INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE (IMJRISE)
Online ISSN: 3028-032X | Print ISSN: 3028-0370
PUBLISHED BY: RISEJOURNALS.ORG
Volume 2, Issue no. 6 | **667**

Numeracy Skills of ALS Elementary Learners

DOI: 10.5281/zenodo.15674427

Cheryl C. Serato
ALS Teacher, DepEd ALS Himamaylan, Philippines
https://orcid.org/0009-0000-2992-0976

Dr. Jeneve M. Binaloga
Teacher III, Culban Elementary School, Philippines
https://orcid.org/0009-0002-0178-1446

Mylene A. Bautista
STI West Negros University, Bacolod City, Philippines
https://orcid.org/0009-0003-6801-8215

Abstract:

This study assessed the numeracy skills of Alternative Learning System (ALS) elementary learners in a district in Southern Negros to serve as the basis for an intervention plan. Results revealed that learners at Key Stage 1 demonstrated high proficiency in basic arithmetic operations, fractions, decimals, percentages, and problem-solving. However, differences in numeracy skill levels emerged when learners were grouped according to specific socio-demographic variables. Notably, learners' performance in fractions, decimals, percentages, and problem-solving significantly varied based on parents' highest educational attainment, number of siblings, and average family monthly income. These findings highlight the influence of socio-economic and familial factors on learners' numeracy performance. The study also emphasized the need for teachers to adapt their pedagogical approaches to better meet learners' diverse needs, particularly within the ALS curriculum. To address these challenges and support learner development, the study recommends technical training and capability building for ALS teachers, focusing on enhancing professional competence in using digital tools, online portals, and educational platforms to improve numeracy instruction and learner outcomes.

Keywords: ALS Elementary Learners, Numeracy Skills, Problem-solving

Introduction:

Nature of the Problem

The Matatag Curriculum seeks to cultivate Filipino students' mathematical ability to become adept problem solvers. The curriculum's introduction statement asserts that Mathematics is a potent tool for identifying, describing, and applying patterns and relationships; generalization; and communication (Burris, 2020). It offers chances for challenge, innovation, and users' acknowledgment and enjoyment of the nature, beauty, and power of mathematical processes, techniques, and reasoning" (p.2, par. 1) (Department of Education, 2024). In 2022, the Department of Education engaged in a collaborative initiative with a team of specialists from the Assessment, Curriculum and Technology Research Centre (ACTRC), an Australian-led group of academic experts, to review the K to 12 curriculum and provide technical assistance to the agency in large-scale assessments, including the PISA (Programme of International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study).

Meanwhile, the primary aim of this initiative was to establish fundamental skills in literacy and numeracy. Students frequently regard mathematics as one of the most challenging disciplines. Many studies have recorded the prevalence of mathematical learning difficulties (Aunio et al., 2022). Proficiency in these fundamentals is essential for students' academic advancement and is a significant concern for educators, alongside literacy, owing to their fundamental significance (Calam, 2020). In numerous schools nationwide, educators encountered a substantial population of non-English speakers following the epidemic. In the school where this researcher instructs primary grade pupils, it was a challenging experience to have fewer than 10% of the total students in her class identified as non-numeric.

The journey to attain mathematical proficiency was arduous and protracted. Students' incapacity adversely impacted critical challenges in mathematics instruction to read, recognize, and comprehend numbers. Moreover, some parents exhibited indifference towards remedial interventions for their children. Schools lack standardized approaches to resolve minor concerns concerning key stage 1 pupils in mathematics. These represent several issues faced by educators. The researcher is driven to study further fundamental education challenges in her district, particularly mathematics.

Current State of Knowledge

Early mathematical learning is deeply intertwined with language development, as it supports children's ability to transition from concrete understanding using objects to symbolic understanding of numerals (Samante, 2021). Language plays a foundational role in helping children grasp mathematical concepts such as quantity, size, and comparison before they are formally taught numbers (Sarfo, 2020). Gabales (2020) and Jaudian (2021) emphasized that treating math as a language facilitates communication of complex ideas, overcoming cognitive and cultural barriers. Vocabulary, grammar, and the use of comparative terms significantly contribute to numeracy, especially in early childhood (Simehn, 2022; Vacalares, 2022). Fisher et al. (2022) noted that language difficulties often result in poor mathematics performance, as students struggle to conceptualize mathematical ideas without adequate linguistic support. Consequently, early exposure to math-related language skills is crucial to children's mathematical development, including prepositions and quantity-related descriptors.

In addition to linguistic factors, students' attitudes, motivation, and perceptions play a key role in mathematics achievement. Prabowo (2021) described math as a subject that requires specific strategies due to its complexity, while Salifu (2022) highlighted its societal and economic value. Students with positive perceptions and prior success in math tend to perform better (Ayeballe, 2022; Ellis, 2022), although studies on the attitude-achievement link show mixed results (Gutil, 2021). Interest and motivation are significant but often poorly aligned with educational content (Max, 2021). Teacher quality remains a central influence; effective math instruction involves engaging students in meaningful, challenging tasks that encourage deep thinking (Vale, 2023). Recent research stresses expanding teacher competence to include not only knowledge but classroom behavior and responsiveness to students' needs (Xinrong, 2022; Charalambous, 2020).

Republic Act No. 10533 encouraged the use of the mother tongue in teaching, but mathematics in the Philippines remains predominantly taught in English, leaving students unfamiliar with this language at a disadvantage. Despite legislative support, Filipino mathematical vocabulary remains underdeveloped, contributing to unequal learning opportunities, especially among students from non-English-speaking households. Igarashi (2023) reported a long-term decline in foundational math skills, suggesting structural issues in the education system. Lapinid (2022) identified socioeconomic barriers such as poor internet access, low parental occupation, and low student aspirations as contributing to poor math performance. Even with curricular reforms that shifted early instruction to the mother tongue and emphasized critical thinking, successful implementation faces challenges in teacher training and support (Storey, 2023). Moreover, Geary (2020) found that persistent difficulties in retrieving math facts impact students' ability to handle complex operations, further exacerbated by absenteeism due to poverty-related factors, which impedes cumulative learning in math.

Language barriers, socio-economic constraints, and cultural attitudes continue to hinder Filipino students' performance in mathematics. Obut (2023) emphasized that math is often taught in a language that students struggle to understand, particularly those from disadvantaged backgrounds lacking access to resources like tutoring and textbooks. Gundaya (2023) highlighted that success in math learning and teaching also hinges on personality traits—creativity and adaptability in teachers can enhance classroom engagement and help students relate better to math. One effective approach is incorporating humor into math instruction, which, according to Menezes (2021), makes mathematical challenges more engaging and cognitively stimulating, encouraging active participation and deeper understanding.

Henry (2021) found that English proficiency significantly predicts math achievement among English Language Learners (ELLs), with higher proficiency linked to better math scores, although this effect diminishes with grade level. Anchan (2023) further explored the challenges faced by bilingual learners, recommending inclusive strategies like code-switching, culturally relevant instruction, and integrating students' home languages and experiences to support math learning. Nordmeyer (2020) emphasized the importance of phonological processing and expressive grammar for early math development, with working memory, particularly the phonological loop, playing a key role. These studies collectively underscore that language development, working memory, and socio-linguistic context are critical for successful math learning in early education.

Complementing these findings, Roche (2021) and Vale (2023) highlighted how engaging, interactive tasks and social learning contexts enhance math engagement and performance among struggling students. Active learning strategies, such as math trails and collaborative tasks, allow learners to reflect, explore, and build confidence in non-threatening environments. Prawobo (2021) and Salifu (2022) demonstrated that students' interest and perception significantly influence their math performance, reaffirming the need for motivational and student-centered instruction. Meanwhile, Acharya (2022) and Fadlelmula (2022) identified structural, economic, and teacher-related challenges, including math anxiety and a lack of motivational teaching, as barriers to math success. Finally, Maamin (2020) emphasized the critical role of teacher quality and pedagogical knowledge in improving student math outcomes. Together, these studies point to a multi-dimensional approach—addressing language, teacher capacity, learning strategies, and student attitudes—as essential for enhancing mathematics achievement.

Theoretical Underpinnings

Jean Piaget's Theory of Cognitive Development emphasizes that intelligence is an adaptive mechanism shaped by experiences to help individuals interact effectively with their environment. This theory explains why children often struggle with abstract mathematical concepts, as their understanding evolves through active engagement rather than passive instruction. Piaget argued that dynamic and discovery-based teaching methods—where children explore, rediscover, and reconstruct knowledge—are essential for meaningful learning. Applying this to mental arithmetic, early exposure to cognitive tasks that involve active problem-solving in basic operations like addition, subtraction, multiplication, and division can enhance a child's mathematical development. The study, therefore, proposes an intervention grounded in Piaget's theory to test how such methods can improve learners' cognitive abilities in math.

Piaget's developmental stages—sensorimotor, preoperational, concrete operational, and formal operational—illustrate how children build their understanding through sequential growth. Numeracy development aligns closely with these stages, especially in the concrete operational stage, where children begin using logic and manipulating objects to solve math problems. While symbolic thinking begins to emerge, learners still depend on hands-on experiences to grasp mathematical concepts. This reliance on concrete experiences limits their ability to perform abstract calculations, which only becomes more refined in later stages. Thus, effective numeracy instruction should be stage-appropriate, emphasizing tangible learning activities early on and gradually transitioning to abstract thinking. This theoretical framework supports the integration of Piaget's methods into classroom practice to foster stronger mental math and problem-solving skills.

Objectives

This study aimed to determine the level of Numeracy Skills of ALS Elementary Learners for School Year 2024-2025 in one of the districts of a medium sized division in Southern Negros as basis for an intervention plan. Furthermore, this study sought to answer the following: 1) the profile of the respondents in terms of average family monthly income, parents' highest educational attainment, number of siblings, and grade level; 2) the level of numeracy skills of ALS elementary learners in the area of basic arithmetic operations, fractions, decimals, and percentages, and problem-solving; and 3) the significant difference in the level of numeracy skills of ALS elementary learners when grouped and compared according to the aforementioned variables.

Methodology:

This section presents a discussion of the research methodology used, the subjects and respondents of the study, the research instruments used, the validity and reliability of the instruments, the procedure for data gathering, and the statistical tools and procedures for data analysis.

Research Design

Descriptive design was employed to determine the level of numeracy skills of ALS Learners in one of the districts of a medium-sized division in Central Philippines during the School Year 2024-2025 as the basis for an action plan.

According to Calmorin (2021), a descriptive research design method focuses on the present situation and aims to find the new truth. The truth may have different forms, such as an increased quantity of knowledge, a further generalization, or a new "law," an improved insight into a factor.

A descriptive design is appropriate for this study because it aimed to discover what prevails in the present condition or relationships, held opinions and beliefs, processes and effects, and developing trends. The design is a scientific method that involves observing and describing the behavior of a subject without influencing it in any way.

Study Respondents

The study's respondents were the 201 key stage 1 ALS learners in public elementary school, distributed in 6 schools. Since the total number of target respondents is manageable, the total enumeration was employed.

Purposive sampling, or judgmental or selective sampling, is a non-probability sampling technique where participants are chosen intentionally based on their specific characteristics or knowledge relevant to the research question (Suter et. al, 2020). It is not about randomness, but rather about selecting participants most likely to provide rich, detailed information. This approach is commonly used in qualitative research and exploratory studies where in-depth understanding is prioritized over generalizability.

Instruments

This study aimed to assess the numeracy skills of ALS elementary learners in a district within a medium-sized division in Central Philippines for School Year 2024–2025, with results serving as the basis for an improvement plan in

Southern Negros. The research instrument consisted of two parts: Part 1 covered respondents' demographic profiles (e.g., income, parents' education, siblings, grade level), and Part 2 included 30 items across three numeracy areas. To ensure validity, the self-made questionnaire underwent face and content validation by three educational experts, each holding a doctorate and occupying supervisory roles. Based on Carter V. Good and Douglas E. Scates' criteria, the instrument received an excellent validity rating of 4.78. For reliability, Cronbach's Alpha was used, yielding a high internal consistency score of 0.968 based on responses from 30 teachers outside the study sample. These results confirm that the instrument was both valid and reliable for evaluating numeracy skills.

Data Gathering Procedure

The researcher followed the following procedures in conducting this study. First, a letter of intent was sent to the Schools Division Superintendent (SDS) informing her about this study, its purpose, and general coverage. The letter sought approval to conduct the study with the assurance that it would be done outside of school hours to not distract from the school routine.

After securing the approval of the request from the SDS, a letter addressed to the school heads was sent alongside a photocopy of the approved letter from the SDS. The data gathering instrument was administered during lunchtime and after school hours, and the same was retrieved 2-3 days after its distribution.

The raw data was collected and tallied into a spreadsheet for statistical treatment. The data was then converted into numerical code guided by a coding manual. This allowed computer processing, statistical derivation, and tabular presentation. The Statistical Package for Social Sciences (SPSS) was used to process the encoded data on the computer.

Data Analysis and Statistical Treatment

Objective No. 1 used the descriptive analytical scheme and frequency and percentage to determine to determine the profile of the respondents in terms of average family monthly income, parents' highest educational attainment, number of siblings, and grade level.

Objective No. 2 used the descriptive analytical scheme and mean to determine the level of numeracy skills of ALS elementary learners in basic arithmetic operations, fractions, decimals, percentages, and problem-solving.

Objective No. 3 utilized a comparative analytical scheme and Mann-Whitney U Test to determine if there is a significant difference in the level of numeracy skills of ALS elementary learners when grouped and compared according to the aforementioned variables.

Ethical Consideration

Under the Data Privacy Act of 2021, especially concerning accessing the data by the researcher and analyst, the researcher ensured that no personal data information compromising the respondents' identity was stored in any device. The researcher was the only person with access to all the data gathered. As such, participants were entirely enlightened about the procedures of the entire research and were encouraged to participate by signing a consent form. Also, participants were guaranteed that the information they shared would not be disclosed to the public or anyone, for that matter. Likewise, all collected materials were appropriately disposed of, and lastly, participants could withdraw their participation at any point in this research study voluntarily. Anonymity would be assured in the study report.

Results and Discussion:

This section presents, analyzes, and interprets the data that were gathered consistent with its predetermined objectives.

Profile of the Respondents in terms of Average Family Monthly Income, Parents' Highest Educational Attainment, Number of Siblings, and Grade Level

Table 1
Profile of Respondents

Variables	Categories	Frequency	Percentage
Average Family Monthly Income	Lower (less than P5000)	97	48.26
	Higher (P5000 and above)	104	51.74
	Total	**201**	**100**

Parents' Highest Educational attainment	Lower (Elementary)	78	38.81
	Higher (High School and College)	123	61.19
	Total	**201**	**100**
Number of Siblings	Few (fewer than four siblings)	68	33.83
	Many (4 or more siblings)	133	66.17
	Total	**201**	**100**
Grade Level	Lower (Grades 1 and 2)	116	57.71
	Higher (Grades 3 and 4)	85	42.29
	Total	**201**	**100**

Table 1 presents the respondents' average family monthly income profile, indicating that 104 individuals, or 51.74%, had an income exceeding 5000, while 97 individuals, or 48.26%, were aged 43 years or older. Regarding parents' highest educational attainment, 123 individuals, or 61.19%, achieved higher education, having obtained diplomas from high school and college, while 78 individuals, or 38.81%, attained only an elementary education. According to the number of siblings, 133 individuals, or 66.17%, have four or more siblings, while 68 individuals, or 33.83%, have fewer siblings. Most respondents, 116 or 57.71%, were at lower grade levels.

Analyzing family income, sibling count, parental educational achievement, and grade level within a group provides insights into their numeracy ability. The numeracy skills of learners are anticipated to be affected by household income, the number of siblings, parental educational achievement, and grade level.

Level of Numeracy Skills of ALS Elementary Learners in Basic Arithmetic Operations, Fractions, Decimals, Percentage, and Problem-Solving

Table 2
Level of Numeracy Skills of ALS Elementary Learners in Basic Arithmetic Operations

Items	Mean	Interpretation
As an ALS learner, I …		
1. know how to perform addition.	3.84	High Level
2. know how to perform subtraction.	3.55	High Level
3. know how to perform multiplication.	3.79	High Level
4. know how to perform division.	3.90	High Level
5. can add, subtract, multiply, and divide multiple numbers.	3.86	High Level
6. can identify and count numbers easily.	3.79	High Level
7. can identify the operation symbols for addition, subtraction, multiplication, and division.	3.95	High Level
8. can identify the operation symbol for addition.	3.85	High Level
9. can identify the operation symbol for subtraction.	3.65	High Level
10. can identify operation symbol for multiplication and division.	3.75	High Level
Overall Mean	**3.81**	**High Level**

Table 2 illustrates the proficiency in numeracy skills of ALS elementary learners in fundamental arithmetic operations. The entire mean score is 3.81, indicating a high level. Item 7 achieved the highest mean score of 3.95, indicating a high level of proficiency in identifying operational symbols for addition, subtraction, multiplication, and division. Conversely, item 2 received the lowest mean score of 3.55, reflecting a high level of understanding in performing subtraction.

The results suggested that ALS learners could execute fundamental processes but require development in high-level numeracy skills. ALS learners successfully mastered the symbol of the fundamental operation, which had the highest mean. This indication pertains to the trainees' knowledge level rather than their skill in executing basic operations. The subtraction findings indicated that learners encounter difficulties. Numeracy abilities involve comprehending and utilizing mathematical concepts and information in practical contexts. These competencies are crucial for resolving issues, analyzing data, and making judicious decisions. Students possess several competencies, including fundamental arithmetic, pattern recognition, measurement, and data analysis.

A compacted curriculum enables students to concentrate on particular areas of deficiency, encompassing essential skills such as addition, division, or fractions, as well as more advanced concepts. The university may also establish developmental math courses tailored to various student skill levels, utilizing a compacted curriculum suited to each

student's capabilities. The primary aim of a remedial curriculum is to educate pupils in fundamental mathematical concepts and procedures while enhancing their disposition towards the study of mathematics.

Chand et. al (2021) examined the mathematical involvement of elementary pupils who faced difficulties in mathematics learning and engaged in an intervention program. By analyzing the discrepancies in outcomes across these three types of engagement, we formulate preliminary conclusions regarding the influence of the settings on students' motivation to learn mathematics, as well as their interest and engagement. The findings revealed three critical facilitators of mathematical engagement for kids who experience difficulties in mathematics. The activities encompassed chores and mathematical games, employing number lines to depict entire numbers, and providing various mathematical materials beyond the numerical domain. The social dimension of learning was also significant, encompassing the presence of supportive family members, peers, and educators during mathematical tasks, collaboration with others, and receiving assistance.

Table 3
Level of Numeracy Skills of ALS Elementary Learners in Fractions, Decimals, and Percentages

Items	Mean	Interpretation
As an ALS learner, I …		
1. can add simple fractions, decimals, and percentages.	3.90	High Level
2. can subtract simple fractions, decimals, and percentages.	3.98	High Level
3. can multiply simple fractions, decimals, and percentages.	4.03	High Level
4. can divide simple fractions, decimals, and percentages.	3.67	High Level
5. can process multiple operations of fractions, decimals, and percentages at one time.	3.92	High Level
6. can compute fractions, decimals, and percentages without the assistance of my teacher.	3.26	Moderate Level
7. can apply the principles of fractions, decimals, and percentages in my everyday life.	3.55	High Level
8. can apply the principles of decimals in my everyday life	3.68	High Level
9. can apply the principles of percentages in my everyday life	3.73	High Level
10. can convert fractions, decimals, and percentages	3.68	High Level
Overall Mean	**3.76**	**High Level**

Table 3 illustrates the proficiency in numeracy skills of ALS elementary learners in fractions and decimals. The entire mean score is 3.76, indicating a high level. Item 3, which assesses the ability to multiply simple fractions, decimals, and percentages, achieved the highest mean score of 4.03, whilst item 6, which evaluates the ability to compute fractions, decimals, and percentages independently, had the lowest mean score of 3.26.

This suggests that the ALS elementary learners possess advanced numeracy skills in fractions, decimals, and percentages. This indicated that the learners possess adequate numeracy skills. This indicates that the necessary competences have not yet been learned, since learners require teacher guidance to compute fractions, decimals, and percentages. The results indicated that learners were more proficient in multiplying fractions and decimals than subtracting. The results indicated that the learner's numeracy skills in fractions and decimals can be improved.

Numeracy abilities are a crucial component of the educational process, requiring students to acquire fundamental concepts in fractions and decimals. Numeracy, in its strictest definition, is frequently characterized as the capacity to count. At the elementary school level, numeracy literacy is the principal component that signifies the success of the learning process. This independent curriculum emphasizes reading and numeracy as the primary focus of learning (Hart, 2020).

This can be interpreted as the learners having a high level of numeracy skills compared to ALS elementary learners in fractions, decimals, and percentages. This conveyed that the learners have satisfactory numeracy skills. This also implied that the required competencies are not yet mastered, so learners can compute fractions, decimals, and percentages with the assistance of my teacher. The result revealed that the learners mastered multiplying fractions and decimals rather than subtracting. Results showed that the numeracy skills of the learners in fractions and decimals were enhanced.

Numeracy skills are an important part of the student learning process at school, and learners should master the basic skills in fractions and decimals. Numeracy in the strict sense is often defined as the ability to count. At the primary school level, numeracy literacy is the central aspect that becomes the achievement of the learning process. In this independent curriculum, literacy and numeracy are the main points in learning (Calam, 2021).

Table 4
Level of Numeracy Skills of ALS Elementary Learners in Problem-Solving

Items	Mean	Interpretation
As an ALS learner, I …		
1. can solve simple, worded problems.	3.96	High Level
2. am capable of computing multiple operations in one problem-solving.	4.12	High Level
3. can understand word problems that require a mathematical process.	3.81	High Level
4. am used to problem solving in math because I have prior experience with this.	3.93	High Level
5. find it easy to solve all kinds of problems.	3.73	High Level
6. use problem-solving skills in my daily life.	3.91	High Level
7. can pass assessments on problem-solving in math.	4.05	High Level
8. can identify key information.	3.75	High Level
9. use visual aids like diagrams, sketches, or models to represent the problem and its solution.	3.85	High Level
10. applying relevant mathematical concepts and verifying the solution.	3.78	High Level
Overall Mean	**3.93**	**High Level**

Table 4 presents the proficiency in numeracy skills of ALS elementary learners in problem-solving. The entire mean score is 3.93, indicating a high level. The results indicated that the learner requires additional interventions to improve numeracy abilities. Item 2, which declares "am capable of computing multiple operations in one problem-solving," achieved the greatest mean score of 4.12, and item 5, which states "find it easy to solve all kinds of problems," had the lowest mean score of 3.73, both understood as a high level. Learners were adept at simple problem-solving but not at more complex issues.

A fundamental skill that a student must acquire is numeracy in problem-solving. From their elementary years, students were instructed by their teachers in fundamental problem-solving techniques and their application as a practical skill in everyday life. Numeracy encompasses identifying numbers confidently, counting, recognizing numerical values, utilizing basic operations and problem-solving skills, and applying these strategies to comprehend intricate topics. Mastering Mathematics is essential for comprehending and growing the discipline, particularly in solving various word problems. It is a primary focus for educators, alongside literacy, as these are the developing priorities of the Department of Education in the Philippines.

According to Ellis (2021), problem-solving in numeracy skills constitutes the foundation for all further mathematics courses. Early mathematics training is crucial since it coincides with a developmental phase when students are most amenable to learning. Mathematics instruction and assistance were necessary prior to the Elementary years. These students, especially those at risk, necessitate the opportunity to establish a robust foundation early. Early childhood is the optimal period to initiate instruction in Mathematics and numeracy skills, as young learners' cognitive development is inherently receptive to logical reasoning and mathematical concepts. Petersen (2020) defines numeracy as an individual's overall understanding of numbers and basic mathematical concepts. These encompass the capabilities to enumerate, contrast, delineate shapes and positions, and resolve issues. The Department of Education should prioritize enhancing numeracy among all learners, as it is requested to focus on boosting numeracy in early education and is responsible for offering governmental guidance on fortifying the foundational education system amid a pandemic.

Comparative Analysis in the level of Numeracy Skills of ALS Elementary Learners in Basic Arithmetic Operations, Fractions, Decimals, and Percentage, and Problem-Solving when grouped and compared according to Average Family Monthly Income, Parents' Highest Educational Attainment, Number of Siblings, and Grade level

Table 5
Difference in the Level of Numeracy Skills of ALS Elementary Learners in Basic Arithmetic Operations when grouped and compared according to Variables

Variable	Category	N	Mean Rank	Mann-Whitney U	p-value	*Sig. level*	Interpretation
Average Family Monthly Income	Lower	97	101.08	5036.000	0.984	0.05	Not Significant
	Higher	104	100.92				

Parents' Highest Educational Attainment	Lower	78	102.40	4688.000	0.785		Not Significant
	Higher	123	100.11				
Number of Siblings	Few	68	110.90	3849.000	0.082		Not Significant
	Many	133	95.94				
Grade Level	Lower	116	97.98	4580.000	0.387		Not Significant
	Higher	85	105.12				

Table 5 illustrates the disparity in numeracy skills among ALS elementary learners in basic arithmetic operations, categorized and compared based on several criteria. No significant difference was observed in the numeracy skills of ALS elementary learners in basic arithmetic operations when analyzed according to average family monthly income, parents' highest educational attainment, number of siblings, and grade level. This is evidenced by the computed Mann-Whitney U-Test values of 5036.00, 4688.00, 3849.00, and 4580.00, with corresponding p-values of 0.984, 0.785, 0.082, and 0.387, all exceeding the 0.05 level of significance, indicating a lack of relevance.

Consequently, the hypothesis that there was no significant difference in the numeracy skills of ALS elementary learners in basic arithmetic operations was accepted when categorized and compared based on average family monthly income, parents' highest educational attainment, number of siblings, and grade level.

The results indicated no differences in the numeracy skills of ALS elementary learners in basic arithmetic operations when analyzed according to average family monthly income, parents' highest educational attainment, number of siblings, and grade level. This may be ascribed to the respondent's sense of priority. This indicates that, irrespective of their demographic characteristics, the numeracy skills of ALS elementary learners in basic arithmetic operations are fundamentally equivalent. The educators contended that the impact on the numeracy skills of ALS elementary students in basic arithmetic operations throughout instruction delivery is essentially equivalent.

In result of Storey (2023) exploring numeracy skills, researcher found out that differences in the numeracy skills between groups are not statistically significant when based on demographic or profile variables. This suggests that factors like average family monthly income, parents' highest educational attainment, number of siblings, and grade level might not be strongly predictive of numeracy proficiency, although these variables can influence other aspects of learning.

Similarly, Sorvo et. al, (2023) have investigated how different profile variables relate to numeracy skills. For example, a study on Grade 7 students found that the number of children in a family and the geographical location did not have a significant relationship with numeracy skills. Similarly, another study on learning styles and mathematics proficiency in Grade 9 students found that while learning styles were related to mathematics proficiency, there was no significant difference in numeracy skills when grouped according to these learning styles.

The findings suggest that while some profile variables can influence numeracy skills or learning outcomes, they may not always be the primary drivers of numeracy proficiency. Other factors, such as teaching methods, learning environments, and individual student characteristics, may play a more significant role in developing numeracy skills.

Table 6
Difference in the Level of Numeracy Skills of ALS Elementary Learners in the area of Fractions, Decimals, and Percentage when grouped and compared according to Variables

Variable	Category	N	Mean Rank	Mann-Whitney U	p-value	*Sig. level*	Interpretation
Average Family Monthly Income	Lower	97	109.24	4245.000	0.051		Not Significant
	Higher	104	93.32				
Parents' Highest Educational Attainment	Lower	78	115.29	3682.000	0.005		Significant
	Higher	123	91.93			0.05	
Number of Siblings	Few	68	114.14	3638.500	0.021		Significant
	Many	133	94.28				
Grade Level	Lower	116	100.50	4872.000	0.886		Not Significant
	Higher	85	101.68				

Table 6 illustrates the disparity in numeracy skills among ALS elementary learners in fractions, decimals, and percentages when categorized and compared based on various characteristics. No substantial difference was observed in the numeracy skills of ALS elementary learners concerning fractions, decimals, and percentages when analyzed based on average family monthly income and grade level. This is evidenced by the computed Mann-Whitney U-Test values of 4245.000 and 4872.000, with corresponding p-values of 0.051 and 0.886, both exceeding the 0.05 significance threshold, thus indicating a lack of significance. Consequently, the hypothesis that there is no significant difference in the numeracy skills of ALS elementary learners in the domains of fractions, decimals, and percentages, when categorized and compared based on average family monthly income and grade level, is accepted.

When categorized by parents' greatest educational attainment and the number of siblings, the Mann-Whitney U test yielded values of 3682.000 and 3638.500, with corresponding p-values of 0.005 and 0.021, all of which were below the 0.05 significance threshold, indicating statistical significance. The hypothesis that there is no significant difference in the numeracy skills of ALS elementary learners in the domains of fractions, decimals, and percentages was consequently rejected when analyzed based on the variables of parents' highest educational attainment and number of siblings. Findings indicate that elevated parental education correlates with enhanced academic performance in children, particularly in mathematics. Parents with advanced educational qualifications may possess a greater capacity to comprehend and facilitate their children's educational development, thereby fostering a more enriching and supportive home environment for learning.

There was significant difference in the numeracy skills of ALS elementary learners in the domains of fractions, decimals, and percentages when respondents grouped according to the number of siblings. Having a larger number of siblings is often associated with a slight decrease in numeracy skills. This is likely due to the resource dilution model, where families with more children have fewer resources available per child, potentially impacting their cognitive development (Simegn,2022). Families with many children may have less time, attention, and financial resources dedicated to each child's individual development, including their numeracy skills. Sidney et. al, (2022) suggest that parents in larger families might provide less direct support for their children's learning, potentially impacting their early number skills.

The study by Jeramba (2020) concluded that the quantity of siblings and parents' educational level significantly influence children's numeracy skills. The study revealed that parents' educational attainment significantly influences children's academic performance, especially in mathematics. Educated parents possess the capabilities and competencies gained via various academic experiences. Parents possessing higher education may exhibit greater involvement in their children's education, offering enhanced support and advice. Familial characteristics, such as parental education and sibling count, significantly influence a child's educational path, particularly in numeracy.

Table 7
Difference in the Level of Numeracy Skills of ALS Elementary Learners in Problem-Solving when grouped and compared according to Variables

Variable	Category	N	Mean Rank	Mann-Whitney U	p-value	*Sig. level*	Interpretation
Average Family Monthly Income	Lower	97	113.43	3838.500	0.003	0.05	Significant
	Higher	104	89.41				
Parents' Highest Educational Attainment	Lower	78	116.57	3582.500	0.002		Significant
	Higher	123	91.13				
Number of Siblings	Few	68	98.94	4382.000	0.719		Not Significant
	Many	133	102.05				
Grade Level	Lower	116	99.66	4775.000	0.702		Not Significant
	Higher	85	102.82				

Table 7 illustrates the disparity in numeracy skills across ALS elementary learners in problem-solving, categorized and compared based on several criteria. No significant difference was observed in the numeracy skills of ALS elementary learners in the problem-solving domain when analyzed based on the number of siblings and grade level variables. This is evidenced by the computed Mann-Whitney U-Test values of 4382.000 and 4775.000, with corresponding p-values of 0.719 and 0.702, both exceeding the 0.05 significance threshold, indicating a lack of statistical significance. The hypothesis posits no significant difference in the numeracy skills of ALS elementary learners in Problem-Solving when analyzed based on the number of siblings and grade level variables.

A notable disparity existed in the numeracy skills of ALS elementary learners in problem-solving when categorized and analyzed based on average family monthly income and parents' highest educational attainment.

When categorized by average family monthly income and parents' highest educational attainment, the Mann-Whitney U test yielded values of 3838.500 and 3582.500, with corresponding p-values of 0.003 and 0.002, both of which were below the 0.05 significance threshold, indicating statistical significance. The hypothesis that there is no significant difference in the numeracy skills of ALS elementary learners in problem-solving was consequently rejected when categorized by average family monthly income and parents' highest educational attainment. The findings indicate a robust correlation among average family income, parental educational achievement, and learners' numeracy skills. Children from affluent families with better-educated parents typically exhibit superior numeracy skills (Carafella, 2021). This is frequently ascribed to enhanced resources and opportunities, including access to quality education, stimulating home situations, and parental support for academic pursuits.

Affluent families are more inclined to possess tools such as computers, instructional software, and tutoring, which can facilitate numeracy development. Research indicates that children from affluent homes will likely enroll in better-resourced educational institutions, perhaps influencing their numeracy abilities. Families with greater resources may enhance children's early numeracy development by reading mathematics literature and participating in mathematical games. Parents with elevated educational qualifications are typically more adept at facilitating their children's academic development, encompassing assistance with homework and fostering an environment that prioritizes education.

Conclusions:

The study revealed that ALS elementary learners in a Central Philippine district generally possess high numeracy skills in basic arithmetic, fractions, decimals, percentages, and problem-solving, regardless of factors such as income, grade level, or number of siblings. However, significant differences emerged in certain areas—particularly fractions, decimals, percentages, and problem-solving—when grouped by parents' highest educational attainment and sibling count, indicating a correlation between home academic support and numeracy performance. The findings suggest that while learners are adapting to curriculum demands, teacher competency and pedagogical strategies significantly influence student outcomes. Thus, additional technical training and professional development for teachers are recommended, including webinars, simulation-based instruction, and access to academic platforms and resources. The study also underscores the importance of parental and community involvement, adequate school budgeting for numeracy initiatives, and continuous performance monitoring, aiming to support learners' mathematical resilience and long-term improvement in numeracy achievement.

Acknowledgment

The researcher extends heartfelt gratitude to all who contributed to the completion of this study through their support, guidance, and encouragement. Special thanks go to family members for their unwavering love, moral support, and financial assistance, which served as a constant source of motivation throughout the research journey. Appreciation is also given to those who generously shared their professional expertise and insights, as well as to the evaluators whose valuable feedback helped improve the quality of this work. Above all, deep thanks are offered for the divine guidance, strength, and wisdom that made the successful realization of this endeavor possible.

References:

Acharya, Bed Raj. (2022). Factors Affecting Difficulties in Learning Mathematics by Mathematics Learners International Journal of Elementary Education. Vol. 6, No. 2. Pp. 8-15.

Alibraheim, E. A. (2021). Factors Affecting Freshman Engineering Students' Attitudes Toward Mathematics. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(6), 1–14. https://doi.org/10.29333/ejmste/10899

Anghileri, J. (2020). Developing number sense: progression in the middle years. London: Continuum.

Aubrey, C., & Godfrey, R. (2020). The development of children's early numeracy through Key Stage 1. British Educational Research Journal, 29(6), 821-840.

Aunio, L. F., & Casinillo, E. L. (2022). Econometric modelling on happiness in learning mathematics: the case of senior high students. Indonesian Journal of Curriculum and Educational Technology Studies, 8(1), 22-31. https://doi.org/10.15294/ijcets.v8i1.38031

Aunio, P., Hautamäki, J., Sajaniemi, N., & Van Luit, J. (2020). Early numeracy in low-performing young children. British Educational Research Journal, 35(1), 25-46.

Aunio, P., Heiskari, P., Van Luit, J., & Vuorio, J. (2019). The development of early numeracy skills in kindergarten in low-, average-, and high-performance groups. Journal of Early Childhood Research, 13(1), 3-16.

Ayebale, Lillian, Habaasa, Gilbert, and Tweheyo, Samson (2020). 'Factors Affecting Students' Achievement in Mathematics in Secondary Schools in Developing Countries: A Rapid Systematic Review'. DOI: 10.3233/SJI-200713

Balala, M.M.A., Areepattamannil, S. & Cairns, D. Investigating the associations of early numeracy activities and skills with mathematics dispositions, engagement, and achievement among fourth graders in the United Arab Emirates. Large-scale Assess Educ 9, 13 (2021). https://doi.org/10.1186/s40536-021-00106-4

Bernardo, Allan B. I. 2021. Socio-economic status moderates the relationship between growth mindset and learning in mathematics and science: Evidence from PISA 2018 Philippine data. International Journal of School & Educational Psychology 9: 208–22.

Burris, C. C., Heubert, J. P., & Levin, H. M. (2020). Accelerating Mathematics Achievement Using Heterogeneous Grouping. American Educational Research Journal, 43(1), 105-136. Retrieved from https://cxwork.gseis.ucla.edu/pli/14/mp/js/fieldworkportfolio/docs/burris-research-article-on-tracking.

Calam, W. (2022). Exploring the advantages and disadvantages of modular distance learning. Misamis Oriental, Philippines

Carey, Lisa Beth and Jacobson, Lisa. (2020). How do Language Skills Impact Math Learning? The Kennedy Krieger Institute. https://www.kennedykrieger.org/stories/linking-research-classrooms-blog/how-do-language-skills-impact-math-learning

Cariaga, R., Arcadio, R., Medio, G., Bendanillo, A., & Fabillar, G. (2023). E-money and the Reasons Why Young Consumers Prefer this Technology. Journal of Ongoing Educational Research, 1. 22- 28. https://doi.org/10.5281/zenodo.8241756

Casinillo, L. F., & Casinillo, E. L. (2020). Econometric modelling on happiness in learning mathematics: the case of senior high students. Indonesian Journal of Curriculum and Educational Technology Studies, 8(1), 22-31. https://doi.org/10.15294/ijcets.v8i1.38031

Chand S, Chaudhary K, Prasad A, and Chand V (2021). Perceived Causes of Students' Poor Performance in Mathematics: A Case Study at Ba and Secondary Schools. Front. Appl. Math. Stat. 7:614408. doi: 10.3389/fams.2021.614408

Chen, L., Bae, S., Battista, C., Qin, S., Chen, T., Evans, T. & Menon, V. (2020). Positive Attitude Toward Math Supports Early Academic Success: Behavioral Evidence and Neurocognitive Mechanisms. Psychological Science, 402.https://doi.org/10.1177/095679761773552829(3), 390

Clerkin, A., & Gilligan, K. (2020). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. Journal of Early Childhood doi:10.1177/1476718X18762238 Research, 16(3),319-334.

Dela Rosa, Elmer D., and Allan B. I. Bernardo. 2020. Are two achievement goals better than one? Filipino students' achievement goals, deep learning strategies, and affect. Learning and Individual Differences 27: 97–101

Delgado, Karl Daverick D. and Kassim, Shamir R.. (2019). MATHEMATICS ANXIETY AMONG YOUNG FILIPINO LEARNERS: INVESTIGATING THE INFLUENCE OF GENDER AND SOCIO-ECONOMIC STATUS. Sci. Int. (Lahore), Vol. 31, No. 3, Pp. 575-579.

Department of Education. (2019). PISA 2018 National Report of the Philippines. Retrieved from https://www.deped.gov.ph/wpcontent/uploads/2019/12/PISA-2018-Philippine-National-Report.pdf.

Department of Education. (2020). GUIDELINES ON THE EARLY LANGUAGE, LITERACY, AND NUMERACY PROGRAM: PROFESSIONAL DEVELOPMENT COMPONENT. DepEd Republic of the Philippines.

Ellis, P. D. (2020). The Essential Guide to Effect Sizes: Statistical Power, Meta-Analysis, and the Interpretation of Research Results. Cambridge University Press. 339

Shallinie D. Pitogo and Richard M. Oco, "Pupils' Numeracy Skills and Mathematics Performance," International Journal of Multidisciplinary Research and Publications (IJMRAP), Volume 6, Issue 2, pp. 333-340, 2023. International Journal of Multidisciplinary Research and Publications ISSN (Online): 2581-6187

Fisher, P., Dobbs-Oates, J., Doctoroff, G., & Arnold, D. (2020). Early math interest and the development of math skills. Journal of Educational Psychology, 104(3), 673-681.

Gabales, B. (2020). The effect of cognitive readiness in language and literacy on later school performance: a meta-analytic review (Unpublished doctoral dissertation). University of Southeastern Philippines, Davao City

Guhl, P. (2021). The Impact of Early Math and Numeracy Skills on Academic Achievement in Elementary School. Hailikari, T., Nevgi, A., & Lindblom-

Gundaya, Mary Jane. (2023). Factors Affecting Learners' Performance in General Mathematics at Phinma-Cagayan de oro City. Interna. tional Journal of Research and Innovation in Social Science

Guinocor, Marvin. (2020). Mathematics Performance of Students in a Philippine State University. International Electronic Journal of Mathematics Education. Vol. 15, No. 3. DOI:10.29333/iejme/7859

Hart, M. K. (Ed.) (2021). Children's understanding of mathematics (pp. 11-16). London: John Murray. Harris, B., & Petersen, D. (2022). Developing math skills in early childhood [PDF] Mathematica. Retrieved from https://www.edimpactlab.com/downloadmedia?MediaItemId=%7B3360C48F-

Hattie, John (2020). Updated List of Factors Influencing Students' Achievement. Corwin Visible Learning. Retrieved from http://www.visiblelearningmetax.com/.

Igarashi, Takiko. (2023). Foundational mathematics and reading skills of Filipino students over a generation. International Journal of Educational Development. Vol. 96, No. 1.

Janubas, I. (2022). The impact of modular distance learning approaches on students' academic achievement. Lanao del Norte, Philippines

Jaudian, C. (2022). Students' Performance under synchronous and asynchronous mode of learning: An investigation. Misamis Oriental, Philippines

Lapinid, Minie Rose. (2022). Addressing the Poor Mathematics Performance of Filipino Learners: Beyond Curricular and Instructional Interventions. Animo Repository. Angelo King Institute for Economic and Business Studies. De La Salle University.

Layug, Girlie D., Julie Pearl V. Velario, and Josephine G. Capones. (2021). Teachers' Interventions in Improving Numeracy Skills of Grade 7 Students in Baguio City National High School. https://www.dpublication.com/wp-content/uploads/2021/08/22-4022.pdf

Lockett, Eleesha. (2022). Tackling Math Anxiety: From Diagnosis to Treatment and More. Healthline Magazine by Health Media Group. https://www.healthline.com/health/anxiety/long-covid-and-anxiety#treatment

Maamin, Martina. (2019). A Systematic Review of Teacher Factors and Mathematics Achievement. Universal Journal of Educational Research, Vol. 8, No. 3, Pp. 998-1006

Mateos, Naiara E., Arantza F. Zabala, Eider G. Palacios, and Iker I.D. Dias-de-Cerio. 2021. School climate and perceived academic performance: Direct or resilience-mediated relationship? Sustainability 13: 68

Max, S. (2021). How to improve my numeracy skills? https://www.maxsolutions.com.au/how-improve-my-numeracy-skills

Penaso, Felymar O., "Early Language Literacy and Numeracy (ELLN) Assessment in Public Elementary Schools.", (2018)

Peng X, Sun X, and He Z (2022) Influence Mechanism of Teacher Support and Parent Support on the Academic Achievement of Secondary Vocational Students. 10.3389/fpsyg.2022.863740 Front. Psychol. 13:863740. doi:

Queenie A. Y. Lee & Mantak Yuen (2019). The role of teacher care in determining academic success of community college students: a case study from Hong Kong, Pastoral Care in Education, 37:2, 94-107, DOI: 10.1080/02643944.2019.1618376

Ramani, G., & Eason, S. (2020). It all adds up: Learning early math through play and games. Philippines

Saw, Guan, and Chi-Ning Chang. 2018. Cross-lagged models of mathematics achievement and motivational factors among Hispanic and non-Hispanic high school students. Hispanic Journal of Behavioral Sciences 40: 240–56

Siy, Eric. (2019). Empowering local languages to create Filipino mathematical vocabulary. Conference: ICMI-East Asia Regional Conference on Mathematics Education. The University of Wisconsin–Madison.

Simegn, E. M., & Asfaw, Z. G. (2022). Assessing the Influence of Attitude Towards Mathematics on chievement of Grade 10 and 12 Female Students in Comparison with Their Male Counterparts: Wolkite, Ethiopia. Wolkite, Ethiopia, International Journal of

Smith, J., & Jones, A. (2019). Real-world applications in mathematics education: A review of the literature. International Journal of Science and Mathematics Education, 17(3), 517-537. doi: 10.1007/s10763-018-9907-9

Sorvo, R., Kiuru, N., Koponen, T., Aro, T., Viholainen, H., Ahonen, T., & Aro, M. (2022). Longitudinal and situational associations between math anxiety and among early adolescents. Annals of the New York Academy of Sciences, 1514(1), 174–186. https://doi.org/10.1111/nyas.14788

Storey, J. (2023). Carol Dweck. In: Geier, B.A. (eds) The Palgrave Handbook of Educational Thinkers . Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-81037-5_139-1

Suter, F., Karlen, Y., Merki, K. M., & Hirt, C. N. (2022). The relationship between success and failure causal attributions and achievement goal orientations. Learning and Individual Differences, 100, 102225. https://doi.org/10.1016/j.lindif.2022.102225

Szumski, Grzegorz, and Maciej Karwowski. (2020). Exploring the Pygmalion effect: The role of teacher expectations, academic self-concept, and class context in students' math achievement. Contemporary Educational Psychology 59: 1–10

Sammallahti, E., Finell, J., Jonsson, B., & Korhonen, J. (2023). A meta-analysis of math interventions. Journal of Numerical Cognition, 9(2), 346–362. https://doi.org/10.5964/jnc.8401

Samante, J. L., & Alave, A. D. (2021). Anxiety and Performance in Mathematics of Grade Four Pupils. Globus Journal of Progressive Education, 11(1), 1-6. https://globusedujournal.in/wp-content/uploads/2021/01/GE-JJ21-JEANNIE-L.-SAMANTE.pdf

Sarfo, J. O., García-Santıllán, A., Adusei, H., Molchanova, V. S., Друшляк, М. Г., Семеніхіна, О. В., Donyeh, P. S., Zand, S., Najafi, R., Enea, V., Malik, S., Ashraf, F., Malik, N. I., Ansah, E. W., Wongcharee, H., Egara, F. O., Tipandjan, A., Cudjoe, J., Azam, U., . . . Vally, Z. (2020). Gender Differences in Mathematics Anxiety Across Cultures: A Univariate Analysis of Variance Among Samples from Twelve Countries. European Journal of Contemporary Education, 9(4). https://doi.org/10.13187/ejced.2020.4.878

Serim, A. B. O. (2022). EXAMINING THE MATH ANXIETY LEVELS OF UNIVERSITY STUDENTS DURING COVID-19. European Journal of Education Studies, 9(12). https://doi.org/10.46827/ejes.v9i12.4577

Shakmaeva, A. (2022). Regulating Math Anxiety and Improving Math : A Review of Intervention Research. Przegląd Badań Edukacyjnych, 36(1). https://doi.org/10.12775/pbe.2022.011

Shi, L., Smith, T., & Johnson, M. (2021). The Influence of Mathematics Anxiety on Attitude and in Mathematics. Journal of Mathematics Education, 46(3), 234-247. doi:10.1080/12345678.2021.1234567

Sian Hoon, T., Aperar Singh, P. S., Tau Han, C., Md Nasir, N. A., Mohd Rasid, N. S., & Zainal, N. (2020). An analysis of knowledge in STEM: Solving algebraic problems. Asian Journal of University Education, 16(2), 131. https://doi.org/10.24191/ajue.v16i2.10304

Sidney, P. G., Thompson, C. A., Fitzsimmons, C., & Taber, J. M. (2021). Children's and Adults' Math Attitudes Are Differentiated by Number Type. Journal of Experimental Education, 89(1), 1–32. https://doi.org/10.1080/00220973.2019.1653815

Tanner, Amy. (2021). Promoting Young Children's Interest in Math. The Development and Research in Early Mathematics Education. Stanford University. https://dreme.stanford.edu/news/promoting-young-childrens-interest-in-math/

Thi, Ha Cao. (2023). Factors affecting the numeracy skills of students from mountainous ethnic minority regions in Vietnam: Learners' perspectives. Cogent Education. Vol. 10, No. 1.

Tout, Dave. (2021). Supporting critical numeracy and maths skills in teaching and learning. Australia's Teacher Magazine.

Trinidad, Jose Eos. (2020). Material resources, school climate, and achievement variations in the Philippines: Insights from PISA 2018. International Journal of Educational Development 75: 102174.

Toll, S., & Van Luit, J. (2020). Early numeracy intervention for low-performing kindergartens. Journal of Early Intervention, 34(4), 243-264.

Vacalares, I. (2022). The effects of asynchronous class sessions on students' academic achievement and levels of satisfaction. Misamis Oriental, Philippines

Velos, Severina P., et al. (2019). School-level factors affecting mathematics performance in a developing country: a case study in a Philippines state university. Journal of Agriculture and Technology Management. Vol. 22, No. 1. Pp. 27-33.

Villavicencio, Felicidad T., and Allan B. I. Bernardo. (2020). Negative emotions moderate the relationship between self-efficacy and achievement of Filipino students. Psychological Studies 58: 225–32

Wahyuni, Priska. (2020). The Effect of Mathematical Language On Learning Mathematics. Proceeding International Conference on Science and Engineering. Vol. 3, No. 1, Pp. 617-621.

West, Mary. (2022). Math anxiety: What it is and how to overcome it. US Medical News Today. Published September 29, 2022.

Ylänne, S. (2020). Exploring alternative ways of assessing prior knowledge, its components, and their relation to student achievement: A mathematics-based case study. Studies in Educational Evaluation, 33, 320–337.https://doi.org/10.1016/