p-ISSN: 2086-4280
e-ISSN: 2527-8827

Comprehensive Numeracy Evaluation Model of Junior High Schools in Indonesia

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Article received: 22-05-2024, revision: 07-06-2024, published: 30-07-2024

Abstrak

Kemampuan numerasi telah menjadi masalah signifikan terutama di sekolah menengah pertama. Penelitian ini bertujuan menciptakan model evaluasi komprehensif untuk menilai kemampuan numerasi di sekolah menengah pertama. Penelitian ini menggunakan dua pendekatan utama. Pendekatan pertama adalah penelitian dan pengembangan, meliputi tahap investigasi awal, tahap desain, dan tahap uji coba. Pendekatan kedua berfokus pada evaluasi kemampuan numerasi di sekolah menengah pertama di Indonesia, khususnya di Provinsi Riau. Hasil uji keterbacaan menunjukkan bahwa instrumen evaluasi, panduan, dan prosedur layak digunakan. Para ahli menganggap model ini sangat efektif dalam menilai kemampuan numerasi di Indonesia. Hasil uji coba skala kecil menunjukkan 26 item yang dikembangkan valid dan reliabel. Hasil uji coba skala besar mengonfirmasi bahwa instrumen memiliki validitas dan reliabilitas konstruk yang dapat diterima. Model evaluasi yang telah divalidasi oleh para ahli dan praktisi melalui uji coba skala kecil dan besar berpotensi meningkatkan kemampuan numerasi siswa sekolah menengah pertama di Indonesia, khususnya di Provinsi Riau.
Kata Kunci: Kemampuan Numerasi; Model Evaluasi Komprehensif; Sekolah Menengah Pertama.

Abstract

Numeracy ability has become a significant problem, especially in junior high schools. This research aims to create a comprehensive evaluation model to assess numeracy skills in junior high schools. This research uses two main approaches. The first approach is research and development, including the initial investigation stage, design stage and testing stage. The second approach focuses on evaluating numeracy skills in junior high schools in Indonesia, especially in Riau Province. The readability test results show that the evaluation instruments, guidelines and procedures are suitable for use. Experts consider this model to be very effective in assessing numeracy skills in Indonesia. The results of the small-scale trial showed that the 26 items developed were valid and reliable. The results of the large-scale pilot test confirmed that the instrument had acceptable construct validity and reliability. The evaluation model that has been validated by experts and practitioners through small-scale and large-scale trials has the potential to improve the numeracy skills of junior high school students in Indonesia, especially in Riau Province.
Keywords: Numeracy Ability; Comprehensive Evaluation Model; Junior High School.
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I. INTRODUCTION

Nationally, Numeracy is a very urgent target for completion in Indonesia. This point is included in the state's medium-term development plan (RPJMN), contained in the Indonesian Ministry of Education and Culture Strategic Plan. This is in line with the low numeracy abilities of elementary school students at the international level, as seen from the TIMMS and PISA scores (Oluyemiadetunji & Nel, 2015; Tito, Muhtadi, & Sukirwan, 2024). The level of numeracy skills in Indonesia at the international level still needs to be improved. The 2000-2018 Pisa report shows Indonesia's overall score still falls. Indonesia is ranked 74th out of 79 participating countries, while TIMSS Indonesia is ranked 44th out of 49 participating countries. Weak numeracy skills in high school are a very urgent problem to resolve because numeracy is an essential factor in students' survival, not only in school settings but also in students' natural life settings (Setyaningsih & Kustiana, 2023).

Numeracy skills are essential in a country's education (Mimeau et al., 2016; Segers et al., 2015; Musliana et al., 2024). Numeracy is a 21st-century skill that needs to be improved so that Indonesia can compete with neighboring countries such as Singapore, Malaysia, Thailand, and the Philippines in numeracy skills (Aunio et al., 2021; Chan & Scalise, 2022). Numeracy skills are proof of the quality of a country's education or not (Chung & Yoo, 2015; OECD, 2018). Numeracy skills or abilities can be an essential indicator of low or high-quality teaching because numeracy skills have a solid relationship to the quality of learning, student motivation, teacher ability, and educational facilities (Cao Thi et al., 2023; Cook, 2018; Nofriyandi, Abdurrahman, & Andrian, 2023). Numeracy skills must be supported by internal and external factors so that improvements can be made optimally (Oluyemiadetunji & Nel, 2015; Zaki et al., 2024).

Based on the problems above, finding a solution or formula to improve students' numeracy abilities or skills in Riau Province is necessary. The solution will be offered by creating a complete evaluation model with test and non-test instruments equipped with evaluation guides and evaluation scoring techniques. The evaluation results based on findings in the field will be the basis for developing a model for increasing numeracy in Riau Province. The evaluation model produced is a new finding that can solve the problem of numeracy skills in Riau Province. The evaluation model developed will become a role model for other regions in Indonesia to improve numeracy skills so that the evaluation results and models obtained can become a strength in competing internationally.

The numeracy evaluation model that will be developed is an evaluation model that has never been created before by any researcher. This evaluation model can holistically evaluate the general numeracy abilities of students in Indonesia, specifically Indonesian junior high school students. This evaluation model was developed through an in-depth investigation process to find an accurate construct for evaluating students' Riau Province numeracy skills. With this evaluation approach, weaknesses in students' numeracy abilities can be

p-ISSN: 2086-4280
e-ISSN: 2527-8827

corrected, and a model for improving students' numeracy abilities can be created based on the evaluation results. In this way, the hope of education in enhancing numeracy skills at the international level can be achieved.

Numeracy is the knowledge and skill to use various numbers or symbols related to basic mathematics to solve practical problems in everyday life (Hakkarainen et al., 2023; Støren et al., 2018). Numeracy analyzes information displayed in multiple forms (graphs, tables, charts, etc.) and then interprets the results to predict and draw conclusions and decisions (Purpura et al., 2015; Jayanti & Cesaria, 2024). In simple terms, Numeracy can be defined as the ability to apply number concepts and calculation operation skills in everyday life (Bell et al., 2023; Rogowsky et al., 2018). Numeracy literacy also includes the ability to translate quantitative information that surrounds us (Trickett et al., 2022). In short, Numeracy is the ability or skill to develop knowledge and skills to use mathematics confidently in all aspects of life (Jang et al., 2020; Lee et al., 2020). According to PISA (Program for International Student Assessment), Numeracy focuses on students' ability to analyze, provide reasons, convey ideas effectively, and formulate, solve, and interpret mathematical problems in various forms and situations (Purpura et al., 2015). Literacy and Numeracy are the essential capital for a human being to carry out various activities in his life. In human resource development, literacy and Numeracy are important to give birth to a superior and competitive generation so that they can compete internationally.

II. METHOD

This research is a development study following the Borg and Gall model, which consists of 10 stages. However, it has been simplified into four stages to suit research needs: 1) initial investigation and design, 2) model validation, 3) trials, evaluations, and revisions, and 4) model implementation and large-scale evaluation.

The initial investigation involved interviews with school principals, mathematics teachers, and students, along with theoretical exploration to identify constructs and factors influencing numeracy. The design stage focused on creating instruments (tests and non-tests), evaluation guides, and scoring techniques to measure mathematical numeracy in Riau Province.

Model validation was conducted through focus group discussions (FGDs) with experts in evaluation, measurement, and information technology. These experts assessed the suitability of the evaluation guides, instruments, scoring techniques, and system design.

The trial stage began with testing the instrument on a small sample of 300 students. Data analysis led to revisions, followed by large-scale testing on 600 students. The study's population included all junior high school students in Riau Province, with samples selected using multistage random sampling from 10 districts and two cities, comprising 166 sub-districts.

The instruments used were tests, questionnaires, and interview guides, developed through theoretical exploration of variables from books and international journals. Indicators were identified to develop specific items for gathering accurate information. Data analysis combined descriptive statistics with confirmatory factor analysis (CFA) to evaluate validity and reliability.

The instruments included questionnaires, interview guides, and tests. These were validated by experts and practitioners. The questionnaire comprised 26 items across four domains: 8 on school sustainability programs, 6 on learning facilities, 5 on teacher accountability, and 7 on parental, societal, and corporate involvement. The interview guide contained 10 questions, while the test included 15 items assessing students' numeracy skills. Instrument development was based on findings from the initial investigation.

The data analysis in this research was conducted in three phases: the initial investigation, small-scale trial, and large-scale trial, followed by an evaluation. The initial investigation phase applied the method outlined in [10], which includes data reduction, data presentation, and drawing conclusions. Both test and non-test instruments (interview guides and questionnaires) were analyzed. In the small-scale trial phase, confirmatory factor analysis (CFA) was used to empirically assess content validity. Similarly, the large-scale trial phase employed CFA to evaluate construct validity, along with descriptive analysis to assess students' numeracy skills.

III. Result and Discussion

A. Initial Investigation

The initial investigation involved 30 mathematics teachers, with a focus group discussion (FGD) conducted to identify issues related to mathematics education. From this discussion, five key constructs were identified as critical for evaluating numeracy skills in Riau Province: school sustainability programs, mathematics learning facilities, teacher accountability, parental involvement, and the role of society and companies. These constructs are fundamental for assessing students' numeracy skills in the region.

B. Design Phase

During the design phase, a questionnaire, an interview guide, and a test were developed. These instruments were then evaluated by experts and practitioners.

1. Readability Test

The readability test aimed to assess and validate the quality of the instrument, evaluation guide, and procedures. This evaluation was carried out by two experts in evaluation, two measurement experts, vice principals, and mathematics teachers. The results were analyzed using descriptive analysis and compared with the product validity criteria outlined by Sultan et al. (2017). The criteria for product validation are presented in Table 1.

Table 1.
Criteria for Product Validity

Average Score	Category
3.26-4.00	Very feasible
2.51-3.25	Feasible
1.76-2.50	Feasible enough
1.00-1.75	Not feasible

p-ISSN: 2086-4280
e-ISSN: 2527-8827

The readability test of the questionnaire was conducted to determine its feasibility in assessing numeracy skills. This evaluation focused on seven key aspects: the clarity of instructions for using the instrument, the use of communicative language, the simplicity and comprehensibility of word choices, the straightforwardness of sentence structure, the avoidance of ambiguity or multiple interpretations, the suitability of the instrument for evaluating numeracy skills in high schools across Riau Province, and the overall ease of use. The assessment results from experts and practitioners are presented in Table 2.

Table 2.
The Readability Test Result

Aspects assessed	Mean	Standard deviation	Category
Aspect 1	3.850	0,30	Very feasible
Aspect 2	3.767	0,28	Very feasible
Aspect 3	3.433	0,45	Very feasible
Aspect 4	3.427	0,37	Very feasible
Aspect 5	3.510	0,43	Very feasible
Aspect 6	3.767	0,36	Very feasible
Aspect 7	3.507	0,30	Very feasible

Based on Table 2, experts and practitioners have concluded that the developed instruments are suitable for assessing numeracy skills in junior high schools across Riau Province. This conclusion is supported by the lowest average score of 3.33, which falls within the "highly feasible" category.

a. Readability Test of Instrument for Interview Guidance

The readability test for the interview guides was conducted to evaluate their usability for principals and mathematics teachers. Experts and practitioners also assessed the readability of the instruments. Seven key aspects were considered in the evaluation: clarity of instructions for using the instruments, use of communicative language, simplicity and comprehensibility of word choices, clarity and straightforwardness of sentence structure, avoidance of ambiguity or multiple interpretations, suitability for assessing numeracy skills in junior high schools across Riau Province, and overall ease of use. The assessment results from experts and practitioners are presented in Table 3.

Table 3.
Readability Test of Interview Guidance

Aspects assessed	Mean	Standard deviation	Category
Aspect 1	3.58	0.51	Very feasible
Aspect 2	3.25	0.75	Feasible
Aspect 3	3.58	0.51	Very feasible
Aspect 4	3.33	0.65	Very feasible
Aspect 5	3.50	0.67	Very feasible
Aspect 6	3.50	0.67	Very feasible
Aspect 7	2.92	0.79	Feasible

Based on Table 3, experts and practitioners have determined that the developed interview guides are suitable for assessing numeracy skills in senior high schools across Riau Province. This conclusion is supported by the lowest average score of 2.92, which falls within the "feasible" category.

b. Readability Test of The Evaluation Guide

The evaluation guide was assessed to determine its clarity and effectiveness in measuring numeracy skills. Several key aspects were considered in the evaluation process, including the ability of the model to diagnose weaknesses in numeracy skills, its intended users (principals, vice

principals, and teachers), and its focus on evaluating essential components. Additionally, the model is designed to be used after school exams, employing a Likert scale and interview guide as instruments. Students are required to provide their name and class information in the designated section, carefully read the instructions, and complete the evaluation within one hour.

Experts and practitioners assessed the evaluation guide based on nine criteria: the clarity of instructions, the comprehensibility of evaluation steps, the ease of understanding how to use the model, the clarity of the allotted time for evaluation, the communicative use of language, the simplicity of sentence structure, the ease of understanding word choices, the avoidance of ambiguity, and the overall usability of the guide. The results of this assessment are presented in Table 4.

Table 4.
Results of the Assessment of Expert & Practitioners

Aspects assessed	Mean	Deviation	Category
Aspect 1	3.31	0.72	Very feasible
Aspect 2	2.78	0.75	Feasible
Aspect 3	3.12	0.67	Feasible
Aspect 4	2.92	0.79	Feasible
Aspect 5	3.1	0.91	Feasible
Aspect 6	3.18	0.67	Feasible
Aspect 7	3.31	0.75	Feasible
Aspect 8	3.25	0.93	Feasible
Aspect 9	3.22	0.68	Feasible

According to the assessment by experts and practitioners, the evaluation guide is deemed feasible for assessing numeracy skills in high schools across Riau Province. This conclusion is based on the fact that all aspects of the guide are considered practical and highly suitable for use.

c. The Readability Test of The Evaluation Procedure

The evaluation procedure was assessed to determine its practicality and ease of implementation. The procedure consists of five key steps: conducting the evaluation at the end of each semester, administering a mathematics test to assess students' competencies based on the material taught using teacher-designed instruments, comparing test scores with predetermined success criteria, reporting the test results to students, and gathering students outside of regular lesson hours to complete the vocational program evaluation instrument for a comprehensive assessment of their mathematics performance over the semester.

Experts and practitioners evaluated the procedure based on seven aspects: clarity of the evaluation steps, adequacy of sentence structure, correct use of spelling and punctuation, practicality and ease of implementation, time efficiency, cost efficiency, and energy efficiency. The results of this assessment are presented in Table 5.

Table 5.
The Results of the Assessment of Experts and Practitioners

Aspects assessed	Mean	Standard deviation	Category
Aspect 1	3.471	0.692	Very feasible
Aspect 2	3.450	0.729	Very feasible
Aspect 3	2.675	0.717	Feasible
Aspect 4	3.010	0.913	Feasible
Aspect 5	2.570	0.812	Feasible
Aspect 6	2.929	0.656	Feasible
Aspect 7	3.182	0.911	Feasible

According to the evaluation by experts and practitioners, the developed

p-ISSN: 2086-4280
e-ISSN: 2527-8827

assessment procedure is deemed suitable for evaluating numeracy skills, as all aspects are considered both possible and highly practical.

2. Assessment of The Effectiveness of The Developed Mode

The model's effectiveness is tested to determine if it can be implemented efficiently and effectively to evaluate numeracy skills. Experts and practitioners assess the model's efficacy based on six criteria: 1) the model's comprehensiveness, 2) the accuracy of the model in evaluating numeracy skills, 3) the suitability of the instrument type used for data collection, 4) the guidance provided for local implementation, 5) the ease of use of the instrument, and 6) the ease of generating evaluation reports. The results of the effectiveness test are shown in Table 6

Table 6.
The Results of the Effectiveness Test

Aspects assessed	Mean	Standard deviation	Category
Aspect 1	3.174	0.696	Very Good
Aspect 2	3.133	0.631	Good
Aspect 3	2.971	0.784	Good
Aspect 4	2.577	0.786	Good
Aspect 5	2.851	0.633	Good
Aspect 6	3.011	0.712	Good

According to the results of the effectiveness test conducted by experts and practitioners, the developed evaluation model is practical and user-friendly for assessing numeracy skills. All aspects are regarded by the experts and practitioners as being in the strong and excellent category.

C. Trial Phase

1. Small-Scale Trial

The small-scale trial was analyzed using confirmatory factor analysis with the first-order method. The analysis provided the loading factor for each of the indicators. The results of the first-order confirmatory factor analysis are presented in Table 7.

Table 7.
The Result of Confirmatory Factor Analysis

Indicators	No Item	Factor	Criteria
Schools Sustainability Program	1	0,24	Invalid
	2	0,402	Valid
	3	0,73	Valid
	4	0,36	Valid
	5	0,65	Valid
	6	0,42	Valid
	7	0,48	Valid
	8	0,32	Valid
Learning Facilities	9	0,39	Valid
	10	0,41	Valid
	11	0,42	valid
	12	0,45	Valid
	13	0,49	Valid
	14	0,53	Valid
Teachers Accountability	15	0,58	Valid
	16	0,47	Valid
	17	0,34	Valid
	18	0,49	Valid
	19	0,37	Valid
Parents, Society, Company Involvement	20	0,66	valid
	21	0,61	Valid
	22	0,57	Valid
	23	0,36	Valid
	24	0,49	Valid
	25	0,43	Valid
	26	0,47	Valid

Based on Table 7, it can be concluded that 25 items are valid, while one item, the school sustainability program, is considered invalid. (Hair Jr et al., 2014).

The reliability was assessed using Cronbach's Alpha, and the result indicates that the developed instrument is reliable, with a Cronbach's Alpha value of 0.754. The results can be found in Table 8.

Table 8.
Reliability Statistics

Cronbach's Alpha	N of Items
0.754	26

2. Large-Scale Trial

A large-scale trial is conducted to assess the validity and reliability of the constructs derived from the evaluation component, which serves as the foundation for evaluating numeracy skills. These constructs are empirically tested and analyzed using statistical confirmatory factor analysis. The goal of this analysis is to evaluate the validity and reliability of the constructs obtained from the initial investigations, which were based on qualitative research approaches. The results of the study are presented in Table 9.

Table 9.
Validity and Reliability of Construct

Indicator	λ	Error	CR
Schools Sustainability Program	0.586	0.267	0,884
Learning Facilities	0.543	0.371	
Teachers Accountability	0.501	0.311	
Parents, Society, Company Involvement	0.554	0.428	

The results of the confirmatory factor analysis reveal that four factors have a loading factor value greater than 0.5, indicating that these factors have both validity and reliability within the appropriate categories. Additionally, the confirmatory factor analysis shows that these four factors meet the goodness of fit statistics, with the following values: Chi-Square < 2df, P-value > 0.05, RMSEA < 0.08, GFI > 0.9, and AGFI > 0.9. In other words, the developed model aligns well with the data obtained in the field.

3. The Readability Test

The readability test indicates that the developed instruments, including questionnaires and interview guides, are deemed suitable for use in evaluating mathematics in local content curricula. The aspects used to assess these instruments are considered both appropriate and highly feasible. The readability test of these instruments is an essential step in the model development process, as it ensures that the questionnaires and interview guides will be effective for use by education offices, principals, and teachers who have not previously used such instruments to evaluate educational programs (Andrian et al., 2018; Setiawan et al., 2019). Education offices, principals, and teachers who are familiar with the contents of the developed instruments can effectively explain them to students, who will serve as both the subjects and objects of the evaluation models when these models are implemented (Sawada et al., 2021). Instruments that have been validated by experts are capable of providing reliable data or information regarding the effectiveness of the model in evaluating numeracy skills (Andrian et al., 2018; Setiawan et al., 2019)

The evaluation guide serves as a reference for the education office,

p-ISSN: 2086-4280
e-ISSN: 2527-8827

principals, and teachers, who are the users of the developed evaluation model. To effectively evaluate numeracy skills, it is essential that these users fully understand the guide (Aunio et al., 2019; Prendergast et al., 2023). The evaluation guide helps users of the evaluation model by providing clear instructions, making it easier for them to implement the model effectively in the field (Hadi et al., 2019; Tompong & Jailani, 2019). A thorough understanding of the evaluation guide for the program evaluation model can help prevent errors during the data collection process (Gashaj et al., 2023; Segers et al., 2015).

Evaluation procedures outline the steps that users of the numeracy evaluation model must follow. These steps should be carried out with care to ensure that the evaluation model for numeracy skills is implemented correctly and effectively (Persson et al., 2021; Wannenburg & Curlewis, 2023). Users must carefully read the procedures to avoid any errors when implementing the numeracy skills evaluation model. These procedures serve as a guide for education offices, principals, teachers, and evaluation agencies in assessing vocational programs effectively (Sugiyanta & Soenarto, 2016; Taylor-Ritzler et al., 2013).

Assessment of model effectiveness is integral to developing an evaluation model of mathematics s in numeracy skills (Maisaroh et al., 2024; Methe et al., 2008; Valério & Ferrara, 2022). A practical evaluation model simplifies the process for users to assess mathematics, considering factors like fund usage, time management, and the efficient use of physical resources. A well-designed evaluation model ensures that users are not burdened or penalized when evaluating education programs (Hadi et al., 2022; Vanitha Thanabalan et al., 2015; Wahyuni et al., 2020). A practical evaluation model enables users to efficiently collect data in the field and process it into meaningful conclusions, ultimately helping to enhance numeracy skills in Riau Province.

IV. CONCLUSION

The developed evaluation model includes an evaluation instrument, evaluation procedure, evaluation guide, and an evaluation effectiveness model sheet. The assessment results show that the instrument, evaluation guide, and evaluation procedure are suitable for evaluating the numeracy skills of junior high schools in Riau Province. Experts and practitioners agree that the evaluation model is highly effective for assessing numeracy skills. The small-scale trial revealed that the loading factor values for the indicators were greater than 0.5, indicating validity, and the Cronbach's Alpha reliability value was above 0.7, confirming reliability. The construct instruments developed demonstrate validity, reliability, and model fit that are acceptable. All factors exhibit a loading factor greater than 0.5 and a construct reliability coefficient above 0.7. The model also meets the goodness of fit criteria, with Chi-Square < 2 df, P-Value > 0.5, RMSEA < 0.08, GFI > 0.9, and AGFI > 0.9.

ACKNOWLEDGEMENT

A big thank you to Universitas Islam Riau for their valuable support, which has enabled the successful execution and completion of this research. This research was supported by Universitas Islam Riau through Research Grant 544/KONTRAK/P-PT/DPPM-UIR/06-2023.

REFERENCES

Andrian, D., Kartowagiran, B., & Hadi, S. (2018). The Instrument Development to Evaluate Local Curriculum in Indonesia. *International Journal of Instruction*, *11*(4), 921–934. https://doi.org/10.12973/iji.2018.11458a

Aunio, P., Korhonen, J., Ragpot, L., Törmänen, M., & Henning, E. (2021). An early Numeracy Intervention for First-Graders at Risk for Mathematical Learning Difficulties. *Early Childhood Research Quarterly*, *55*, 252–262. https://doi.org/10.1016/j.ecresq.2020.12.002

Aunio, P., Korhonen, J., Ragpot, L., Törmänen, M., Mononen, R., & Henning, E. (2019). Multi-Factorial Approach to Early Numeracy—The Effects of Cognitive Skills, Language Factors and Kindergarten Attendance on Early Numeracy Performance of South African First Graders. *International Journal of Educational Research*, *97*, 65–76. https://doi.org/10.1016/j.ijer.2019.06.011

Bell, M. F., Segal, L., Dennison, S., Kinner, S. A., Dawe, S., Spittal, M. J., & Preen, D. B. (2023). Numeracy and Literacy Attainment of Children Exposed to Maternal Incarceration and Other Adversities: A Linked Data Study. *Journal of School Psychology*, *100*. https://doi.org/10.1016/j.jsp.2023.101241

Cao Thi, H., Le, T. A., Tran Ngoc, B., & Phan Thi Phuong, T. (2023). Factors Affecting the Numeracy Skills of Students from Mountainous Ethnic Minority Regions in Vietnam: Learners' Perspectives. *Cogent Education*, *10*(1). https://doi.org/10.1080/2331186X.2023.2202121

Chan, J. Y. C., & Scalise, N. R. (2022). Numeracy Skills Mediate the Relation Between Executive Function And Mathematics Achievement in Early Childhood. *Cognitive Development*, *62*. https://doi.org/10.1016/j.cogdev.2022.101154

Chung, J. H., & Yoo, T. H. (2015). Government Policy, Network Externalities and Mobile Telecommunication Services: Evidence from OECD Countries. *Applied Economics*, *47*(21), 2173–2183. https://doi.org/10.1080/00036846.2015.1005816

Cook, R. (2018). Gender Differences in Adult Numeracy Skills: What is the Role of Education? *Educational Research and Evaluation*, *24*(6–7), 370–393. https://doi.org/10.1080/13803611.2018.1540992

Gashaj, V., Thaqi, Q., Mast, F. W., & Roebers, C. M. (2023). Foundations for Future Math Achievement: Early Numeracy, Home Learning Environment, and the Absence of Math Anxiety. *Trends in Neuroscience and Education*, *33*.

https://doi.org/10.1016/j.tine.2023.100217

Hadi, S., Andrian, D., & Kartowagiran, B. (2019). Evaluation Model for Evaluating Vocational Skills Programs on Local Content Curriculum in Indonesia: Impact of Educational System in Indonesia. *Eurasian Journal of Educational Research*, 82, 45–62. https://doi.org/10.14689/ejer.2019.82.3

Hadi, S., Maisaroh, S., Hidayat, A., & Andrian, D. (2022). An Instrument Development to Evaluate Teachers' Involvement in Planning the Schools' Budgeting at Elementary Schools of Yogyakarta Province. *International Journal of Instruction*, *15*(2), 1087–1100. https://doi.org/10.29333/iji.2022.15260a

Hair Jr, J. F., William, C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis Joseph F . Hair Jr . William C . Black Seventh Edition*.

Hakkarainen, A., Cordier, R., Parsons, L., Yoon, S., Laine, A., Aunio, P., & Speyer, R. (2023). A systematic review of functional numeracy measures for 9–12 -year-olds: Validity and reliability evidence. *International Journal of Educational Research*, *119*. https://doi.org/10.1016/j.ijer.2023.102172

Jang, S. M., Parker, W. M., Pai, A. B., Jiang, R., & Cardone, K. E. (2020). Assessment of literacy and numeracy skills related to medication labels in patients on chronic in-center hemodialysis. *Journal of the American Pharmacists Association*, *60*(6), 957-962.e1. https://doi.org/10.1016/j.japh.2020.07.010

Jayanti, R., & Cesaria, A. (2024). Pengaruh kemampuan literasi numerasi dan dukungan orang tua terhadap hasil belajar matematika soal cerita di sekolah dasar. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *3*(2), 137-148. https://doi.org/10.31980/pme.v3i2.1441

Lee, E. H., Lee, Y. W., Lee, K. W., Hong, S., & Kim, S. H. (2020). A New Objective Health Numeracy Test for Patients with Type 2 Diabetes: Development and Evaluation of Psychometric Properties. *Asian Nursing Research*, *14*(2), 66–72. https://doi.org/10.1016/j.anr.2020.01.006

Maisaroh, S., Hadi, S., & Andrian, D. (2024). Instrument model to evaluate children-friendly school program at elementary school in Indonesia. *International Journal of Evaluation and Research in Education* , *13*(2), 809–819. https://doi.org/10.11591/ijere.v13i2.25440

Methe, S. A., Hintze, J. M., & Floyd, R. G. (2008). Validation and Decision Accuracy of Early Numeracy Skill Indicators. *School Psychology Review*, *37*(3), 359–373. https://doi.org/10.1080/02796015.2008.12087883

Mimeau, C., Coleman, M., & Donlan, C. (2016). The Role of Procedural Memory in Grammar and Numeracy

Skills. *Journal of Cognitive Psychology*, *28*(8), 899–908. https://doi.org/10.1080/20445911.2016.1223082

Musliana, R., Hulpiana, T., Putri, D., Awinda, S., Rahmania, L. A., & Nurmawanti, I. (2024). Etnomatematika Historical Building "Taman Mayura" dan Implementasinya dalam Pengembangan Kemampuan Numerasi Siswa Sekolah Dasar. *Plusminus: Jurnal Pendidikan Matematika*, *4*(2), 199-214. https://doi.org/10.31980/plusminus.v4i2.1467

Nofriyandi, Abdurrahman, & Andrian, D. (2023). Digital Learning Media Integrated with Malay Culture to Improve Students' Numeration Ability and Motivation. *Mosharafa: Jurnal Pendidikan Matematika*, *12*(2), 301-314. https://doi.org/10.31980/mosharafa.v12i2.785

OECD. (2018). *PISA 2018 Worldwide Ranking – average score of mathematics, science and reading*.

Oluyemiadetunji, S., & Nel, N. M. (2015). Challenges of Improving Literacy and Numeracy Skills of Prison Inmates in Nigeria. *Journal of Psychology*, *6*(1), 66–75. https://doi.org/10.1080/09764224.2015.11885525

Persson, E., Andersson, D., Koppel, L., Västfjäll, D., & Tinghög, G. (2021). A Preregistered Replication Of Motivated Numeracy. *Cognition*, *214*. https://doi.org/10.1016/j.cognition.2021.104768

Prendergast, M., Forster, A., O'Meara, N., O'Sullivan, K., & Faulkner, F. (2023). Numeracy-Meets: an Innovative Professional Development Model for Adult Numeracy Practitioners in Ireland. *Irish Educational Studies*. https://doi.org/10.1080/03323315.2023.2209854

Purpura, D. J., Reid, E. E., Eiland, M. D., & Baroody, A. J. (2015). Using a Brief Preschool Early Numeracy Skills Screener to Identify Young Children With Mathematics Difficulties. *School Psychology Review*, *44*(1), 41–59.

Rogowsky, B. A., Terwilliger, C. C., Young, C. A., & Kribbs, E. E. (2018). Playful learning with technology: The Effect of Computer-Assisted Instruction on Literacy and Numeracy Skills of Preschoolers. *International Journal of Play*, *7*(1), 60–80. https://doi.org/10.1080/21594937.2017.1348324

Sawada, T., Tomori, K., Sakaue, K., Higashikawa, Y., Ohno, K., Okita, Y., Seike, Y., Fujita, Y., & Umeda, M. (2021). Evaluating the Content Validity of a New On-Road Driving Test. *Physical and Occupational Therapy in Geriatrics*, *39*(3), 295–315. https://doi.org/10.1080/02703181.2021.1873476

Segers, E., Kleemans, T., & Verhoeven, L. (2015). Role of Parent Literacy and Numeracy Expectations and Activities in Predicting Early Numeracy Skills. *Mathematical Thinking and Learning*, *17*(2–3), 219–236. https://doi.org/10.1080/10986065.2015.1016819

Setiawan, A., Mardapi, D., & Andrian, D. (2019). The Development of Instrument for Assessing Students'

Affective Domain Using Self-and Peer-Assessment Models. In *International Journal of Instruction*, *12*(3). https://doi.org/10.29333/iji.2019.12326a

Setyaningsih, N., & Kustiana, M. N. (2023). Analysis of Students' Creative Thinking Ability in Solving HOTS Problems Viewed from Numeration Ability. *Mosharafa: Jurnal Pendidikan Matematika*, *12*(2), 351-362. https://doi.org/10.31980/mosharafa.v12i2.789

Støren, L. A., Lundetræ, K., & Børing, P. (2018). Country Differences in numeracy skills: How Do They Vary by Job Characteristics and Education Levels? *International Journal of Lifelong Education*, *37*(5), 578–597. https://doi.org/10.1080/02601370.2018.1554718

Sugiyanta, S., & Soenarto, S. (2016). An Evaluation Model of Educational Quality Assurance at Junior High Schools. *Research and Evaluation in Education*, *2*(2), 194. https://doi.org/10.21831/reid.v2i2.11118

Taylor-Ritzler, T., Suarez-Balcazar, Y., Garcia-Iriarte, E., Henry, D. B., & Balcazar, F. E. (2013). Understanding and Measuring Evaluation Capacity: A Model and Instrument Validation Study. *American Journal of Evaluation*, *34*(2), 190–206. https://doi.org/10.1177/1098214012471421

Tito, A. S. D. A. P., Muhtadi, D., & Sukirwan. (2024). Kemampuan literasi numerasi siswa dalam menyelesaikan masalah perbandingan senilai. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *3*(1), 127-136. https://doi.org/10.31980/pme.v3i1.1721

Tompong, B. N. K. J., & Jailani, J. (2019). An Valuation of Mathematics Learning Program at Primary Education Using Countenance Stake Evaluation model. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *23*(2), 156–169. https://doi.org/10.21831/pep.v23i2.16473

Trickett, J., Batchelor, S., Brittle, B., Foulkes, M., Pickering, J., Slocombe, F., & Gilmore, C. (2022). The role of Parent-Led and Child-Led Home Numeracy Activities in Early Mathematical Skills. *Cognitive Development*, *63*. https://doi.org/10.1016/j.cogdev.2022.101189

Valério, M., & Ferrara, S. (2022). Numeracy at the Dawn of Writing: Mesopotamia and beyond. *Historia Mathematica*, *59*, 35–53. https://doi.org/10.1016/j.hm.2020.08.002

Vanitha Thanabalan, T., Siraj, S., & Alias, N. (2015). Evaluation of a Digital Story Pedagogical Module for the Indigenous Learners using the Stake Countenance Model. *Procedia - Social and Behavioral Sciences*, *176*, 907–914. https://doi.org/10.1016/j.sbspro.2015.01.557

Wahyuni, A., Effendi, L. A., Angraini, L. M., & Andrian, D. (2020). Developing Instrument to Increase Students' Geometry Ability based on Van Hiele Level Integrated with Riau Malay

Culture. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *24*(2), 208–217. https://doi.org/10.21831/pep.v24i2.33811

Wannenburg, E., & Curlewis, L. (2023). Exploring the Need for Numeracy Skills in Legal Practice. *Cogent Education*, *10*(1). https://doi.org/10.1080/2331186X.2023.2190307

Zaki, A., Ramdhani, N., Arwadi, F., & Talib, A. (2024). Numerical Skills Analysis of Mathematics Department Students in the Kampus Mengajar Batch 7 Program. *Mosharafa: Jurnal Pendidikan Matematika*, *13*(2), 551-562. https://doi.org/10.31980/mosharafa.v13i2.2017

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