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Systematic Literature Review: How Important are Literacy and Numeracy for Students, and How to Improve it?

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Abstrak

Abad ke-21 telah mengubah cara seseorang berkomunikasi, bekerja dan belajar yang akhirnya diperlukan keterampilan-keterampilan untuk menghadapi situasi global. Ditambah dengan pandemi Covid-19 menyebabkan siswa di Indonesia mengalami learning loss yang berakibat adanya kesenjangan kemampuan belajar peserta didik tidak pada standar yang sesungguhnya. Kemampuan literasi dan numerasi menurun sedangkan kemampuan ini masuk ke dalam keterampilan abad 21 yang harus dikuasai untuk menguasai segala aspek. Penelitian ini bertujuan untuk menganalisis pentingnya literasi dan numerasi. Metode literatur sistematik review (SLR) akan digunakan. Dua tahapan SLR yaitu tahapan planning dan conducting merujuk pada analisis bagaimana data akan dianalisis. SLR akan berperan dalam merangkum dan menganalisis temuan dan berbagai wawasan mengenai persoalan terkait literasi dan numerasi. Tinjauan sistematik akan mempertimbangkan beberapa pendapat penelitian yang akan membahas mengenai pentingnya literasi dan numerasi. Hasil penelitian menunjukkan bahwa literasi dan numerasi merupakan pasangan layaknya satu kesatuan dalam membangun sebuah konsep pemahaman yang dapat membantu belajar dan berdampak karir di masa akan datang. Temuan terkait faktor-faktor yang dapat membiasakan berliterasi dan numerasi yaitu lingkungan, perhatian pendidik, strategi pembelajaran, teknologi dan membelajarkan literasi dan numerasi lintas kurikulum.

***Kata kunci*:** Literacy, Numeracy, *Lintas Kurikulum*

Abstract

The 21st century has changed how people communicate, work, and learn, which ultimately requires skills to face global situations. In addition, the COVID-19 pandemic has caused students in Indonesia to experience learning loss, resulting in gaps in students' learning abilities that are not at the standard. Literacy and numeracy abilities are decreasing, while these abilities are included in the 21st-century skills that must be mastered to master all aspects. This study aims to analyze the importance of literacy and numeracy. The systematic literature review (SLR) method will be used. The systematic literature review (SLR) method will be used. The two stages of SLR, namely the planning and conducting stages, refer to the analysis of how the data will be analyzed. SLR will play a role in summarizing and analyzing findings and various insights regarding issues related to literacy and numeracy. The systematic review will consider several research opinions discussing the importance of literacy and numeracy. The research results show that literacy and numeracy are partners like one unit in building a concept of understanding that can help learning and impact careers in the future. The findings relate to factors that can be used for literacy and numeracy: the environment, educators' attention, learning strategies, technology, and teaching literacy and numeracy across the curriculum.

Keywords: Literacy, Numeracy, Cross Curriculum

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1. INTRODUCTION

The entry of the 21st century has changed the way people communicate, work, and learn, so education in the 21st century focuses on preparing students to face world challenges. The 21st-century skills that today's students need are critical thinking, creativity, communication, collaboration, literacy, flexibility, productivity, leadership, and social skills (Laar et al., 2020; van Laar et al., 2019). However, coupled with events in education in Indonesia that were most felt during the pandemic, learning loss caused learning stability to decrease. Learning loss is the loss or reduction of students' abilities, which is characterized by a gap between students' learning abilities and actual standards (Mahsun et al., 2021; Wahyudi, 2021).

In order to thrive in the rapidly evolving landscape of the 21st century, students today must develop a wide array of essential skills. These include the ability to think critically and creatively, which enables them to approach problems with innovative solutions. Effective communication and collaboration are equally crucial, as they allow students to work well with others and articulate their ideas clearly (Mercer-Mapstone & Kuchel, 2017; Prasetyo et al., 2022). Additionally, students must cultivate strong literacy skills to process and analyze information efficiently, as well as the flexibility to adapt to changing environments and circumstances. Productivity, leadership, and social skills are also indispensable, empowering students to take initiative, guide teams, and engage meaningfully within diverse communities (Celik, 2017; Kivunja, 2014).

This incident occurs almost at all levels of education. Education is experiencing a significant transformation from face-to-face learning to online learning via devices such as cell phones and computers (T. M. Siregar et al., 2021; Taylor et al., 2020). The most influential effect is in areas that do not have a good enough capacity to develop learning by relying on face-to-face meetings without the help of adequate media or technology. The learning approach used to deal with the pandemic, for example, studying at home, is not as optimal as that done in the classroom (Junaidin et al., 2023; Kim et al., 2024). During the pandemic period, collaboration between parents, schools, and the community has become crucial in the teaching and learning process, especially when students are given the task of learning via video. Even though technological knowledge may be limited, the active role of parents is considered important (Stuchlikova, 2016; Yulia et al., 2023). One of the abilities that affects learning loss is literacy and numeracy skills, which can be proven that literacy and numeracy scores will be higher if learning is carried out face-to-face compared to distance (Lynch et al., 2023; Sabates et al., 2021). Literacy and numeracy are basic abilities that will be learned from the beginning of a child's development. Basic literacy and numeracy are pillars of knowledge and capital production in developing human productivity (Kivunja, 2014; Singh et al., 2023). The results of observations of school report cards that have been carried out in Sleman, Yogyakarta, which is a city area, have AKM (Minimum Competency Assessment) results in literacy and numeracy scores that are still in the medium category, which can be interpreted as meaning that literacy and numeracy skills have reached minimum competency, but improvement is needed.

As confirmed by the PISA 2022 results report, which measures aspects of reading literacy and mathematics literacy, Indonesia's PISA results have decreased. PISA 2018 had an average of 371, which was the same as the score of 18 years earlier; this is 80 points below the OECD average, and PISA 2022 has an average of 359 (PISA 2022 Results (Volume I), 2023). Literacy and numeracy skills are important, and these abilities are included in the 21st-century skills that students need in this information era (Hidayah et al., 2021; Iswara et al., 2022).

Several studies discussing literacy and numeracy will be summarized as findings in this literature review article. The novelty of this study is expected to answer the question of how to improve literacy and numeracy in the school environment by knowing the strategies that can be chosen to develop these abilities in humans from various research that has been carried out. Apart from that, the importance of literacy and numeracy will be explained through the research findings that have been obtained to emphasize the importance of these abilities in an individual so that they become abilities that must be accustomed to in life. This study aims to analyze the importance of literacy and numeracy. The systematic literature review (SLR) method will be used.

2. METHODS

This research is included in the systematic literature review (SLR) type. A literature review is a written summary of a document/book/article that describes information related to the study topic. The selected literature must also be categorized to correlate with the researched topic (Creswell, 2012). This SLR will have two stages: planning and conducting (Carrera-Rivera et al., 2022). This research plan contains (1) determining the criteria for the journal to be selected, (2) determining research questions, and (3) determination of digital sources. The criteria obtained will be triggered by keywords or keywords and relevant words, namely, (1) the role of literacy and numeracy, (2) Literacy; (3) Numeracy. The digital source used is the publish or perish (PoP) application with the Google Scholar source option. Research questions are determined based on the questions you want to find. Critical evaluation will be needed in this case, followed by abstracting and recording literature assisted with visual aids, this research will be summarized in a table. Journals that appear in the search will be selected. Selection occurs in two stages: selection according to the journal to be used, which is closely related to keywords and relevant words, and selection against predetermined criteria. The flow of this research can be seen in Figure 1.

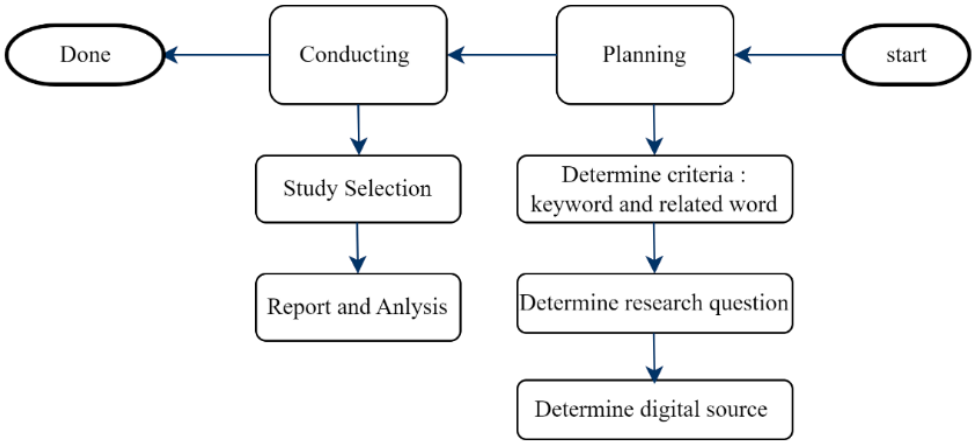

Figure 1. The Flow of Research

3. RESULTS AND DISCUSSION

Results

These results will discuss the final filter of the systematic review. The result of first selection can be seen in Table 1. The first selection stage with predetermined keywords is when 300 articles appear, which will be selected by opening and examining whether the article falls into the category. This selection resulted in 32 articles out of 300 articles.

Table 1. The First Selection

	Source	Quantity
Before	Publish or Perish- Google schoolar	300
After	Publish or Perish- Google schoolar	32

Base on Table 1, selected journals, namely 32 journals, of which it consists of reputable journal data centers. Details can seen in Table 2.

Table 2. Reputable Journal Details

	Scopus				Sinta						Others (Garuda, reseachgate , ERIC etc.)
	Q1	Q2	Q3	Q4	1	2	3	4	5	6	
Amount	4	7	3	4	-	2	2	-	-	-	8

Base on Table 2 the source is from the journal data center, namely the Scopus index Q1, Q2, Q3, Q4, and Sinta 2 and 3, as well as Researchgate, ERIC. Table 3 will explain the details of the second selection. After the selection process is complete, the final stage is analyzing and reporting the data to answer the existing research questions.

Table 3. Details the Final Selection

No	Author	Title	Study Design	Publisher	Year
1	(Faqih et al., 2023)	Advanced Chatbot Development to Improve Students Literacy and Numeracy Skills	Experimental research	journal.walisongo.ac.id (Sinta 3)	2022
2	(Prince & Frith, 2020)	An investigation of the relationships between academic numeracy of universities students in South Africa and their mathematical and language abilities	Quantitative	Springer (Q1)	2020
3	(T. M. Siregar et al., 2021)	Analysis of Economics Mathematics Literacy and Numeracy in Supporting the Implementation of Distance Learning	Descriptive qualitative	atlantis-press.com (Q4)	2021
4	(Sunderaraman et al., 2022)	Assessing numerical reasoning provides insight into financial literacy	Quantitative (healthy adults)	Taylor & Francis (Q3)	2022
5	(Gnambs & Lockl, 2023)	Bidirectional effects between reading and mathematics development across secondary school	Quantitative (SMP)	Springer (Q2)	2023
6	(Geary et al., 2020)	Comorbid learning difficulties in reading and mathematics: The role of intelligence and in-class attentive behavior	Quantitative (JUNIOR HIGH SCHOOL)	frontiersin.org (Q2)	2020
7	(Napoli et al., 2021)	Characteristics related to parent-child literacy and numeracy practices in preschool	Quantitative (parents of 16 preschool)	frontiersin.org (Q2)	2021
8	(Croce et al., 2020)	Developing disciplinary literacy in mathematics: Learning from professionals who use mathematics in their jobs	Qualitative	Wiley Online Library (Q2)	2020
9	(Karlina et al., 2022)	Developing Literacy and	qualitative	seminar.ustjogja.ac	2022

No	Author	Title	Study	Publisher	Year
		Numeracy Teaching and Learning for Kindergarten: A Case Study	research	.id	
10	(Aprilia et al., 2023)	Development of Probability Learning Media PjBL -STEM Based Using E-comics to Improve Students' Literacy Numeracy Skills	RnD	journal.unnes.ac.id (Sinta 2)	2023
12	(Mutaqin et al., 2021)	Development of The AKM Test with Javanese Cultural Context To Measure Numeracy Literacy Skills In Statistical Materials For High School Students	RnD	Jurnal.ustjogja.ac.id (S3)	2021
13	(Novita & Herman, 2021)	Digital technology in learning mathematical literacy, can it be helpful?	Literature review	iopscience.iop.org (Q4)	2021
14	(Hadianto et al., 2021)	Does reading comprehension competence determine the level of solving mathematical word problems competence?	Quantitative (SD)	iopscience.iop.org (Q4)	2021
15	(Conica et al., 2023)	Domain-specific and cross-domain effects of the home literacy and numeracy environment at 3 years on children's academic competencies at 5 and 9 years.	Quantitative (children)	psycnet.apa.org (Q1)	2023
16	(Kartiko et al., 2022)	E-Book Development of Static Fluid Contents to Improve Students' Numeracy Literacy Competence	RnD	scie-journal.com (Garuda)	2022
17	(Niklas & Tayler, 2017)	Children's Competencies Development in the Home Learning Environment	Literature Review	frontiersin.org (Q2)	2021
18	(Singh et al., 2023)	Effectiveness of literacy and numeracy in commerce subjects among secondary schools in Fiji	qualitative research	edulearn.intellectual.org (Q4)	2023
19	(Sinaga et al., 2023)	Implementation of PBL Model on Strengthening Students' Numerical Literacy and Digital Literacy Skills	quantitative	researchgate.net (Sinta 2)	2023
20	(Lie et al., 2022)	Improving Literacy And Numeracy Of Students In Elementary And Junior High School Through Merdeka Belajar Independent Campus (MBKM)	quantitative	ijcsnet.id	2022
21	(Reder et al., 2020)	Practice makes perfect: Practice engagement theory and the development of adult literacy	quantitative	Springer (Q1)	2020

No	Author	Title	Study	Publisher	Year
		and numeracy proficiency			
22	(Rahim et al., 2023)	Literacy, Numeracy, and Scientific Literacy Levels for Junior High School Students in Banjarmasin	quantitative	banuainstitute.org (Garuda)	2023
23	(Zua, 2021)	Literacy: Gateway to a world of exploits.	quantitative	ERIC (Eric)	2021
24	(Whitefor d, 2020)	Mathematics, numeracy and literacy: A combination for success.	Peer Review	search.informit.org Australian search journal	2020
25	(Cahyana et al., 2023)	Improving Students' Literacy and Numeracy Using Mobile Game-Based Learning with Augmented Reality in Chemistry and Biology.	RnD	International Journal of Interactive Mobile Technologies (Q3)	2023
26	(Arifin & Nugroho, 2023)	Website-Based Learning Media on Reading and Numeracy Content for Third Grade Elementary Schools	RnD	International Journal of Interactive Mobile Technologies (Q3)	2023
27	(Rosnelli & Ristiana, 2023)	Independent Curriculum Learning Management to Improve Students' Literacy and Numerical Competence in Schools	Quantitative Descriptive	http://www.ijemst.net/ (Q2)	2023
28	(Ramos & M., 2022)	Litenum Game: Impact on the Literacy and Numeracy Performance of Grade One Pupils	quasi-experimental	ijase.org (et al)	2022
29	(C. S. Coffey et al., 2020)	An Investigation into the Teaching of Numeracy in Subjects Other than Mathematics across the Curriculum	Case Studies	ERIC (Q2)	2023
30	(Goos & O'Sullivan , 2023)	Supporting Adults to Become Numerate Citizens: A Study of Adult Numeracy Provision in Ireland	Qualitative	ERIC (Q1)	2023
31	(Yekple et al., 2021)	Developing Literacy And Numeracy In Early Childhood Education In Ghana: The Role Of Traditional Ewe Play Games	Qualitative	International Journal of Progressive Sciences and Technologies http://ijpsat.ijsht-journals.org/	2021
32	(Fiteriani et al., 2022)	Development of LKPD Natural Sciences Based on Literacy and Numeration Assisted by Augmented Reality Media in Islamic Elementary School	Quantitative and Quantitative	Jurnal Ilmiah PGMI (Sinta 3)	2022

Discussion

How important are literacy and numeracy skills for each student?

Literacy is one aspect that is considered in the world of education. The importance of literacy skills for a person's development and the existence of a nation plays a role in the significant development of the nation. However, not all individuals have strong literacy skills. Therefore, they need to be directed and adjusted with the help of educators as learning designers at the educational level. Literacy and numeracy are basic abilities that a person will have from childhood to adulthood. This competency is a prerequisite for children's cognitive abilities for educational attainment and future success (Gnambs & Lockl, 2023; Zua, 2021). Early education regarding literacy and mathematics skills begins when children are in the early development phase (Karlina et al., 2022; Maureen et al., 2018). It is important to expand literacy and numeracy education to children at the preschool level. The development of literacy and numeracy skills in children at the preschool level is closely related to their ability to read and write. Literacy and numeracy activities are also connected to children's ability to receive, analyze, and communicate concepts related to literacy and numeracy (Saefurohman et al., 2021; Yulia et al., 2023).

Parental involvement plays a role in helping children understand and explore new knowledge. There are a variety of approaches parents can take to strengthen their children's literacy and numeracy skills, including activities such as reading story books, teaching letters and numbers at home, and involving children in daily activities such as making shopping lists. Parents have an important role as the first educators of their children, and consistency in parental presence and support is crucial (Durisic & Bunijevac, 2017; Napoli et al., 2021). The parent's point of view is that literacy development is more important than numeracy (the ability to count). Parents more often teach and are involved in practical processes in literacy than in numeracy, even though literacy and numeracy are related to each other.

Literacy is related to numeracy, reading, and counting, which become interconnected over time. Having literacy and numeracy skills is an asset in forming critical thinking and active participation in society and can even form decision-making abilities. The effect of this ability will help in forming skills and insight and facing global challenges by innovating (Hadianto et al., 2021; Pramono & Hanita, 2021). Students can count if they have reading comprehension competency. Reading comprehension is one aspect of literacy. Therefore, education needs to emphasize the learning process. Literacy ability is related to how students understand mathematical problems, starting from connecting words by word so that they know the problem being addressed (Colwell & Enderson, 2016; Rohmah et al., 2022). Students with higher numeracy scores will also have higher literacy scores. The finding of transfer effects between reading and numeracy shows good stability in middle and high school. For example, literacy and numeracy skills have significant implications for student performance in commerce classes, where the ability to read and apply basic knowledge mediates the smooth learning process.

Is literacy and numeracy across the curriculum necessary?

Literacy is always juxtaposed with linguistic and literary subjects, even though literacy itself has an important role in all learning, and literacy and numeracy are needed in all aspects. Therefore, the development of numeracy skills and academic literacy must be embedded in all scientific disciplines (Heilmann, 2021; Prince & Frith, 2020). Literacy and numeracy must be encouraged with reflection and insight through learning experiences that are relevant to life because it is not only researchers and educators who are aware of this importance, but the government is also involved in pursuing literacy and numeracy at the school level. Educational policies should support school participation through interdisciplinary, interdisciplinary, and transdisciplinary approaches to incorporating

numeracy into the curriculum (P. Coffey & Sharpe, 2023; Whiteford, 2020). The government program to support literacy and numeracy in Indonesia in an interdisciplinary context explains cross.

Research conducted in the literacy and numeracy curriculum includes (1) developing electronic books on static fluid subjects and (2) trade subjects involving commercial, accounting, and economic studies. Through learning commerce, students improve their financial understanding, learning budgeting, tracking expenses, creating investment plans, as well as analyzing financial reports (R. A. Siregar & Sari, 2021; Sunderaraman et al., 2022). Literacy and numeracy have a central role for commerce students because this subject demands critical thinking and understanding, as well as the application of reading, writing, and calculations. The research mentioned above is some across the curriculum. Many fields discuss the relationship between literacy and numeracy in the current era. Literacy does not only cover one field but is closely related to other fields, such as education, health, and agriculture (Spínola, 2015; Suryawati et al., 2018).

What are the strategies for familiarizing students with literacy and numeracy?

Literacy and numeracy skills can be built from students' initial environment, namely their home. Literacy and numeracy in the home environment can stimulate students' cognitive abilities, which have a direct impact on children's education, such as relaxing activities of playing cards, board games, and reading together (Napoli, Amy R., Purpura, 2018; Sari et al., 2020). Family social status moderates the relationship between the literacy and numeracy environment at home and the skills possessed by students. A positive correlation is formed by the presence of literacy activities in family environments with high and low social status. However, it is different for numeracy activities, namely those with high social status (Dole et al., 2015; Md-Ali et al., 2016). Formal and informal activities in the home environment also affect children's literacy and numeracy development in old age. They are proven by informal and formal testing of literacy and numeracy at home at the age of 3 years, which turns out to have a good impact at the age of 5 and 9 years. If informal literacy habits are carried out, such as sharing stories and counting books, it will have more impact than being taught formally (Conica et al., 2023; Schellinger et al., 2019).

Another thing about the home environment, namely the full attention that educators give to students, is an important predictor in overcoming numeracy and literacy difficulties in secondary school. There is a need for teachers to understand the concept of numeracy, professional development, and a strong pedagogical identity and practice. Attentive behavior that is consistently given to students will reduce bad results from academic activities and reduce students' learning difficulties (Geary et al., 2020; Weiwei et al., 2021). Learning with inquiry and discourse analysis can also help students practice literacy, which is guided directly by educators. The importance of training is to increase students' literacy and understanding of numbers through the following steps: 1) conducting simple research in numeracy groups, 2) developing systematic reasoning abilities when solving problems, 3) drawing conclusions based on facts, 4) prioritizing the use of Information Technology and Effective communication (ICT) to improve aspects of knowledge, attitudes and skills, 5) distinguish between needs and desires, and 6) take appropriate attitudes in the social context as part of culture (Albro & Turner, 2019; Rosnelli & Ristiana, 2023).

Technology as a literacy tool can provide facilities for acquiring knowledge content by adapting to student needs and freeing educators to organize learning. Adaptation of technology must be carried out as a medium to support learning, such as making learning videos and reporting in class administration, which has proven to be effective and efficient in increasing student literacy and numeracy at the primary, secondary, and upper education levels (Chung et al., 2019; Fadella et al., 2018). Consistent use of technology can help

increase students' exploration of literacy and its relationship with mathematics. Integrating technology in learning must also consider mature pedagogy and concepts. Therefore, teachers, as learning designers, must be able to place what students need.

4. CONCLUSION

Literacy and numeracy are ability bases that will affect all areas of life. Literacy and numeracy skills will used and mutually relate to one another. Science, mathematics, chemistry, and other fields will still need second that ability. Literacy and numeracy become part of growth education, which will always be used from an early age until adults. Therefore, it requires appropriate strategies and approaches to growing a flower child. Starting from the conditioning environment, utilization of technology, and modification learning to strive to interest participants. A necessary cross-literacy and numeracy learning curriculum prepared for participants to get used to using these abilities at once can hone abilities in the field of interest. The right strategy will have a good effect or impact on the growth of educated participants; if habituation is up to the level of proficiency, it will be useful for future and career participants.

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