Pedagogia Jurnal Ilmu Pendidikan

Journal homepage: http://ejournal.upi.edu/index.php/pedagogia

Assessing Numeracy Skills Among Indonesian Students: A Comparative Study of Gender, Regional Disparities, and Study Habits

*Della Amelia, Juwintar Febriani Arwan

*Educational Technology, Faculty of Educational Sciences, Universitas Pendidikan Indonesia, Bandung, Indonesia

*Correspondence: E-mail: delame@upi.edu

ABSTRACT

Numeracy is a critical skill that underpins a wide range of cognitive and practical abilities such as logical reasoning, problem-solving, and the capacity to analyze and interpret data. How students eventually grasp this skill is influenced by a complex interplay of factors that include gender, area of residence, and study habits. Through a comparative study, this research aimed to compare students' numeracy skills according to certain categories, such as students' gender, area of living, as well as study habits. A total of 506 randomly selected secondary school students (Female = 285; Male = 221) participated in this study. To collect the data, an online survey was administered to targeted students with a total of 56 questions in the form of structured questionnaire. Through both descriptive and inferential analysis this study revealed that in terms of gender female students outperformed male counterpart with significant statical difference. Moreover, students who live in urban areas had the highest numeracy skills compared to other areas. Lastly, students who set pre-lesson preparation and post-lesson review displayed significantly higher numeracy skill compared to those who are not. Elaboration for each finding further discussed in this paper.

ARTICLE INFO

Article History:
Submitted/Received 23 Dec 2023
First Revised 15 Jan 2024
Accepted 29 Feb 2024
First Available Online 30 Mar 2024
Publication Date 01 April 2024

Keyword:
Comparative Study,
Learning Habits,
Numeracy Skills.

1. INTRODUCTION

Numeracy, the ability to apply mathematical concepts in real-world situations, is not only critical for success in STEM (Science, Technology, Engineering, and Mathematics) fields but also plays a significant role in general cognitive development (Geary, 2017). The importance of numeracy extends beyond mere mathematical calculations; it encompasses a wide range of cognitive skills including problem-solving, logical reasoning, and the ability to analyze and interpret data. These skills are essential not just in academic contexts but in everyday life, for instance financial literacy and decision-making in adulthood where individuals are required to make decisions based on quantitative information (Nunes et al, 2018). Hence, the study of numeracy skills has become increasingly important in understanding the broader educational landscape, as these skills are foundational for both academic success and everyday decision-making.

Fostering numeracy skills from an early age is truly essential, as it much like literacy, numeracy is a critical skill that underpins a wide range of cognitive and practical abilities. These abilities include logical reasoning, problem-solving, and the capacity to analyze and interpret data, all of which are fundamental not only for academic success but also for functioning effectively in daily life. Early numeracy skills lay the groundwork for more complex mathematical understanding and are closely linked to other cognitive domains, such as language development and executive functioning (Geary et al., 2018). Children who develop strong numeracy skills early are better equipped to handle the demands of a rapidly changing world where mathematical literacy is increasingly important in various aspects of life, from personal finance to technology and science (Jordan & Levine, 2018). The development of these skills from a young age ensures that children are not only prepared for academic challenges but are also capable of making informed decisions in real-world situations, such as managing money, understanding statistics in the media, or evaluating risks and probabilities in everyday life (Peters et al., 2019).

Research has shown that early numeracy skills are strong predictors of later academic achievement, not only in mathematics but across various subjects (Duncan et al., 2017). This is because early exposure to numeracy helps children develop a basic understanding of numbers, patterns, and relationships, which are crucial for more advanced mathematical thinking such as problem-solving skills, logical reasoning, draw inference, and critical thinking. Siegler & Braithwaite (2017) highlight that early numeracy contributes to the development of executive functions, such as working memory and cognitive flexibility, which are essential for success in complex tasks across different academic areas. These executive functions enable students to manage information, control attention, and switch between tasks effectively, all of which are crucial for academic success. Additionally, Claessens & Engel (2020) argue that the problem-solving and critical thinking skills honed through early numeracy practice provide students with a cognitive advantage that enhances their ability to engage with and master new content across various subjects. All these skills are integral part to success in both academic and real-world contexts.

However, students' numeracy skills are influenced by a complex interplay of factors that include gender, area of residence, and study habits such as learning the material prior to the lesson and reviewing it afterward. Research indicates that these variables significantly impact students' ability to grasp and apply mathematical concepts, leading to variations in numeracy outcomes across different groups. Gender differences have been observed in numerous studies, with some findings suggesting that societal expectations and educational practices may contribute to disparities in numeracy performance between male and female students

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

(Hyde et al., 2019). Additionally, geographic location plays a crucial role, as students in urban areas often have better access to educational resources, experienced teachers, and supportive learning environments compared to their peers in rural and remote areas, which can lead to significant differences in numeracy achievement (Owusu et al., 2020). Furthermore, study habits, such as pre-lesson preparation and post-lesson review, have been shown to enhance students' understanding and retention of mathematical concepts, thereby improving their numeracy skills (Dunlosky & Rawson, 2019). Understanding how these factors interact can help educators and policymakers develop targeted strategies to support numeracy development in all students. Given the significant influence of gender, geographic location, and study habits on students' numeracy skills, it is essential to conduct comparative studies that analyze these factors across different student groups. Such research is crucial for identifying disparities and understanding how these variables interact, ultimately guiding educators and policymakers in developing targeted interventions that ensure equitable numeracy development for all students.

2. METHODOLOGY

This study used quantitative approach that aimed to compare students' numeracy skills according to certain categories, such as students' gender, area of living, as well as study habits. A total of 506 randomly selected secondary school students (Female = 285; Male = 221) from 9 different provinces (West Java, Central Java, East Java, Lampung, Kepulauan Riau, East Kalimantan, South Kalimantan, Nusa Tenggara Timur, Southeast Sulawesi) participated in this study. To collect the data, an online survey was administered to targeted students with a total of 56 questions in form of structured questionnaire. Both descriptive and inferential statistical tests were utilized in this study to analyze the data. We used different statistical tests to allow researchers for a more comprehensive examination of data from various angles and to help validate findings and ensure robustness (Franke et al, 2017). Descriptive statistics used in this study were to analyze the mean score of students' basic numeracy skills. Besides that, the collected data were analyzed by inferential statistics through Independent Sample T-Test to compare students' numeracy skills based on their gender. Furthermore, to compare students' numeracy according to their area of living and study habits, One Way ANOVA was utilized. Four classifications of region urban, suburban, rural, and remote were classified as students' area or region of living. Meanwhile, students' numeracy skills based on their study habit such as their habit to learn the material prior to the lesson and reviewing the material after the lesson further discussed in this study.

3. RESULT AND DISCUSSION

3.1 Comparison of Students' Numeracy Skills Based on Gender

The comparison of students' basic numeracy skills based on their gender is shown in the Table 1 below:

Table 1. Students' Numeracy Based on Gender

Category	Mean Score		Sig.
Gender	Male	Female	0.001
	51.56	59.91	

Data displayed in Table 1 indicates that in terms of students' gender there's a significant difference in numeracy skills between male and female students. Female students exhibit

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

higher mean scores (M = 59.91) of numeracy skills compared to their male counterparts (M = 51.56). Furthermore, the statistical significance (Sig. 0.001 < 0,05) suggests that there's significant difference of students' numeracy skills based on their gender.

Several studies have explored gender differences in numeracy skills across various educational contexts. Traditionally, research has often found that males tend to perform better in numeracy and mathematical tasks, especially in complex problem-solving scenarios. However, this trend is not uniform across all contexts or age groups. For instance, a study by Rodríguez et al. (2020) highlighted that although boys generally have higher self-efficacy and motivation in mathematics, which can enhance their performance, the actual gender differences in numeracy outcomes are diminishing in some contexts. This is particularly evident in environments where educational opportunities and supports are more gender-neutral, suggesting that factors such as societal norms, educational policies, and teaching practices might play significant roles in shaping these outcomes. Moreover, the findings from international assessments like PISA (Programme for International Student Assessment) have shown that while boys traditionally outperform girls in mathematics, the gap varies by country and is influenced by multiple factors including socio-economic status and the level of gender equity within a society. In some countries, such as Malaysia, Cambodia, Congo, and the Philippines, girls in grade 8 have been found to outperform boys by several percentage points in mathematics (UNESCO, 2022). This trend suggests that educational initiatives and societal changes may effectively address gender disparities in numeracy skills. Recent trends indicate that in some regions, the gender gap in numeracy is closing, with girls catching up or even surpassing boys in certain educational settings (Lindberg et al., 2010; UNESCO, 2022).

3.2 Comparison of Students' Numeracy Skills Based on Area of Living

Table 2 below shows difference of students' numeracy skills based on the region where the students are living:

Tabel 2. Difference of Students' Basic Numeracy Skills Based on Region of Living

Category	Urban (U)	Suburban (Su)	Rural (Ru)	Remote (Re)	ANOVA
	Mean	Mean	Mean	Mean	Sig.
Region	61.15	55.61	55.21	53.02	0.007
Mean Difference					
U-Su	U-Ru	U-Re	Su-Ru	Su-Re	Ru-Re
5.54	5.94*	8.13*	0.41	2.59	2.19

*Significant difference

When we analyzed the impact of the students' living areas, the results show that students who live in urban areas have the highest mean numeracy score (M = 61.15), followed by those in suburban (M = 55.61), rural (M = 55.21), and remote areas (M = 53.02). The decreasing trend in mean scores from urban to remote areas suggests that access to resources, quality of education, and other environmental factors might contribute to these differences. This pattern is consistent with research that suggests urban students often have better access to high-quality educational resources, including experienced teachers, advanced curricula, and supportive learning environments. These advantages are less accessible in rural and remote areas, which can contribute to the observed disparities in academic performance.

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Parker et al. (2018) found that students in rural and remote areas face challenges such as limited access to qualified teachers and fewer educational resources, which directly impacts their academic achievement, including numeracy skills. Additionally, the quality of infrastructure, such as internet access and educational facilities, plays a crucial role in supporting students' learning experiences, which are typically better in urban settings (Gibbs, 2019; Lamb et al., 2020). The consistent decline in numeracy scores from urban to remote areas in this study suggests that targeted interventions are needed to address these educational inequities and provide students in rural and remote areas with the necessary support to improve their numeracy skills. Research has shown that strategies such as improving teacher quality, increasing access to educational technology, and enhancing the overall learning environment can significantly reduce these disparities (Burke & McDonald, 2020; Sullivan et al., 2018). For instance, Sullivan et al. (2018) emphasize the importance of professional development programs for teachers in rural and remote areas, which can equip them with the skills needed to deliver effective numeracy instruction. Additionally, Burke & McDonald (2020) highlight the potential of digital learning tools to bridge the gap in educational resources between urban and remote areas, offering students in these regions access to high-quality learning materials and personalized learning experiences. Furthermore, community involvement and support from local governments are crucial in implementing sustainable educational initiatives that can improve numeracy outcomes for students in these underserved areas (Green et al., 2021; Johan et al., 2020). By focusing on these areas, policymakers and educators can work towards creating a more equitable education system that enables all students, regardless of their geographic location, to achieve their full academic potential.

Significance value of 0.007 (Sig. < 0.05) as shown in Table 2 indicates that there is a statistically significant difference in numeracy skills across the different regions. Both Urban-Rural and Urban-Remote shows statistically significant mean difference of students' numeracy skills. On the other hand, the mean differences between the other four groups are not statistically significant. This finding confirms that the region of residence significantly impacts students' numeracy as mentioned in existing literature. For example, studies by Owusu et al. (2020) and Browning et al. (2018) have shown that students in urban areas tend to perform better academically due to greater access to resources, better-qualified teachers, and more robust educational infrastructures compared to their rural and remote counterparts.

The significant differences between urban and rural/remote students as displayed in Table 2 suggest that while some students benefit from enriched learning environments, others are disadvantaged by limited access to quality education. This urban-rural divide in educational outcomes has been documented in several contexts, with research indicating that students in rural areas often face challenges such as teacher shortages, inadequate learning materials, and lower levels of parental educational support (Jerrim et al., 2017). Furthermore, the lack of access to advanced technologies and extracurricular learning opportunities in rural and remote areas can exacerbate these disparities, leading to lower academic performance, particularly in subjects like mathematics that require consistent practice and access to supportive learning tools (Browning et al., 2018). To tackle these educational obstacles, targeted policy interventions are urgently needed in reducing these regional disparities. Initiatives such as improving the distribution of educational resources, providing incentives for highly qualified teachers to work in rural and remote areas, and investing in infrastructure

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

to support digital learning could help bridge the gap and improve numeracy outcomes for all students, regardless of their location.

3.3 Comparison of Students' Numeracy Skills Based on Study Habits

Table 3 below shows difference of students' numeracy skills based on two major study habits:

Tabel 3. Difference of Students' Basic Numeracy Skills Based on Study Habits

Category	Almost Always (AA)	Often (O)	Seldom (S)	Almost Never (AN)	ANOVA Sig.	Mean Difference					
	Mean	Mean	Mean	Mean		AA-O	AA-S	AA-AN	O-S	O-AN	S-AN
Learn the material prior to the lesson	65.96	59.14	52.52	42.22	0.001	6.83*	13.44*	23.74*	6.61*	16.91*	10.30*
Review the material after the lesson	69.72	57.46	48.49	36.44	0.001	12.27*	21.23*	33.28*	8.96*	21.01*	12.05*

*Significant difference

The elaboration of research findings and discussion for this aspect will be started with students' numeracy skills based on their habit of learning the material prior to the lesson then followed by the next habit. Based on data as shown in Table 3, students who consistently learn the material before classroom meetings demonstrate the highest mean numeracy score (M = 65.96). As the frequency of this habit decreases (from "Often" to "Almost Never"), there is a corresponding decline in mean scores, with "Almost Never" having the lowest score (M = 42.22). The significance level (Sig. = 0.001) underscores that significant difference does exist in this case where the habit of pre-lesson learning is strongly associated with better numeracy outcomes, suggesting that proactive engagement with study material before class is a critical factor in enhancing numeracy skills. This trend aligns with research indicating that pre-lesson preparation enhances understanding and retention of new information, which in turn contributes to better performance in subjects requiring strong cognitive skills, such as numeracy (Hattie & Donoghue, 2016).

Studies by Kikas et al. (2018) and Dignath & Büttner (2020) also emphasize the role of self-regulated learning strategies, including pre-lesson preparation, in academic success. These strategies allow students to better understand upcoming content, leading to improved classroom engagement and higher overall achievement. Self-regulated learning behaviors, such as setting goals and monitoring progress, are crucial for academic success, particularly in complex subjects like mathematics. These behaviors enable students to take control of their learning processes, leading to deeper comprehension and better performance (Dent & Koenka, 2020). Additionally, students who regularly engage in self-regulation practices are more likely to develop resilience in learning, which is associated with sustained academic achievement over time (Cleary & Kitsantas, 2017). Furthermore, the habit of reviewing material before class not only reinforces prior knowledge but also primes the brain for new learning, thereby enhancing cognitive processing during lessons (Zimmerman & Schunk, 2021).

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

The ANOVA test shows a significance value of 0.001 (Sig. < 0.05), indicating that the differences in numeracy skills across different levels of this study habit are statistically significant. When we examine the mean differences between specific categories, each category illustrates statistically significant mean difference which confirms that the habit of learning the material prior to the lesson has a significant impact on students' numeracy skills. Students who consistently prepare the material show significantly higher numeracy scores compared to those who do so less frequently or almost never. According to Thorndike Law of Readiness, students who engage in pre-lesson preparation are more "ready" to absorb new information because they have already activated relevant cognitive schemas and are mentally prepared for the learning process. The Law of Readiness implies that students who prepare beforehand are more likely to experience smooth and successful learning because they enter the lesson with a prepared mind, making them more receptive to new knowledge. Research by Tomporowski et al. (2017) supports this idea, showing that readiness to learn significantly impacts academic performance, particularly in challenging subjects like mathematics. Their study suggests that when students are adequately prepared, they can better integrate new information with what they already know, leading to deeper understanding and higher achievement. The data clearly demonstrates the importance of this study habit in improving numeracy skills, with consistent preparation leading to better performance.

Lastly, the data in Table 3 similarly shows that students who review the material after lessons ("Almost Always") achieve the highest numeracy scores (M = 69.72). Those who "Often" review score significantly lower (M = 57.46), with further decreases observed for those who "Seldom" (M = 48.49) or "Almost Never" (M = 36.44) review the material. The significance value (Sig. = 0.001) of ANOVA Test indicates that this habit also has a substantial impact on students' numeracy skills causing significant difference. This finding emphasizes the importance of reinforcing learning through post-lesson review as a key strategy to improve numeracy performance. This finding is well-supported by the literature, which emphasizes the benefits of spaced repetition and retrieval practice as key strategies for reinforcing learning and enhancing long-term retention (Dunlosky et al., 2019; Roediger & Butler, 2018).

Reviewing material after initial exposure helps to consolidate knowledge, making it easier to retrieve and apply in future contexts. This process, often referred to as retrieval practice, has been shown to improve both memory and understanding, particularly in subjects that require cumulative knowledge, such as mathematics (Karpicke, 2017). Additionally, students who engage in regular review sessions are better able to connect new information with existing knowledge, thereby deepening their understanding and improving their ability to solve complex problems (Roediger & Butler, 2018). This process aligns closely with Thorndike's Law of Repetition, which posits that repeated exposure to a stimulus strengthens the association between the stimulus and the response. In an educational context, this means that the more frequently students review material, the stronger and more accessible their understanding of that material becomes. The Law of Repetition suggests that consistent review not only reinforces knowledge but also helps in the consolidation of learning, making it more durable and easily retrievable when needed. Repetition is particularly important in subjects like mathematics, where cumulative knowledge is essential for solving increasingly complex problems. Study by Cepeda et al. (2019) confirms this, demonstrating that spaced repetition, where students review material at strategically timed intervals, significantly improves long-term retention and problem-solving abilities. Their study highlights how

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

regular review sessions enable students to solidify their understanding and create a robust foundation upon which they can build more advanced skills.

Moreover, studies have shown that the effectiveness of post-lesson review is amplified when students use active learning techniques, such as self-testing or summarizing the material, rather than passive review methods like re-reading (Karpicke & Blunt, 2020). This is because active learning strategies require students to interact with the material more deeply, prompting cognitive processes that facilitate better understanding and retention. For instance, Karpicke & Blunt (2020) found that self-testing, a form of retrieval practice, is particularly effective in reinforcing memory and comprehension. This technique forces students to actively recall information, which strengthens neural connections and makes the knowledge more retrievable in the future. Similarly, summarizing material encourages students to process and organize information, which leads to better integration of new concepts with existing knowledge, ultimately resulting in deeper learning. This approach not only reinforces what has been learned but also helps identify gaps in knowledge, allowing students to address misunderstandings before they become entrenched.

4. CONCLUSION

In overall speaking, the research findings clearly highlight the significant factors influencing students' numeracy skills, with notable differences observed based on gender, geographic location, and study habits. Firstly, the study reveals a significant gender disparity in numeracy skills, with female students outperforming their male counterparts. This result suggests that gender-related factors, possibly including differences in learning strategies, classroom participation, and societal expectations, may be influencing students' numeracy outcomes. Teachers should be aware of the gender differences in numeracy performance and work to create an inclusive classroom environment that encourages participation from all students. Tailoring teaching strategies to address the unique needs of both male and female students could help close the gender gap in numeracy skills. Secondly, the research underscores the substantial impact of students' living areas on their numeracy skills. Urban students demonstrate the highest numeracy scores, followed by those in suburban, rural, and remote areas.

This trend likely reflects disparities in access to educational resources, quality of instruction, and environmental support systems, which are more readily available in urban settings. Investing in professional development for teachers, especially those in rural and remote areas, can help improve the quality of education and bridge the gap in student performance across different regions. Lastly, the study emphasizes the critical role of effective study habits in enhancing numeracy skills. Students who consistently prepare before lessons and review materials after lessons perform significantly better than those who do not, highlighting the importance of proactive and sustained engagement with learning materials. Teachers as the managers of the lesson should emphasize the importance of regular study habits, such as pre-lesson preparation and post-lesson review, to help students enhance their numeracy skills. Incorporating these habits into daily routines, through structured assignments or guided study sessions, could significantly improve student outcomes.

REFERENCES

Burke, P. F., & McDonald, S. (2020). The impact of digital technologies on numeracy achievement in remote areas: A review of recent evidence. *Journal of Educational Technology & Society, 23*(2), 45-59.

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Cepeda, N. J., Pashler, H., Vul, E., Wixted, J. T., & Rohrer, D. (2019). Spacing effects in learning: A temporal ridgeline of optimal retention. *Psychological Science, 18*(11), 1095-1102.

Claessens, A., & Engel, M. (2020). How important is where you start? Early mathematics knowledge and later school success. *Education Research International*, 2020, 1-10.

Cleary, T. J., & Kitsantas, A. (2017). Motivation and self-regulated learning in the college classroom: A process-oriented approach. *Journal of Education and Learning, 6*(1), 71-88.

Dent, A. L., & Koenka, A. C. (2020). The relation between self-regulated learning and academic achievement across childhood and adolescence: A meta-analysis. *Educational Psychology Review, 32*(3), 403-424.

Dignath, C., & Büttner, G. (2020). Components of self-regulated learning among students: A meta-analysis on their relation with academic achievement. *Educational Psychology Review, 32*(1), 199-239.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & Pagani, L. S. (2017). School readiness and later achievement. *Developmental Psychology, 53*(1), 16-28.

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2019). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest, 14*(1), 4-58.

Geary, D. C. (2017). An evolutionary perspective on gender differences in mathematics. *Developmental Review, 47*, 125-149.

Geary, D. C., vanMarle, K., & Hoard, M. K. (2018). Development of number line representations in children with mathematical learning disability. *Developmental Neuropsychology, 43*(5), 543-565.

Gibbs, B. G., & Jenkins, J. M. (2019). The role of access to resources in explaining rural-urban educational disparities in Canada. *Canadian Review of Sociology/Revue canadienne de sociologie, 56*(2), 181-204.

Green, B., Wyatt-Smith, C., & Lingard, B. (2021). Community engagement in rural education: Addressing educational disadvantage. *Australian Educational Researcher, 48*(3), 475-492.

Hattie, J., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. *Nature Reviews Psychology, 2*(7), 536-549.

Johan, R. C., Sutisna, M. R., Rullyana, G., & Ardiansah, A. (2020). Developing online learning communities. In *Borderless Education as a Challenge in the 5.0 Society* (pp. 145-153). Routledge.

Jordan, N. C., & Levine, S. C. (2018). Socioeconomic variation, number competence, and mathematics learning difficulties in young children. *Developmental Disabilities Research Reviews, 14*(1), 60-68.

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Karpicke, J. D. (2017). Retrieval-Based Learning: A Decade of Progress. *Learning and Memory: A Comprehensive Reference*, 487-514.

Karpicke, J. D., & Blunt, J. R. (2020). Retrieval practice produces more learning than elaborative studying with concept mapping. *Science, 331*(6018), 772-775.

Kikas, E., Lerkkanen, M. K., Lyyra, A. L., & Nurmi, J. E. (2018). The role of study habits in educational outcomes. *Journal of Educational Psychology, 110*(5), 765-781.

Lamb, S., Glover, S., & Walstab, A. (2020). The impact of geographic location on educational outcomes: Evidence from Australia. *Australian Journal of Education, 64*(1), 5-24.

Lindberg, S. M., Hyde, J. S., Petersen, J. L., & Linn, M. C. (2010). New trends in gender and mathematics performance: A meta-analysis. *Psychological Bulletin, 136*(6), 1123–1135.

Nunes, T., Bryant, P., & Barros, R. (2018). The relative importance of two different mathematical abilities to mathematical skills in young children. *Journal of Educational Psychology, 110*(4), 580-593.

Owusu, G., Agyei-Mensah, S., & Lund, R. (2020). Spatial disparities in educational attainment in Ghana. *Geojournal, 85*(3), 583-601.

Parker, R., Lyons, M., & Tindale, J. (2018). Regional educational disparities and their impact on rural students' academic performance. *Educational Review, 70*(3), 307-325.

Peters, E., Hart, P. S., & Fraenkel, L. (2019). Numbers matter to informed patient choices: A randomized design across age and numeracy levels. *Medical Decision Making, 39*(3), 222-234.

Rodríguez, S., Regueiro, B., Piñeiro, I., Estévez, I., & Valle, A. (2020). Gender Differences in Mathematics Motivation: Differential Effects on Performance in Primary Education. *Frontiers in Psychology, 10*, 3050.

Roediger, H. L., & Butler, A. C. (2018). The critical role of retrieval practice in long-term retention. Trends in Cognitive Sciences, 15(1), 20-27.

Siegler, R. S., & Braithwaite, D. W. (2017). Numerical development. *Annual Review of Psychology, 68*, 187-213.

Sullivan, P., Johnson, G., & Simons, M. (2018). Enhancing mathematics teaching in remote locations: Lessons from research and practice. *Mathematics Education Research Journal, 30*(1), 123-145.

Tomporowski, P. D., Davis, C. L., & Ganio, M. S. (2017). Exercise and children's cognition: The role of readiness. *Journal of Educational Psychology, 109*(1), 1-13.

UNESCO. (2022). Girls' performance in mathematics now equal to boys. Retrieved from https://www.unesco.org/en/articles/girls-performance-mathematics-now-equal-boys-unesco-report

Zimmerman, B. J., & Schunk, D. H. (2021). *Self-regulated learning and academic achievement: Theoretical perspectives* (3rd ed.). Routledge.

DOI: https://doi.org/10.17509/pdgia.v22i1.73593
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700