



Development of Ethnomatematics-Based E-Book Teaching Materials to Train Numeracy Skills in Geometry Materials in Elementary Schools

Rizky Amalia Dhiaul Zaini¹, Wiryanto², Rooselyna Ekawati³

¹Student of Education Master of Primary Education, State University of Surabaya

²Lecturer of Primary Education, State University of Surabaya

³Professor of Mathematics education, State University of Surabaya

ABSTRACT: This study aims to develop ethnomatematics-based E-Book teaching materials to train students' numeracy skills and to determine student learning activities when using E-Book teaching materials. This research is a type of Research and Development (R&D) research. The development model used in this study is the ASSURE development model. This research will later develop valid, practical and effective ethnomatematics-based E-Book teaching materials as well as analyze student learning activities. Data collection instruments in this study used validation sheets, questionnaires, tests and observation sheets. The data analysis technique used is the analysis of validity, practicality, effectiveness and analysis of student learning activities. The results showed that the validity of the media and material validity of E-Book teaching materials based on ethnomatematics obtained results of 93.7% and 89.2% with the "Very Valid" criteria. The practicality of ethnomatematics-based E-Book teaching materials obtained results of 94.2% from teacher responses and 82% from student responses so that ethnomatematics-based E-Book teaching materials can be said to be "Very Practical". Furthermore, the effectiveness of E-Book teaching materials based on ethnomatematics obtained an average N-Gain result of 42.50% with the "Medium" effectiveness criterion. Meanwhile for the results of student learning activities, the results obtained in the experimental group were greater than in the control group, namely 87% with the criteria of "Very Active".

KEYWORDS: E-Book, Ethnomatematics, Elementary School, Numeracy.

INTRODUCTION

The World Economic Forum (WEF) in 2015 has identified six basic literacy that students must have in the 21st century, one of these basic literacy skills is numeracy skills (WEF & BCG (World Economic Forum & Group), 2015). Numeracy is the ability to understand and use mathematical concepts and skills to solve problems in real-world situations (Gal et al., 2009). In addition, numeracy ability can also be interpreted as the ability to analyze reading in the form of graphs, tables, charts, pictures and so on and contains mathematical elements in it using a logical mindset (Kemendikbud, 2017).

The same opinion was also explained by Yustitia & Siswono (2021) that numeracy is the ability to access, use, interpret and communicate information and mathematical ideas related to numbers in certain contexts. In the context of early childhood education, the development of numeracy is important to lay the foundation for future math skills and to help children understand the value of mathematics in everyday life. This is in line with the opinion of the Ministry of Education and Culture which explains that numeracy is the ability to think using concepts, according to procedures, facts, and mathematical tools to solve problems that exist in everyday life (Assessment, 2020).

Currently, numeracy skills in Indonesia are still low, one of which is in the city of Surabaya. Based on the results of the Minimum Competency Assessment or AKM for elementary school students in the city of Surabaya in 2022 with a total of 759 educational units and a total of 18,655 student respondents obtained a numeracy ability score below the minimum competency. Because less than 50% of students are able to reach the minimum limit for numeracy skills (Pusmendik, 2022). Like at Hidayatur Rohman Elementary School in Surabaya, students' numeracy abilities in 2022 will score 1.73 with criteria below the predetermined minimum competency. This is because in the learning process the teacher only uses student book teaching materials that have been prepared by the Ministry of Education and Culture and does not develop other teaching materials. Meanwhile, one way to train students' numeracy skills is to



develop teaching materials (Eka, 2022). This is in line with the 2013 curriculum where teaching materials can be used or utilized by teachers in carrying out educational and learning activities (Sagita, 2018).

The development of teaching materials is carried out with the aim that the learning process can be achieved in accordance with the learning objectives that have been made by the teacher, and teaching materials are developed according to the needs of their students. One of the developments of appropriate teaching materials to train students' numeracy skills is ethnomathematics-based teaching materials (Widiantari et al., 2022). Basically ethnomathematics in education has the aim of teaching contextual mathematical concepts based on the culture that exists in the environment around students, so that students can solve problems encountered in everyday life (Masamah, 2019). In ethnomathematics learning students are invited to study mathematics through their own cultural experiences and practices, so that they can understand mathematical concepts better and more meaningfully (Sarwoedi et al., 2018). In addition, E-Book teaching materials based on ethnomathematics are also able to increase student learning motivation (Annisa, 2022). This is in line with research conducted by Lena et al., (2019) that the development of teaching materials with a scientific approach characterized by ethnomathematics can increase student motivation in class with a score of 3.34 in a very interesting category. Other research conducted by Rizal et al., (2021) also states that the use of ethnomathematics-based teaching materials is more effective in increasing students' mathematical abilities and learning interest in class. And also research conducted by Martyanti (2017) explains that ethnomathematics-based learning in geometry material can improve critical thinking skills and train students' problem solving abilities.

Based on the results of the explanation above, the purpose of this study is to develop ethnomathematics-based E-Book teaching materials to train students' numeracy skills and to find out student learning activities when using E-Book teaching materials.

METHOD

This type of research is Research and Development (R&D). The development model used in this study is the ASSURE development model. The ASSURE development model is a media development model that uses technological assistance to assist teachers in the learning process in the classroom (Azizah & Budijastuti, 2021). The ASSURE development model consists of 6 steps including analyze learner characteristics (analyze student characteristics), state objectives (set goals), select, modify or design media (choose, modify, and develop media), utilize media (use media), requires learner response (asking for student responses), and evaluate (evaluation) (Nurhayatin et al., 2018).

Data collection instruments in this study used validation sheets, questionnaires, tests and observation sheets. The expert validation sheet instrument is used to collect data on the feasibility of the teaching materials being developed (Rusdi, et al., 2019). The questionnaire was used to find out the practicality of teaching materials obtained from the responses of students and teachers after using E-Book teaching materials. The test instrument will be used to determine the effectiveness of E-Book teaching materials. While the observation sheet is used to determine student activity during learning takes place. The data analysis technique used is the analysis of validity, practicality, effectiveness and analysis of student learning activities.

RESULTS AND DISCUSSION

Based on the results of the development of ethnomathematics-based E-Book teaching materials to train the numeracy skills of fourth-grade students in learning mathematics on flat shape materials, the validity, practicality and effectiveness of the teaching materials were obtained. Referring to the ASSURE development model, the research results are explained as follows:

1. Analyze Learner Characteristics

Based on the results of initial observations conducted by researchers at Hidayatur Rohman Elementary School, out of 24 students in class IV B, there were 16 students who experienced difficulties in learning mathematics, especially in flat shape material. This is known when given a basic question about the nature of flat shapes "What flat shape has four sides of the same length?" only five students were able to answer and when they were given a question to determine the area of a rectangle, almost all students could not solve the problem and only 3 students were able to solve the problem. In addition, based on the results of the math test for grade IV students at Hidayatur Rohman Elementary School, Surabaya, there are still many who are below the KKM, but based on the information provided by the teacher, student scores are helped by remedial so that student scores are able to reach the KKM specified at the school, which is 75.



As for the learning style of students in class IV B at SD Hidayatur Rohman Surabaya, the average learning style is visual. This can be seen when students are given learning using the lecture method, many students do not pay attention to the teacher when explaining the material in front of the class. Whereas in subsequent lessons when the teacher explained the material using Power Point, almost all of the students paid attention to the teacher.

2. State Objectives

After knowing the characteristics of students the next step is to determine learning objectives. Before setting goals, the first step is to determine the basic competencies to be achieved by students, then set indicators to make it easier to achieve the learning objectives of flat shape material. Basic competencies and indicators can be seen in the following table:

Table 2.1 Basic Competencies and Indicators

Basic Competencies		Indicator	
3.9	Explain and determine the perimeter and area of squares, rectangles, and triangles as well as square roots and square roots.	3.9.1	Identify the characteristics of quadrilateral and triangle.
		3.9.2	Analyze the perimeter and area of quadrilaterals and triangles.
4.9	Solve problems related to the perimeter and area of squares, rectangles, and triangles including involving powers of two with square roots.	4.9.1	Presents the perimeter and area of quadrilaterals correctly.

The next step after establishing Basic Competencies and Indicators is setting learning objectives to be achieved. In this study the learning objectives to be achieved by researchers are:

- Through ethnomathematics-based teaching materials students can identify the properties of quadrilaterals and triangles properly and correctly.
- Through ethnomathematics-based teaching materials students can analyze the perimeter and area of quadrilaterals and triangles properly and correctly.
- Through experiments students can present the perimeter and area of a quadrilateral in the school environment properly and correctly.

3. Select, Modify Or Design Media






The results of the development of teaching materials that have been carried out will then be tested for validity through media experts and material experts. The results of the validity of teaching materials based on the assessment of media experts and material experts can be seen in the following table:

Table 3. 1 Media Expert Validation Test Results

No	Assessment Aspects	Score
1.	Media Design	21
2.	Ease of Use	31
3.	Language	8
Total Score		60
Percentage		93,7%
Criteria		Very Valid

Based on the percentage calculation results obtained from media experts on ethnomathematics-based E-Book teaching materials of 93.7%, ethnomathematics-based E-Book teaching materials are said to be "Very Valid" to be used with minor revisions. The revision results can be seen in the following table:

Table 3. 2 Revision of E-Book Teaching Materials

Before Revision	After Revision
<p>Initial Cover View</p>  <p>On the initial cover it looks simple and less attractive.</p>	<p>Cover view after revision</p>  <p>Make the cover more attractive by adding color to the initial cover page, so the cover looks more attractive</p>
<p>There are no instructions for using the E-Book yet.</p>	<p>Added Instructions for Using the E-Book</p>  <p>Added an E-Book usage guide page to make it easier for students and teachers to use ethnomathematics-based E-Book teaching materials.</p>
<p>Early E-Book back cover</p>  <p>Initially, the back cover of the e-book was made blank and had no writing or pictures.</p>	<p>Back cover of E-Book after revision</p>  <p>After that, they are given short information about the contents in the e-book and contain a brief identity about the author.</p>

Meanwhile, the material validation results were obtained from material experts. The results of the material expert validation can be seen in the following table:



Table 3. 3 Material Expert Validation Test Results

No	Assessment Aspects	Score
1.	Curriculum	12
2.	Utilization	13
3.	Material Accuracy	17
4.	Language	8
Total Score		50
Percentage		89,2%
Criteria		Very Valid

Based on the percentage calculation results obtained from material experts on ethnomathematics-based E-Book teaching materials of 89.2%, the material contained in ethnomathematics-based E-Book teaching materials is said to be "Very Valid" to use.

4. Utilize Media

At this stage it was carried out to determine the effectiveness of ethnomathematics-based E-Book teaching materials. The results of the effectiveness of teaching materials were obtained through the instrument pre-test and post-test questions which were carried out in the experimental group and the control group. Effectiveness is calculated by N-Gain using SPSS 26 for windows software. The effectiveness results are described in the following table:

Table 4. 1 Effectiveness Results

No.	Class	N-Gain Score	N-Gain (%)	Score	
				Minimum	Maximum
1.	Control Group	0,29	29,33	-50,00	66,67
2.	Experiment Group	0,42	42,50	-100	100

The effectiveness results showed that the control group's average N-Gain score was 0.29 or in the form of a percentage of 29.33%. Based on the average N-Gain score, the control group is included in the criteria for low effectiveness. While the effectiveness results in the experimental group got an average N-Gain score of 0.42 or in the form of a percentage of 42.50%. Based on the average N-Gain score, the experimental group is included in the criteria for moderate effectiveness. Based on the results of this presentation, it can be concluded that the control group with normal learning cannot improve the numeracy skills of fourth grade students in elementary schools. Meanwhile, for the experimental group, learning using E-Books based on ethnomathematics was "quite effective" in improving the numeracy skills of fourth grade elementary school students.

Meanwhile, trials of E-Book teaching materials based on ethnomathematics were also used to see student learning activities. The results of student learning activities were obtained through the control group, namely the class that did not use ethnomathematics-based E-Book teaching materials and the experimental group, namely the group that used ethnomathematics-based E-Book teaching materials. There are differences in the results of student learning activities in the control group and the experimental group which are observed through several assessment indicators with the average final results presented in the following table:

Table 4. 2 Results of Learning Activities

No.	Class	Percentage	Category
1.	Control Group	60%	Quite Active
2.	Experiment Group	87%	Very active

Based on the table above, fourth elementary school students in the control group, namely classes that do not use E-Book teaching materials, show an average percentage of 60% with the criterion "quite active". Meanwhile in the experimental group, namely the



class that used E-Book teaching materials, 87% with the criteria of "very active". Based on this explanation, it can be said that classes that use E-Book teaching materials are better at increasing student learning activities.

5. Requires Learner Response

After carrying out the development and carrying out the implementation stage, the next step is to ask for teacher and student responses to find out the practicality of ethnomathematics-based E-Book teaching materials. The results of the practicality of ethnomathematics-based E-Book teaching materials based on teacher responses can be seen in the following table:

Table 5.1 Practical Results Based on Teacher Responses

No	Assessment Aspects	Score
1.	Tampilan Media	12
2.	Materi	14
3.	Kemudahan Penggunaan	12
4.	Bahasa	11
Total Score		49
Percentage		94,2%
Criteria		Very Practical

Based on the results of the percentage calculation obtained from the teacher's response after using ethnomathematics-based E-Book teaching materials of 94.2%, ethnomathematics-based E-Book teaching materials can be said to be "Very Practical".

Student responses were obtained from fourth grade students at Hidayatur Rohman Elementary School in the experimental group with 12 students filling out the questionnaire. The results of the practicality test data based on student responses scored 82% with the "Very Practical" criteria.

6. Evaluation

In the final stage, namely evaluating the use of ethnomathematics-based E-Book teaching materials. At the time of use there are problems in operation where in using E-Book teaching materials it must be in a stable network condition, because when the network is unstable the E-Book cannot be opened. Students' ability to understand the material is very good, this can be seen when working on post test questions, the average student completeness increased by 83% compared to before using E-Book teaching materials, where only 16% of students mastered flat shape material.

DISCUSSION

Numeracy ability is very important for students to have, because with numeracy skills students can solve problems encountered in everyday life (Tout & Gal, 2015). One way to bridge students' numeracy skills is through ethnomathematics (Steen, 2001). Ethnomathematics can help students develop their numeracy skills by involving them in activities that involve manipulating and analyzing mathematical statements (Anugrahana, 2021).

In addition, ethnomathematics can also be a useful tool for improving numeracy skills by making mathematics more relevant and attractive to students. By incorporating cultural contexts and real-world examples into mathematical concepts, ethnomathematics can help students develop a deeper understanding of mathematical concepts and improve their problem-solving skills. One way to apply ethnomathematics to practice numeracy skills is by providing real-world examples where ethnomathematics encourages the use of real-world examples to teach mathematical concepts. For example, students can learn fractions by dividing food into equal parts or learn geometry by studying traditional architecture (Peni & Baba, 2019).

This is in line with research conducted by Widiyanti et al., (2022) that the development of e-module teaching materials that use ethnomathematics can improve student numeracy and character. In addition, other research has been conducted by Lai (2016) that



the development of e-book teaching materials is more effective than learning that does not use e-books. In addition to more effective use of ethnomathematics-based E-Book teaching materials, it can also improve students' numeracy skills in the learning process (Hidayah et al., 2021). Other research conducted by Cahyaningtyas (2019) also explains that the development of an E-Book to improve numeracy skills is said to be valid with a percentage of 82% in the good category, and for the practicality of the E-Book obtained from the teacher's response with a score of 98% and from students 80% so that it can be said that the E-Book is used practically. Therefore, in each lesson, the teacher should develop teaching materials based on ethnomathematics that are good and can be used to improve students' numeracy skills (Nuryadi et al., 2022).

CONCLUSION

The purpose of this study was to develop ethnomathematics-based E-Book teaching materials to train students' numeracy skills and to find out student learning activities when using E-Book teaching materials. Based on the results of the validity of the media and the validity of the ethnomathematics-based E-Book teaching materials, the results were 93.7% and 89.2% with the "Very Valid" criteria. The practicality of ethnomathematics-based E-Book teaching materials obtained results of 94.2% from teacher responses and 82% from student responses so that ethnomathematics-based E-Book teaching materials can be said to be "Very Practical". Furthermore, the effectiveness of E-Book teaching materials based on ethnomathematics obtained an average N-Gain result of 42.50% with the "Medium" effectiveness criterion. Meanwhile for the results of student learning activities, the results obtained in the experimental group were greater than in the control group, namely 87% with the criteria of "Very Active". So that it can be said that the development of ethnomathematics-based E-Book teaching materials is "Very Valid" to be developed and able to increase student learning activities. E-Book teaching materials can not only be used in learning flat shapes, but can also be used in other materials such as fractions, geometric shapes, and other learning materials.

REFERENCES

1. Annisa, N. F. (2022). *Pengembangan Permainan Tradisional Congklak Digital Berbasis Etnomatematika Menggunakan Adobe Flash Untuk Siswa Kelas VI*. Universitas Pendidikan Indonesia.
2. Anugrahana, A. (2021). Etnomatematika dalam Literasi Numerasi Mahasiswa Kerjasama Kabupaten Mappi Ditinjau dari Bahasa. *SNFKIP 2021 Universitas Sanata Dharma*, 236–243.
3. Asesmen, P. (2020). Pembelajaran Badan Penelitian dan Pengembangan dan Perbukuan Kementerian Pendidikan dan Kebudayaan. *Desain Pengembangan Soal AKM*.
4. Azizah, V. N., & Budijastuti, W. (2021). Media pembelajaran ilustratif e-book tipe flipbook pada materi sistem imun untuk melatih kemampuan membuat poster. *Jurnal Inovasi Pembelajaran Biologi*, 2(2), 40–51.
5. Cahyaningtyas, F. (2019). *Pengembangan E-Book Retells dalam Literasi Numerasi di Sekolah Dasar*. University of Muhammadiyah Malang.
6. Eka, S. (2022). *Pengembangan bahan ajar modul berbasis literasi bahasa dan numerasi dikelas IV SD*. UIN RADEN INTAN LAMPUNG.
7. Gal, I., Alatorre, S., Close, S., Evans, J., Johansen, L., Maguire, T., Manly, M., & Tout, D. (2009). PIAAC Numeracy: A Conceptual Framework. OECD Education Working Papers, No. 35. *OECD Publishing (NJI)*. <https://doi.org/https://doi.org/10.1787/220337421165>
8. Hidayah, I. R., Kusmayadi, T. A., & Fitriana, L. (2021). E-Book Based on Local Wisdom to Improve Students' Numeracy Skill: Is It Effective? *International Conference of Mathematics and Mathematics Education (I-CMME 2021)*, 142–147.
9. Kemendikbud. (2017). *Materi Pendukung Literasi Numerasi*. Tim GLN Kemendikbud.
10. Lai, C.-S. (2016). Integrating E-Books into Science Teaching by Preservice Elementary School Teachers. *Journal of Education in Science, Environment and Health*, 2(1), 57–66.
11. Lena, S., Netriwati, N., Conference, I. S.-J. of P., & 2019, undefined. (2019). Development of teaching materials of elementary school student with a scientific approach characterized by ethnomathematics. *iopscience.iop.org*, 1318, 12060. <https://doi.org/10.1088/1742-6596/1318/1/012060>
12. Martyanti, A. (2017). Meningkatkan kemampuan berpikir kritis pada pembelajaran geometri berbasis etnomatematika. *Jurnal Gantang*, 2(2), 105–111.



13. Masamah, U. (2019). Pengembangan pembelajaran matematika dengan pendekatan etnomatematika berbasis budaya lokal Kudus. *Jurnal Pendidikan Matematika (Kudus)*, 1(2).
14. Nurhayatin, T., Marlia, M., & Fauziyyah, D. F. (2018). IMPLEMENTASI E-COMICS PORTABLE SEBAGAI INOVASI MEDIA PEMBELAJARAN BAHASA INDONESIA. *JURNAL PESONA*, 4(1).
15. Nuryadi, N., Purwoko, R. Y., Rumasoreng, M. I., & Astuti, E. P. (2022). *Model Pembelajaran Matematika Berbasis Etnomatematika Berorientasi pada Kemampuan Numerasi*. K-Media.
16. Peni, N. R. N., & Baba, T. (2019). Consideration of curriculum approaches of employing ethnomathematics in mathematics classroom. *Journal of Physics: Conference Series*, 1321(3), 32125.
17. Pusmendik. (2022). *Capaian Hasil Assesmen Nasional*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. https://pusmendik.kemdikbud.go.id/profil_pendidikan/profil-wilayah.php
18. Rizal, A. F., Purwaningrum, J. P., & Rahayu, R. (2021). Pengembangan E-Modul Berbasis Etnomatematika Untuk Menumbuhkan Kemampuan Komunikasi Matematis Dan Minat Belajar Siswa. *Koordinat Jurnal MIPA*, 2(2), 1–14.
19. Rusdi, R., Fauzan, A., Arnawa, I. M., & Lufri, L. (2019). *Development of Mathematics Teaching Materials Based on Realistic Mathematics Education and Literacy in Junior High School*. 120–125. <https://doi.org/10.2991/ICOIE-18.2019.28>
20. Sagita, D. (2018). Peran Bahan Ajar LKS untuk Meningkatkan Prestasi Belajar Matematika. *Seminar Nasional Pendidikan Matematika Ahmad Dahlan*, 1, 37–44.
21. Sarwoedi, S., Marinka, D. O., Febriani, P., & Wirne, I. N. (2018). Efektifitas etnomatematika dalam meningkatkan kemampuan pemahaman matematika siswa. *Jurnal Pendidikan Matematika Raflesia*, 3(2), 171–176.
22. Steen, L. A. (2001). *Mathematics and democracy: The case for quantitative literacy*. NCED Princeton, NJ.
23. Tout, D., & Gal, I. (2015). Perspectives on numeracy: Reflections from international assessments. *ZDM*, 47, 691–706.
24. WEF & BCG (World Economic Forum, & Group), T. B. C. (2015). *New Vision for Education: Unlocking the Potential of Technology*. Cologny/Geneve: World Economic Forum. https://www3.weforum.org/docs/WEFUSA_NewVisionforEducation_Report2015.pdf
25. Widiantari, N. K. K., Suparta, I. N., & Sariyasa, S. (2022). Meningkatkan Literasi Numerasi dan Pendidikan Karakter dengan E-Modul Bermuatan Etnomatematika di Era Pandemi COVID-19. *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, 10(2), 331–343.
26. Yustitia, V., & Siswono, T. Y. E. (2021). Numeracy of prospective elementary school teachers: a case study. *Journal of Physics: Conference Series*, 1918(4), 42077.

Cite this Article: Rizky Amalia Dhiaul Zaini, Wiryanto, Rooselyna Ekawati (2023). *Development of Ethnomatematics-Based E-Book Teaching Materials to Train Numeracy Skills in Geometry Materials in Elementary Schools*. *International Journal of Current Science Research and Review*, 6(6), 3408-3415