

## MATHEMATICAL LITERACY DEVELOPMENT THROUGH REAL-TIME SOCIOECONOMIC DATA ANALYSIS IN SENIOR HIGH SCHOOLS

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### **Abstract**

Mathematical literacy is an essential competency needed by students to understand, interpret, and use mathematical concepts in various real-life contexts, particularly in facing increasingly complex social and economic dynamics. The development of digital technology and the availability of real-time socioeconomic data open new opportunities in mathematics learning at the senior high school level, particularly in linking abstract concepts to relevant contextual problems. This study aims to systematically examine the development of mathematical literacy through the use of real-time socioeconomic data analysis in mathematics learning in senior high schools. The method used is a literature review by examining relevant scientific articles, proceedings, and research reports, both national and international, published within a certain time frame. The results of the study indicate that the integration of real-time socioeconomic data in mathematics learning can improve conceptual understanding, mathematical modeling skills, critical reasoning, and data-based decision-making skills in students. In addition, this approach also encourages active student engagement, increases the relevance of learning, and strengthens the connection between mathematics and real-world phenomena. However, this study also identifies several challenges, such as teacher readiness, the availability of technological infrastructure, and the need for adaptive and contextual learning designs. This research is expected to provide conceptual contributions to the development of innovative and contextual mathematics learning strategies to improve students' mathematical literacy in the data-driven era.

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## INTRODUCTION

Mathematical literacy is a key competency urgently needed by students in the 21st century. Mathematical literacy is no longer understood solely as the ability to calculate or solve routine problems, but rather as an individual's ability to formulate, use, and interpret mathematics in various real-life contexts. Globally, mathematical literacy is a crucial indicator in assessing the readiness of young people to face increasingly complex social, economic, and technological challenges. The results of various international assessments indicate that the mathematical literacy skills of students in many developing countries, including Indonesia, remain at a level that requires improvement, particularly in the application of mathematical concepts to analyze real-world and dynamic contextual problems (Essang et al., 2025).

One of the main challenges in developing mathematical literacy at the high school level is the gap between the mathematics taught in the classroom and the realities of students' daily lives (Sujatha & Vinayakan, n.d.-a). Mathematics learning is often oriented toward abstract procedures and problem-solving, disconnected from actual social and economic contexts. As a result, students tend to view mathematics as a difficult, irrelevant, and disconnected from real life. This condition results in low learning motivation and limits students' ability to use mathematics as a critical thinking tool to understand and solve real-world problems.

The development of digital technology and the availability of large amounts of data open up new opportunities to transform mathematics learning to be more contextual and meaningful. Currently, real-time socioeconomic data, such as inflation, unemployment rates, poverty, economic growth, population mobility, and energy consumption, can be widely accessed through various official and open platforms. This data represents real phenomena occurring around students and is directly related to people's lives. The use of real-time socioeconomic data in mathematics learning has the potential to bridge the gap between abstract mathematical concepts and the social realities faced by students (Song et al., 2024a).

Real-time socioeconomic data analysis in the context of mathematics learning enables students to develop more comprehensive mathematical literacy. Through observing, processing, interpreting, and drawing conclusions from actual data, students not only learn mathematical concepts such as

statistics, probability, algebra, and functions, but also develop critical thinking, problem-solving, and data-driven decision-making skills. This process encourages students to understand that mathematics is a relevant and essential analytical tool for understanding ever-changing socioeconomic dynamics (Song et al., 2024b).

At the high school level, students are at a stage of cognitive development that enables them to think abstractly, analytically, and reflectively. This stage is an opportune moment to integrate mathematics learning with real-world, contextual socioeconomic issues. By involving real-time data, mathematics learning can be directed toward exploring authentic problems, such as analyzing trends in staple food prices, income inequality between regions, or the impact of economic policies on community well-being. Such activities not only strengthen understanding of mathematical concepts but also foster social awareness and data literacy skills, much needed in the information age (Smith et al., 2023).

However, the implementation of real-time socioeconomic data analysis in mathematics learning in high schools still faces various challenges. These challenges include teachers' readiness to integrate actual data into their lessons, limited relevant learning resources, and a curriculum that does not fully accommodate data-driven approaches and real-world contexts. Furthermore, there are few empirical or conceptual studies specifically addressing how mathematical literacy development can be achieved through real-time socioeconomic data analysis in high schools. This situation indicates a gap between the potential use of real-time data and the currently dominant mathematics learning practices.

In the context of education policy, strengthening numeracy and data literacy has become a top priority in efforts to improve the quality of human resources. Mathematics education is expected to produce not only students capable of solving exam questions, but also individuals capable of understanding quantitative information, assessing data reliability, and making rational and responsible decisions (Ngoveni, n.d.). Therefore, a mathematics learning approach that utilizes real-time socioeconomic data aligns with the direction of educational transformation that emphasizes meaningful, contextual, and real-life-oriented learning.

Literature reviews show that learning based on real contexts and authentic data has a positive impact on improving mathematical literacy, conceptual understanding, and student engagement in the learning process. However, most research still focuses on the use of simulated or static data,

rather than real-time data that reflects current socioeconomic conditions. However, the use of real-time data provides a higher dimension of actuality and relevance, allowing students to directly see the connection between mathematics and ongoing phenomena in society.

Based on the above description, it can be concluded that developing mathematical literacy through real-time socioeconomic data analysis in high schools is an important and strategic issue that deserves further study. This research is relevant because it seeks to integrate the need to strengthen mathematical literacy with the use of actual data widely available in the digital era. Through a comprehensive literature review, this research is expected to provide a conceptual foundation for how real-time socioeconomic data analysis can be utilized as an innovative approach in mathematics learning in high schools. Thus, this research not only contributes to the development of mathematics education theory and practice but also has implications for curriculum development, learning strategies, and improving teacher competency in facing the challenges of 21st-century education. Strengthening mathematical literacy rooted in real-time socioeconomic data analysis is expected to equip students with critical, adaptive, and relevant mathematical thinking skills to the dynamics of global and local socioeconomic life.

## **RESEARCH METHOD**

This research used a literature review method to analyze and synthesize various scientific sources relevant to the development of mathematical literacy through the analysis of real-time socioeconomic data at the high school level. The literature review was conducted by searching reputable journal articles, conference proceedings, academic books, and education policy reports that discuss mathematical literacy, the use of real-time data, data-driven education, and the integration of socioeconomic contexts in mathematics learning. These sources were collected through scientific databases such as Scopus, Web of Science, Google Scholar, and national journal portals. Inclusion criteria included publications within the last ten years, relevance to the secondary education context, and clarity of the theoretical and methodological frameworks used.

The data analysis process was conducted qualitatively using a thematic analysis approach to identify patterns, key concepts, and key findings related to learning strategies, the role of real-time socioeconomic data, and its impact on strengthening students' mathematical literacy. Each source was critically analyzed to assess its contribution to understanding the relationship between real-world contexts and students' mathematical abilities, including aspects of

reasoning, problem-solving, and data-driven decision-making. The results of the literature synthesis are then used to formulate a conceptual framework that explains how the use of real-time socioeconomic data can be pedagogically integrated into mathematics learning in high schools, as well as identifying research gaps that can form the basis for further empirical studies.

## **RESULT AND DISCUSSION**

### **Characteristics of Real-Time Socioeconomic Data and Its Potential Use in Mathematics Learning**

Real-time socioeconomic data is a dynamic representation of a community's social and economic conditions, obtained continuously or over very short periods of time through various digital sources. The main characteristics of this data lie in its actual, contextual, and responsive nature to changes in social and economic situations. Unlike conventional statistical data, which is typically periodic and retrospective, real-time socioeconomic data can depict ongoing phenomena, such as fluctuations in the prices of daily necessities, population mobility levels, digital economic transaction activity, temporary unemployment rates, or changes in consumer consumption patterns. These characteristics make real-time socioeconomic data highly relevant for use as an authentic learning resource in mathematics learning, particularly in developing students' mathematical literacy (Kennel & Ruzika, 2024).

One of the main characteristics of real-time socioeconomic data is its large volume and complexity (Jin et al., 2022). This data often originates from various platforms such as government information systems, digital financial applications, social media, mobility sensors, and regularly updated online statistical databases. This large volume of data reflects a diversity of interacting social and economic variables, such as income, expenditure, education level, access to public services, and labor market dynamics. In the context of mathematics learning, this data complexity provides students with opportunities to interact with real, unsimplified data, challenging them to sort data, identify variables, and select appropriate analysis methods. This process indirectly trains critical thinking skills, mathematical modeling, and logical reasoning, which are at the heart of meaningful mathematics learning.

Beyond volume and complexity, another prominent characteristic of real-time socioeconomic data is its contextual nature and proximity to students' daily lives. Data relating to staple food prices, local inflation rates, average household income, or trends in public transportation use allow students to see

direct connections between the mathematical concepts learned in class and the social realities they experience. This authentic context is crucial in modern mathematics learning, as it can bridge the gap between mathematics as an abstract concept and mathematics as a tool for understanding and solving real-life problems (Martin et al., 2020). Thus, real-time socioeconomic data acts as a bridge between mathematical theory and everyday practice.

Real-time characteristics also contain a strong temporal dimension, as data continuously changes over time. These changes enable the analysis of trends, seasonal patterns, and short-term fluctuations, which are highly relevant to mathematical topics such as statistics, probability, sequences and series, functions, and graphical analysis. During learning, students can be encouraged to observe changes in data from day to day or week to week and then model these changes in tables, graphs, or mathematical equations. This activity not only enhances understanding of mathematical concepts but also fosters students' awareness that mathematics is dynamic and adaptable to changes in the social and economic environment (Verma et al., 2022).

The potential of utilizing real-time socioeconomic data in mathematics learning also lies in its ability to encourage problem-based and project-based learning. Teachers can design learning scenarios in which students are asked to analyze specific socioeconomic issues, such as rising food prices, income inequality, or the impact of economic policies on society (Liu et al., 2023). By using real-time data, students can perform calculations, estimates, and predictions supported by actual data. This process requires students to not only perform mathematical operations but also to interpret the results critically and contextually. Thus, mathematics learning does not stop at numerical answers but rather develops toward understanding the meaning and social implications of the analysis results.

Furthermore, real-time socioeconomic data has great potential in developing students' data literacy and digital literacy. In the digital era, the ability to read, understand, and evaluate data is a crucial competency for students. By utilizing real-time socioeconomic data in mathematics learning, students learn how to access valid data sources, verify the accuracy of the data, and understand the limitations and potential biases it may contain. This process aligns with the goals of 21st-century mathematics education, which focuses not only on mastering procedures but also on developing critical and ethical attitudes in using data for decision-making.

From a pedagogical perspective, the use of real-time socioeconomic data also contributes to increased student learning motivation. When students

realize that the data they analyze is real and directly impacts people's lives, they tend to be more emotionally and cognitively engaged in the learning process. This engagement can increase students' curiosity, interest in learning, and confidence in using mathematics as an analytical tool. Mathematics learning, initially perceived as difficult and abstract, can transform into a relevant and meaningful exploratory activity (Martins et al., 2024).

However, the potential use of real-time socioeconomic data in mathematics learning also requires teachers to be prepared to design appropriate learning strategies. Teachers need to have a sufficient understanding of data characteristics, basic analysis techniques, and how to simplify data complexity without losing its contextual meaning. Furthermore, real-time data integration also requires adequate technological and infrastructure support so students can access and process data effectively. Despite the challenges, the potential benefits offered by real-time socioeconomic data are far greater, especially in shaping mathematics learning that is relevant to the demands of the times.

### **The Relationship between Mathematical Literacy, Data Literacy, and Digital Literacy in High School Students**

The relationship between mathematical literacy, data literacy, and digital literacy in high school students is a crucial issue in the context of 21st-century education, characterized by rapid technological developments, the availability of large amounts of data, and the increasing complexity of real-life problems. These three types of literacy cannot be viewed as standalone competencies, but rather are interconnected and mutually reinforcing in developing students' critical, analytical, and reflective thinking skills (T et al., 2025). At the high school level, students' cognitive development phase is at the formal operational stage, giving them the potential to integrate mathematical abstraction skills with data understanding and the meaningful use of digital technology.

Mathematical literacy serves as a primary foundation for logical and systematic thinking processes. This literacy encompasses not only the ability to calculate or apply formulas but also the ability to formulate problems, interpret contextual situations into mathematical models, analyze relationships between variables, and evaluate solutions. In modern life, saturated with information based on numbers and symbolic representations, mathematical literacy is a crucial tool for students to understand social, economic, and scientific phenomena (Busnawir et al., 2023). However, these mathematical skills will be

less relevant if not linked to the context of real data and digital media, which have become an integral part of students' lives today.

Data literacy serves as a bridge between mathematical abstraction and empirical reality. Data literacy encompasses the ability to collect, read, interpret, analyze, and draw conclusions from data, whether in the form of tables, graphs, or other digital visualizations (Michos et al., 2023). For high school students, data literacy enables them to understand data-based information frequently encountered in mass media, statistical reports, and digital platforms. These skills require an understanding of mathematical concepts such as averages, percentages, probability, correlation, and trends, demonstrating that mathematical literacy is a crucial prerequisite for the development of data literacy. Without a sufficient understanding of mathematics, students will struggle to interpret the meaning behind data and risk making reasoning errors or accepting information uncritically.

On the other hand, digital literacy provides a framework and tools for students to effectively access, process, and communicate mathematical information and data. Digital literacy is not only related to the ability to use technological devices but also encompasses a critical understanding of digital information, the ethics of technology use, and the ability to select and utilize digital applications or platforms appropriately. In the context of mathematics and data learning, digital literacy enables students to use data processing software, visualization applications, mathematical simulations, and online learning resources to enrich their learning experience. Thus, digital literacy serves as a catalyst that strengthens the application of mathematical and data literacy in real-world situations.

The interconnectedness of these three literacies is evident in the contextual problem-solving process. When students are faced with social or economic problems presented in the form of digital data, they need to use digital literacy to access and understand data sources, mathematical literacy to model and analyze the problem, and data literacy to interpret the analysis results and draw relevant conclusions. This process requires the integration of complex cognitive abilities, so learning that connects these three literacies can encourage the development of higher-order thinking skills. Students not only learn to understand concepts but also learn how those concepts are used to understand the world around them (Afifah et al., 2024).

In the high school context, the integration of mathematical literacy, data literacy, and digital literacy also contributes to the development of critical and reflective attitudes toward information. In the digital age, students are faced

with a flood of information that is not always accurate or presented objectively. The ability to read graphs, understand statistics, and evaluate data sources is crucial to prevent students from being easily influenced by misleading information. Mathematical literacy helps students evaluate the validity of calculations or numerical claims, data literacy helps them understand the context and quality of data, while digital literacy helps them assess the credibility of information sources and how that data is presented.

The interconnectedness of these three literacies also has significant pedagogical implications. High school learning needs to be designed in an integrative manner, utilizing real-world data and digital technology as the context for mathematics learning. A contextual, problem-based learning approach can be an effective means of developing mathematical literacy, data literacy, and digital literacy. Through data analysis activities, technology-based projects, and critical discussions of digital information, students can develop a deeper and more meaningful understanding. This demonstrates that literacy development cannot be achieved in isolation but must be designed as a mutually supportive whole.

Furthermore, the interconnectedness of mathematical literacy, data literacy, and digital literacy is also relevant to students' future needs. The world of work and higher education increasingly demands individuals who are able to process data, think analytically, and utilize technology intelligently (ERIC - EJ1264128 - Digital Literacy of STEM Senior High School Students: Basis for Enhancement Program, International Journal of Technology in Education, 2020, n.d.). By mastering these three literacies from high school onward, students will be better prepared to face global challenges and actively participate in a knowledge-based society. These skills also support rational and responsible decision-making in everyday life, both in personal and social contexts.

Overall, mathematical literacy, data literacy, and digital literacy are three closely interrelated competencies that cannot be separated from learning in high school. Mathematical literacy provides the foundation for logical and quantitative reasoning, data literacy connects this reasoning to empirical reality, and digital literacy provides the tools and context for accessing and communicating information effectively. The integration of these three not only improves the quality of learning but also equips students with critical and adaptive thinking skills, which are essential in the digital age. Therefore, efforts to develop education at the senior high school level need to place these three literacies as a complete unit in the planning, implementation, and evaluation of learning.

### **Challenges of Implementing Real-Time Data-Based Learning in High Schools**

The implementation of real-time data-based learning in high schools is a pedagogical innovation that aligns with the demands of educational transformation in the digital era. This approach utilizes live and up-to-date data obtained from various sources, such as socioeconomic, environmental, health, traffic, and other continuously updated digital data, to support contextual and relevant learning processes. Despite its significant potential for improving data literacy, digital literacy, and critical thinking skills in students, the implementation of real-time data-based learning at the high school level faces various structural, pedagogical, technological, and cultural challenges. These challenges need to be comprehensively understood so that the implementation of this innovation does not stop at the discourse level but can truly improve the quality of learning.

One of the main challenges lies in the readiness of technological infrastructure in schools. Real-time data-based learning is highly dependent on the availability of stable internet access, adequate hardware, and supporting systems such as servers, applications, and data processing platforms. In reality, not all high schools have equal technological facilities, especially those located in remote areas or areas with limited network connectivity (Kayumova et al., 2025). This infrastructure imbalance creates a gap in learning opportunities, with only some students able to fully utilize data-based learning, while others remain stuck with conventional learning methods. This situation not only hinders learning effectiveness but also has the potential to widen the gap in education quality between regions.

Beyond infrastructure issues, significant challenges also arise from the competency aspect of teachers. Real-time data-based learning requires teachers not only to master the subject matter but also to possess adequate data literacy and digital literacy skills. Teachers are required to be able to access data sources, verify the accuracy of information, process data into easily understood representations, and relate it to learning objectives. For some teachers, especially those unfamiliar with digital technology or data analysis, these demands pose a significant additional burden. The lack of ongoing training and technical assistance makes many teachers feel insecure about integrating real-time data into their learning, resulting in the expected innovations not being implemented optimally (Secreto et al., 2025).

The next challenge relates to curriculum complexity and limited learning time. A dense high school curriculum with competency achievement targets

often leaves limited room for real-time data-driven learning exploration. Using actual data requires additional time for collection, analysis, discussion, and reflection, which does not always align with the allocated learning time. As a result, teachers tend to revert to faster, more structured, albeit less contextual, learning methods. This situation demonstrates the tension between the demands of learning innovation and the reality of curriculum implementation in the field (Rohmah et al., 2025).

From the student perspective, the challenges of implementing real-time data-based learning are equally complex. Not all students have sufficient data and digital literacy to understand and critically interpret data. Many students are still accustomed to receiving information in pre-formed formats, thus experiencing difficulties when dealing with dynamic and complex raw data. Furthermore, differences in socioeconomic backgrounds also affect students' ability to access learning support tools and technologies outside of school. Without appropriate support strategies, real-time data-based learning has the potential to cause confusion and decrease student motivation.

Another challenge that requires attention is the quality and validity of the data used in learning. Real-time data is dynamic and often comes from multiple sources with varying degrees of reliability. Without proper verification capabilities, the use of such data can lead to misconceptions or erroneous conclusions. In an educational context, misinterpretation of data not only impacts conceptual understanding but also the formation of students' mindsets. Therefore, teachers need a strong understanding of the ethics of data use, the validity of sources, and the limitations of drawing data-based conclusions, which in practice remains a challenge.

Data ethics and security are also crucial issues in the implementation of real-time data-based learning. The use of data sourced from the surrounding environment or certain digital platforms has the potential to involve sensitive information, either directly or indirectly. Without clear regulations and guidelines, there is a risk of privacy violations or data misuse in the learning process. At the high school level, understanding of data ethics remains relatively limited, both among teachers and students. This requires firm school policies and systematic education on responsible data use to prevent negative impacts in the future.

Implementation challenges also arise from a learning culture that is still oriented towards end-results, such as exam scores and graduation. Real-time data-based learning emphasizes the processes of analysis, reasoning, and problem-solving, the results of which cannot always be measured instantly

through written tests. In an education system that still prioritizes quantitative evaluation as the primary indicator of success, this approach often receives insufficient recognition (Farshad et al., 2024). Teachers and schools find themselves in a dilemma between pursuing learning innovation and meeting the demands of formal evaluation. Consequently, the implementation of real-time data-based learning is often limited or experimental.

Furthermore, policy support and school management are also crucial factors in successful implementation. Without a clear vision from school leaders and support in the form of facility procurement, teacher training, and academic policy adjustments, real-time data-based learning struggles to develop sustainably. In many cases, learning innovations still rely on individual teacher initiatives, rather than being part of the school's institutional strategy. This dependency makes implementation inconsistent and vulnerable to disruptions when policies or human resource changes occur.

Overall, the challenges of implementing real-time data-based learning in high schools reflect the complexity of educational transformation in the digital era. These challenges relate not only to technical aspects but also to pedagogical, cultural, ethical, and structural dimensions. Addressing these challenges requires a holistic approach, involving infrastructure improvements, strengthening teacher competencies, developing a more flexible curriculum, and cultivating a culture of sustainable data literacy. With integrated and continuous efforts, real-time data-based learning has the potential to become a strategic tool for equipping high school students with 21st-century skills relevant to the dynamics of a data-driven society.

### **Implications of Developing Mathematical Literacy Based on Socioeconomic Data for Students' Readiness to Face Global Social and Economic Challenges**

Developing mathematical literacy based on socioeconomic data has significant implications for students' readiness to face increasingly complex and dynamic global social and economic challenges. In the era of globalization and digitalization, characterized by the rapid flow of information and changes in the global economic structure, students' ability to understand, analyze, and use data meaningfully has become a non-negotiable necessity. Mathematical literacy is no longer understood simply as the ability to calculate or master formulas, but rather as a thinking competency that enables students to interpret real-world phenomena through a critical and contextual quantitative approach (Sujatha & Vinayakan, n.d.-b). When mathematical literacy is developed by utilizing socioeconomic data relevant to everyday life, students

learn mathematics not only as an abstract discipline but also as a tool for understanding the social and economic realities they face at the local, national, and global levels.

The first implication of developing mathematical literacy based on socioeconomic data is seen in the improvement of students' critical and analytical thinking skills in understanding global social and economic issues. Socioeconomic data such as unemployment rates, poverty, income inequality, inflation, economic growth, and the human development index provide a real-world context that requires students to go beyond reading numbers to interpreting their meaning. This process trains students to ask critical questions, compare conditions across regions or countries, and draw conclusions based on quantitative evidence. These skills are crucial in addressing global challenges such as the economic crisis, changes in the labor market, and increasing social inequality. Students who are accustomed to interacting with socioeconomic data will be better equipped to rationally understand global dynamics and resist being easily influenced by misleading or non-data-based information (Kang & Cogan, 2022).

Furthermore, developing mathematical literacy based on socioeconomic data has implications for increasing students' social awareness and empathy for societal issues. When students learn mathematics through data that represents real-life social conditions, they begin to realize that the numbers analyzed reflect human life with all its challenges and limitations. This understanding encourages students to view social and economic problems not simply as statistical phenomena, but as humanitarian issues requiring sustainable solutions (Kang & Cogan, 2022). Thus, mathematical literacy becomes a means to foster social sensitivity and moral responsibility in students as global citizens. Readiness to face global social challenges is determined not only by cognitive intelligence but also by the ability to understand social reality in a holistic and balanced manner.

A further implication relates to students' readiness to face global economic challenges, particularly in the context of data-driven decision-making. The modern world of work and economic life demands individuals who are able to read trends, analyze risks, and make rational and measured decisions. Through learning socioeconomic data-based mathematical literacy, students are trained to interpret graphs, tables, and mathematical models related to economic phenomena. These skills are essential for understanding global economic issues such as price fluctuations, market dynamics, industrial growth, and the impact of economic policies. With these skills, students are

better prepared to face global competition, whether as prospective workers, entrepreneurs, or future decision-makers (Aksu et al., 2022).

Developing contextual mathematical literacy also has implications for strengthening students' adaptability to rapid global change. Global social and economic challenges are often uncertain and dynamic, such as global economic crises, pandemics, or climate change, which impact economic and social structures. Learning based on socioeconomic data trains students to navigate uncertainty through historical data analysis and trend projections. Students learn that data can be used to understand patterns, predict possibilities, and design adaptation strategies. These skills are crucial for building a resilient and flexible generation in the face of unpredictable global change (Sumathi et al., n.d.).

Another equally important implication is the development of data literacy and digital literacy skills integrated with mathematical literacy. In a global context, socioeconomic data is generally available in digital format and sourced from various international platforms. When students engage in learning that uses real-world data, they indirectly develop the ability to access, validate, and process digital data. This integration of mathematical literacy, data literacy, and digital literacy provides a crucial foundation for students' readiness to face increasingly technology- and information-based global challenges. Students become not only data users but also capable of evaluating the quality and relevance of data in decision-making.

Furthermore, developing mathematical literacy based on socioeconomic data has implications for the formation of a global mindset in students. By analyzing data from various countries and regions, students gain a broader perspective on the differences and similarities in social and economic conditions worldwide. This helps students understand the interconnectedness of countries within the global economic system and the impact of global policies and events on people's lives. This global mindset is crucial in preparing students to become global citizens capable of working across cultures and comprehensively understanding the complexities of global challenges.

Overall, the implications of developing mathematical literacy based on socioeconomic data for students' readiness to face global social and economic challenges are profound and multidimensional. Contextual, data-driven mathematics learning not only enhances students' cognitive abilities but also shapes the character, social awareness, and adaptive readiness needed in the global era. With a strong and relevant mathematical literacy base, students are expected to be able to address global challenges critically, rationally, and

responsibly, and contribute positively to creating a more just and sustainable global society.

## CONCLUSION

This study concludes that developing mathematical literacy through real-time socioeconomic data analysis at the high school level has significant potential to improve students' ability to understand, interpret, and apply mathematical concepts in real-life contexts. The use of actual and relevant socioeconomic data encourages students to focus not only on mathematical calculations but also on data-driven reasoning, modeling, and decision-making. Through this approach, mathematics is understood as a contextual and meaningful analytical tool, thereby enhancing the connection between classroom learning and the socioeconomic phenomena facing society.

Furthermore, this study shows that the integration of real-time data analysis into mathematics learning contributes to strengthening students' critical thinking skills, data literacy, and interdisciplinary understanding. This approach also opens up opportunities for teachers to develop learning strategies that are more adaptive, innovative, and responsive to socioeconomic dynamics. Thus, developing mathematical literacy based on actual socioeconomic data is not only relevant for improving students' academic competence but also crucial in preparing a younger generation capable of analytical, reflective, and responsible thinking in facing the complex challenges of the data-driven era.

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