freedom for students to learn independently and creatively (Sugiharto, 2021; Ferary, 2021). The impact is the formation of the character of students who have independent personalities (Devian et al., 2022). Therefore, the center of the Kurikulum Merdeka is students in the learning process.

https://doi.org/10.17509/jik.v21i1.66317

Through the Kurikulum Merdeka, the Ministry of Education, Culture, Research, and Technology allows educational units to design operational curricula following students' vision, mission, and learning needs. This freedom will encourage an effective teaching and learning process to improve the quality of learning. However, the flexibility of the Kurikulum Merdeka will have a positive meaning if teachers have the initiative, activeness, and confidence to design their operational curriculum. This is due to the implementation stage, where an operational curriculum suitable for educational activities in one region will not necessarily be relevant if implemented in other regions.

Apart from that, the Kurikulum Merdeka learning design differs from the learning design in the 2013 curriculum. In the 2013 curriculum, the learning design was more structured and had clear guidelines because the government provided detailed explanations regarding what basic competencies each student must have. Class level, especially at the elementary school level, will make it easier for teachers to design learning in the classroom following the basic competencies that students must achieve (Azita et al., 2023).

The Field of Mathematics Studies in the Kurikulum Merdeka

Mathematics subjects are organized around five content elements (with an additional element as an option for classes XI and XII) and five process elements. The content elements in Mathematics Subjects are related to the view that mathematics is a learning material (subject matter) that students must understand. Mathematical understanding is closely related to forming a flow of understanding of mathematics learning material in formal-universal facts, concepts, principles, operations, and relationships. The content elements in Mathematics subjects at each level of education are packaged in the fields of study: Numbers, Algebra, Measurement, Geometry, Data Analysis and Probability, and Calculus as an option for classes XI and XII (see **Table 1**).

Table 1. The Field of Mathematics Studies in the Kurikulum Merdeka

Elements	Descriptions
Bilangan	Bidang kajian Bilangan membahas tentang angka sebagai simbol bilangan, konsep bilangan, operasi hitung bilangan, dan relasi antara berbagai operasi hitung bilangan dalam sub-lemen representasi visual, sifat urutan, dan operasi
Aljabar	Bidang kajian Aljabar membahas tentang aljabar non- formal dalam bentuk simbol gambar sampai dengan aljabar formal dalam bentuk simbol huruf yang mewakili bilangan tertentu dalam sub-lemen persamaan dan pertidaksamaan, relasi dan pola bilangan, serta rasio dan proporsi
Pengukuran	Bidang kajian Pengukuran membahas tentang besaran- besaran pengukuran, cara mengukur besaran tertentu, dan membuktikan prinsip atau teorema terkait besaran tertentu dalam sub-elemen pengukuran besaran geometris dan nongeometris
Geometri	Bidang kajian Geometri membahas tentang berbagai bentuk bangun datar dan bangun ruang baik dalam kajian Euclides maupun Non-Euclides serta ciri-cirinya dalam sub-elemen geometri datar dan geometri ruang
Analisis Data dan Peluang	Bidang kajian Analisis Data dan Peluang membahas tentang pengertian data, jenis-jenis data, pengolahan data dalam berbagai bentuk representasi, dan analisis data kuantitatif terkait pemusatan dan penyebaran data serta peluang munculnya suatu data atau kejadian tertentu dalam sub-elemen data dan representasinya, serta ketidakpastian dan peluang

Source: Kemendikbudristek 2022

Table 1 shows six mathematics learning objectives in data analysis and probability from primary to secondary education. To achieve these six learning objectives, students must at least learn the material: 1) understanding data, 2) types of data, 3) processing data in various forms of representation, 4) quantitative data analysis related to the concentration and distribution of data, 5) probability for the emergence of specific data or events in data sub-elements and their representation, as well as 6) uncertainty and probability. This is not much different from the Australian curriculum, where data analysis

https://doi.org/10.17509/jik.v21i1.66317

and probability competencies consist of experimenting, identifying and describing a possibility, and recognizing a variation of results. The statistical competency consists of collecting and organizing data, making displays using tables, drawing, and simple column graphs, and interpreting and comparing the data display (English, 2023).

The application of Kurikulum Merdeka to mathematics learning can be made by making learning materials related to daily activities to motivate students to relate the mathematical knowledge they have acquired to everyday life. Mathematics learning material can be submitted by playing games so that students can more easily understand the material provided. Meanwhile, practice questions in mathematics learning can be in the form of engineering project-based questions starting with problem identification to improve students' critical thinking skills (Malikah, 2022).

METHODS

This study uses a qualitative literature study methodology. The literature study methodology is an activity related to collecting library materials, reading library materials, writing important things from library materials, and processing information obtained from these activities (Snyder, 2019). Characteristics of library studies are that researchers do not look for information from texts or numbers rather than from the field, researchers only meet information sources that are available in the library, library data is secondary, and the state of library data is not hampered by time and space (Nazifah, 2020). Researchers used a curriculum approach to examine the differences and similarities between the 2013 curriculum and the Kurikulum Merdeka, Indonesia's expected mathematics curricula, focusing on data analysis and opportunity studies. This was done because initial formal learning about data is taught in mathematics. This methodology is additionally driven by the growing focus on curriculum-related research in STEM education (Li et al., 2020) and the need for data skills in the 21st century (Ow-Yeong et al., 2023).

The steps taken in this research include: (1) formulating research questions; (2) determining the characteristics of the primary study required; (3) sampling potentially relevant literature; (4) selecting related literature; (5) synthesizing the findings; and (6) reporting results (Sauer & Seuring, 2023). At the stage of formulating research questions, researchers ask about the extent to which knowledge and skills related to data analysis elements and probability are taught in elementary schools. Then, the researcher determines the main study characteristics needed from these questions. In this case, it is related to the mathematics curriculum, especially in elementary schools, where researchers conducted comparative studies related to the 2013 mathematical curriculum and the Kurikulum Merdeka. Documents referred to the Minister of Education and Culture Regulation document are then analyzed to answer research questions. Following the fourth and fifth stages, the researcher added relevant literature to strengthen and synthesize the findings. Finally, researchers write research reports in the form of scientific articles.

The data in this research was collected using document instruments related to basic competencies or learning outcomes in the curriculum of 2013 and the Kurikulum Merdeka. The basic competency (KD) documents in the 2013 curriculum were obtained through *Permendikbud Nomor 37 tahun 2018*, while the learning achievement (CP) documents in the Kurikulum Merdeka were obtained through *Kemendikbudristek Nomor 033/H/KR/22*. The data analysis technique refers to Mezmir (2020) and consists of data reduction, presentation, and verification. Data obtained from regulations issued by the Ministry of Education and Culture is reduced, and then the reduced data is displayed. Brief explanations, infographics, correlations between categories, flow charts, and other visual representations of this data can be used. Next, the final step in qualitative data analysis is drawing conclusions and verification.

https://doi.org/10.17509/jik.v21i1.66317

RESULTS AND DISCUSSION

The content area in data analysis and probability at the elementary school level in the 2013 curriculum and the Kurikulum Merdeka can be seen in Table 2, where there are differences in the competencies aimed at and the division of phases or classes. In the Kurikulum Merdeka, learning achievements (CP) are arranged based on phase, namely phase A (generally for grade 1 and grade 2 of elementary school), phase B (generally for grade 3 and grade 4 of elementary school), and phase C (generally for grade 5 and grade 6 elementary school). In contrast, in the 2013 curriculum, basic competencies (KD) are arranged based on class level, from classes I to VI.

Additionally, in the 2013 curriculum, the education unit is directed to use the subject-based learning organization approach, except in elementary schools that use an integrative thematic approach. In contrast, in the Kurikulum Merdeka, the education unit can organize subject-based, thematic, or integrated learning.

Table 2. The Content Area in the Field of Data Analysis and Probability in the 2013 Curriculum and the Kurikulum Merdeka

Phase	Learning Achievement (Kurikulum merdeka)	Class		Basic Competencies (2013 Curriculum)
A	Students can sort, group, compare, and present data from many objects using rulers and pictograms in up to 4 categories (Goliah et al., 2022).	I		-
		II		-
B	Students can sort, compare, present, analyze, and interpret data in tables, picture diagrams, pictograms, and bar charts (one unit scale) (Goliah et al., 2022).	III	3.13	Explaining data related to students, which is presented in picture diagrams (Setiawan, 2021).
			4.13	Presenting data related to students presented in picture diagrams (Setiawan, 2019).
		IV	3.11	Explains students' data and environment, presented as a bar diagram (Setiawan, 2019).
			4.11	Collect data about students and their environment and present it as a bar chart (Setiawan, 2021).
C	To obtain information, students can sort, compare, present, and analyze data on many objects and measurement data in pictures, pictograms, bar charts, and frequency tables. In a randomized experiment, they can determine events with greater probability (Goliah et al., 2022).	V	3.7	Explains data related to students or the surrounding environment and how to collect it (Setiawan, 2021).
			4.7	Analyze data related to students or the surrounding environment and how to collect it (Setiawan, 2021).
			3.8	Explain the presentation of data relating to students and compare it with data from the surrounding environment in the form of lists, tables, picture diagrams (pictograms), bar charts, or line charts (Setiawan, 2019).
			4.8	Organize and present data relating to students and compare it with data from the surrounding environment in the form of lists, tables, picture diagrams (pictograms), bar charts, or line charts (Setiawan, 2019).
		VI	3.8	Explain and compare single data's mode, median, and mean to determine which value best represents the data (Setiawan, 2021).
			4.8	Solve problems related to the mode, median, and mean of single data in problem-solving (Setiawan, 2019).

Source: Research 2023

https://doi.org/10.17509/jik.v21i1.66317

Table 2 shows that learning achievements (CP) in the Kurikulum Merdeka are stated in paragraphs that combine knowledge, attitudes, and skills to achieve, strengthen, and increase competence. At the same time, basic competencies (KD) in the 2013 curriculum are expressed in points and ordered to achieve core competencies (KI), which are organized annually, where basic competencies (KD) in the 2013 curriculum are in the form of grouped scope and sequence into four core competencies (KI), namely spiritual attitudes, social attitudes, knowledge, and skills.

Discussion

The Ministry of Education, Culture, Research, and Technology, through the Kurikulum Merdeka, provides freedom for educational units to design operational curricula that follow the vision, mission, and learning needs of students. This freedom will encourage an effective teaching and learning process to improve the quality of learning. However, the flexibility of the Kurikulum Merdeka will have a positive meaning if teachers have the initiative, activeness, and confidence to design their operational curriculum. This is due to the implementation stage, where an operational curriculum suitable for educational activities in one region will not necessarily be relevant if implemented in other regions.

Data material in the Kurikulum Merdeka has been given to students in phase A or generally grades 1 and 2; however, in the 2013 curriculum, new data material is given to students in grade 3 or the equivalent of phase B. Expected learning outcomes in phase A in the Kurikulum Merdeka means that students can sort, sort, group, compare and present data from many objects using graphs and pictograms in up to 4 categories. These findings indicate that in the Kurikulum Merdeka, data-related knowledge and representation skills have begun to be taught when students first enter elementary school so that they acquire data-related skills. This is in line with research by Mahmud & Wong (2022) and Van-Laar et al. (2020), who state that developing data skills is becoming increasingly crucial in the twenty-first century, given that the public now has greater access to data thanks to digital media. Thus, the significance of accurately reading and comprehending data and examining how inaccurately given data can result in misinformation is increased (Caled & Silva, 2022; Carmi et al., 2020).

Apart from that, the data material used in the Kurikulum Merdeka is explicitly related to data from many objects and data from measurements. In contrast, the 2013 curriculum relates to students' data and environment. These findings show that the two curricula provide data material with different approaches; where in the 2013 curriculum, students are asked to collect information, for example, by collecting data on students' height or weight, then students are asked to process and analyze the data and present the data in various ways. Meanwhile, in the Kurikulum Merdeka, students are asked to collect information, for example, by collecting data on vehicles passing in front of the school; then, students are asked to process and analyze this data and present the data in various ways.

The learning verbs used at all levels show similarities in the 2013 curriculum and the Kurikulum Merdeka, even though the 2013 curriculum is not explained in detail as in the Kurikulum Merdeka. Apart from that, in representing data and material in the field of study, there are differences in the order of the 2013 curriculum and the Kurikulum Merdeka. The material for determining events with a greater probability in a random experiment in the Kurikulum Merdeka has started to be taught at the elementary school level, namely in phase C or generally in grades 5 and 6. However, in the 2013 curriculum, this material began to be taught at the junior high school level or equivalent to phase D. Not only that, the material on mode, median, and mean from single data has been taught starting in grade 6 or equivalent to phase C. In contrast, in the Kurikulum Merdeka, this material begins to be taught in phase D or generally in grades 7, 8, and 9 of junior high school.

https://doi.org/10.17509/jik.v21i1.66317

CONCLUSION

Based on the results of the research and discussion previously described, it can be concluded that the fields of data analysis and probability in the 2013 curriculum and the Kurikulum Merdeka provide different learning experiences. Data material in the Kurikulum Merdeka has been taught starting from phase A or generally grades 1 and 2. In contrast, in the 2013 curriculum, data material began to be taught in grade 3 or the equivalent of phase B. Apart from that, there are differences in the order of material provided by the two curricula at the elementary school level. The suggestions that researchers can provide based on the results of their research findings are for further research to analyze further the importance of data literacy at different levels following the mathematical curriculum in Indonesia, conducting broader research that includes competencies other than data analysis and probability, teaching materials, and structures; and further analyzing the textbooks used by the two curricula, especially in the elements of data analysis and probability in elementary schools.

AUTHOR'S NOTE

The authors affirm no conflict of interest with this article's publishing. The author attests to no plagiarism in the article's data or content. Additionally, the authors would like to deliver gratitude to Lembaga Pengelola Dana Pendidikan (LPDP) as a part of the Ministry of Finance of the Republic of Indonesia for sponsoring the author in continuing the master's program as well as for assisting this publication and collaboration.

REFERENCES

Afnida, M., & Suparno, S. (2020). Literasi dalam pendidikan anak usia dini: Persepsi dan praktik guru di prasekolah Aceh. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *4*(2), 9-17.

Azita, A., Ersalianda, D., Andri, M., Mukhlis, M., & Tandon, M. (2023). Differences in the implementation of the 2013 curriculum and the independent learning curriculum at SMAN 3 Siak Hulu. *Lingeduca: Journal of Language and Education Studies*, *2*(2), 133-143.

Bakker, A., Cai, J., & Zenger, L. (2021). Future themes of mathematics education research: An international survey before and during the pandemic. *Educational Studies in Mathematics*, *1*(2), 20-34.

Börner, K., Bueckle, A., & Ginda, M. (2019). Data visualization literacy: Definitions, conceptual frameworks, exercises, and assessments. *Proceedings of the National Academy of Sciences of the United States of America*, *6*(2), 57-64.

Caled, D., & Silva, M. J. (2022). Digital media and misinformation: An outlook on multidisciplinary strategies against manipulation. *Journal of Computational Social Science*, *5*(1), 51-64.

Carmi, E., Yates, S. J., Lockley, E., & Pawluczuk, A. (2020). Data citizenship: Rethinking data literacy in the age of disinformation, misinformation, and malinformation. *Internet Policy Review*, *9*(2), 1-22.

Cholilah, M., Tatuwo, A. G. P., Rosdiana, S. P., & Fatirul, A. N. (2023). Pengembangan kurikulum merdeka dalam satuan pendidikan serta implementasi kurikulum merdeka pada pembelajaran abad 21. *Sanskara Pendidikan dan Pengajaran*, *1*(2), 56-67.

Davies, N., & Sheldon, N. (2021). Teaching statistics and data science in England's schools. *Teaching*

https://doi.org/10.17509/jik.v21i1.66317

Statistics, *4*(1), 52-70.

Devian, L., Desyandri, & Erita, Y. (2022). Merdeka belajar dalam pandangan Ki Hadjar Dewantara dan relevansinya bagi pengembanagan pendidikan karakter. *Jurnal Pendidikan dan Konseling*, *6*(4), 6-12.

English, L. D. (2023). Linking probability and statistics in young students' reasoning with chance. *Statistics Education Research Journal*, *22*(2), 1-12.

Fadillah, F., & Munandar, D. R. (2021). Analisis kemampuan literasi statistis dalam pembelajaran Matematika di masa pandemi. *Jurnal Pembelajaran Matematika Inovatif*, *4*(5), 57-68.

Ferary, D. (2021). On Ki Hadjar Dewantara's philosophy of education. *Nordic Journal of Comparative and International Education (NJCIE), 5*(2), 65-78.

Firat, E. E., Joshi, A., & Laramee, R. S. (2022). Interactive visualization literacy: The state-of-the-art. *Information Visualization*, *21*(3), 285-310.

Goliah, M., Jannah, M., & Nulhakim, L. (2022). Komponen kurikulum pembelajaran khususnya pada muatan 5 bidang studi utama di SD. *Jurnal Pendidikan dan Konseling*, *4*(2), 47-15.

Hassani, H., Beneki, C., Silva, E. S., Vandeput, N., & Madsen, D. Ø. (2021). The science of statistics versus data science: What is the future? *Technological Forecasting and Social Change*, *17(3), 1-14*.

Huan, C., Meng, C. C., & Suseelan, M. (2022). Mathematics learning from concrete to abstract (1968-2021): A bibliometric analysis. *Participatory Educational Research*, *9*(4), 45-68.

Hwang, G.-J., & Tu, Y.-F. (2021). Roles and research trends of artificial intelligence in mathematics education: A bibliometric mapping analysis and systematic review. *Mathematics*, *9*(6), 24-40.

Insani, F. D. (2019). Sejarah perkembangan kurikulum di Indonesia sejak awal kemerdekaan hingga saat ini. *As-Salam: Jurnal Studi Hukum Islam & Pendidikan*, *8*(1), 43-64.

Juliyanti, J., Prayitno, S., Amrullah, A., & Sarjana, K. (2021). Pengaruh kemampuan numerik dan spasial terhadap hasil belajar matematika siswa kelas VIII SMP. *Griya Journal of Mathematics Education and Application*, *1*(3), 262-274.

Kailani, R., Susilana, R., & Rusman, R. (2021). Digital literacy curriculum in elementary school. *Teknodika*, *19*(2), 76-90.

Kim, S., Raza, M., & Seidman, E. (2019). Improving 21st-century teaching skills: The key to effective 21st-century learners. *Research in Comparative and International Education*, *14*(1), 99-117.

Kuntarto, H. B., & Prakash, A. (2020). Digital literacy among children in elementary schools. *Diakom: Jurnal Media dan Komunikasi*, *3*(2), 157-170.

Li, Y., Wang, K., Xiao, Y., & Froyd, J. E. (2020). Research and trends in STEM education: A systematic review of journal publications. *International Journal of STEM Education*, *7*(1), 1-14.

Mahmud, M. M., & Wong, S. F. (2022). Digital age: The importance of 21st century skills among the

https://doi.org/10.17509/jik.v21i1.66317

undergraduates. *Frontiers in Education*, *7*(2), 1-9.

Malikah, S., Winarti, W., Ayuningsih, F., Nugroho, M. R., Sumardi, S., & Murtiyasa, B. (2022). Manajemen Pembelajaran Matematika pada Kurikulum Merdeka. *Edukatif: Jurnal Ilmu Pendidikan*, *4*(4), 12-18.

Masyhura, N., & Ramadan, Z. H. (2021). Implementation of digital literacy in elementary schools. *International Journal of Elementary Education*, *5*(4), 26-39.

Mezmir, E. A. (2020). Qualitative data analysis: An overview of data reduction, data display and interpretation. *Research on Humanities and Social Sciences*, *10*(2), 15-27.

Nazifah, N. A. (2020). Keusangan literatur, paro hidup, dan zipf pada artikel bidang pertanian. *IQRA`: Jurnal Ilmu Perpustakaan dan Informasi (e-Journal)*, *14*(1), 1-28.

Nurhandayani, N., Hadi Saputra, H., & Kunci, K. (2021). Pengaruh pendekatan Matematika realistik terhadap motivasi dan hasil belajar Matematika kelas IV SDN Gugus II Madapanga 2020/2021. *Renjana Pendidikan Dasar*, *1*(3), 166-174.

Nurhasanah, A., Pribadi, R. A., & Nur, M. D. (2021). Analisis kurikulum 2013. *Didaktik: Jurnal Ilmiah FKIP Universitas Mandiri*, *7*(2), 84-93.

Ow-Yeong, Y. K., Yeter, I. H., & Ali, F. (2023). Learning data science in elementary school Mathematics: a comparative curriculum analysis. *International Journal of STEM Education*, *10*(1), 48-60.

Peng, R. D., & Parker, H. S. (2022). Perspective on data science. *Annual Review of Statistics and Its Application*, *9*(2), 1-20.

Rahmadayanti, D., & Hartoyo, A. (2022). Potret kurikulum merdeka, wujud merdeka belajar di sekolah dasar. *Jurnal Basicedu*, *6*(4), 174-187.

Rohmatulloh, R., Novaliyos, N., Nindiasari, H., & Fatah, A. (2023). Pembelajaran Matematika pada era merdeka belajar: Literature review. *Jurnal Pendidikan Matematika*, *7*(1), 286-295.

Sadewa, M. A. (2022). Meninjau kurikulum prototipe melalui pendekatan integrasi-interkoneksi Prof M Amin Abdullah. *Jurnal Pendidikan dan Konseling (JPDK)*, *4*(1), 266-280.

Sarker, I. H. (2021). Data science and analytics: an overview from data-driven smart computing, decision-making and applications perspective. *SN Computer Science*, *2*(5), 1-22.

Sauer, P. C., & Seuring, S. (2023). How to conduct systematic literature reviews in management research: A guide in 6 steps and 14 decisions. *Review of Managerial Science, 17*(3), 34-45.

Setiawan, E. P. (2019). Analisis muatan literasi statistika dalam buku teks Matematika kurikulum 2013. *Pythagoras: Jurnal Pendidikan Matematika*, *14*(2), 163-177.

Setiawan, E. P. (2021). Statistical literacy in primary school Mathematics curricula: Historical review and development. *Jurnal Pendidikan dan Kebudayaan*, *6*(1), 1-20.

Shafiee, M. S., & Meng, C. C. (2023). Impact of concrete-pictorial-abstract approach with collaborative

https://doi.org/10.17509/jik.v21i1.66317

lesson research on year four pupils' proficiency in volume. *Asia Pacific Journal of Educators and Education*, *38*(1), 119-140.

Shilton, K., Moss, E., Gilbert, S. A., Bietz, M. J., Fiesler, C., Metcalf, J., Vitak, J., & Zimmer, M. (2021). Excavating awareness and power in data science: A manifesto for trustworthy pervasive data research. *Big Data and Society*, *8*(2), 35-45.

Sugiharto, S. (2021). Explicating and framing Dewantara's conduct pragmatism as a pragmatist philosophy of education. *Journal of Philosophy of Education, 55*(5), 793-806.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of business research*, *10*(4), 333-339.

Van-Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2020). Determinants of 21st-century skills and 21st-century digital skills for workers: A systematic literature review. *SAGE Open*, *10*(1), 1-12.

Wiryanto, W. (2020). Proses pembelajaran Matematika di sekolah dasar di tengah pandemi COVID-19. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian*, *6*(2), 125-132.

Wise, A. F. (2019). Educating data scientists and data literate citizens for a new generation of data. *Journal of the Learning Sciences, 2*(1), 20-35.

https://doi.org/10.17509/jik.v21i1.66317