



TECHNIUM

SOCIAL SCIENCES JOURNAL

9 R 04

1

\$ Q H Z G H F D
I R U V R F L D O

,661



ZZZ WHFKQLXPVFLHQFH FRF

A Systematic Literature Review: Characteristic of Ethnomathematical-Based Subject Specific Pedagogy

Nuryadi¹, Zaenuri², Iqbal Kharisudin³

¹Students Program Doctoral Mathematics Education Universitas Negeri Semarang Indonesia, ^{2,3}Mathematics Education Universitas Negeri Semarang

nuryadi87@students.unnes.ac.id¹, zaenuri.mipa@mail.unnes.ac.id²,
iqbalkharisudin@mail.unnes.ac.id³

Abstract. Ethnomathematics-based Subject Specific Pedagogy (SSP) is a learning instrument packaged in a comprehensive, complete and systematic way for mathematics material in cultural studies. The era of society 5.0 is a human-centered and technology-based concept through a system that integrates virtual and physical spaces. The influence of globalization on the life of the nation and state has an impact on the erosion of cultural values. Ethnomathematics-based SSP has a very important role in growing and developing the competence of teachers and students based on cultural values. Several studies have been synthesized with previous researches to provide an overview of the effectiveness of Ethnomathematics-based SSP. To overcome this problem, the Systematic Literature Review has been carried out by documenting and reviewing all articles related to mathematics education in the period 2010 - 2020. The articles used in this study are 19 articles of nationally and internationally accredited journals accessed from Google Scholar, Research Gate, SINTA, DOAJ, and Scopus. The results of a literature review of 19 research articles that study pedagogy, and ethnomathematics with components of syllabus, lesson plans, student teaching materials, Student Worksheets (LKPD), and effective assessments in learning mathematics. It can be seen from several studies which show that by developing the SSP with cultural elements, it is able to grow students' character and cultural insight. The application of an ethnomathematics-based learning model or approach to mathematics can improve problem solving and critical thinking skills. Meanwhile, ethnomathematics-based learning instrument can improve mathematical literacy.

Keywords. Subject Spesific Pendagogy;etnomatematika

1. Introduction

The mathematical concepts that exist in the human's point of view are sometimes different from those exists in reality. Therefore, mathematics learning assumedly needs to provide content/bridge between mathematics in the daily life based on local culture and school mathematics [1]. Mathematics is formed as a result of human's thinking that involves ideas, processes, and reasoning that have been integrated into all aspects of people's lives wherever they are. Essentially, mathematics is a symbolic technology that grows on skills or environmental activities that are cultural. Thus, an individual mathematics is influenced by their cultural background because what they do is based on what they experince. The impact of rapid, advanced and comprehensive modernization and technology in every aspects of society on the life of the nation cannot be denied, it has an impact on the decrease of the noble cultural

values of our nation. It happens because of the lack of application and understanding of the importance of cultural values in society. This decrease of cultural values can be seen by current phenomena such as the number of violence, riots, self-destructive activities, adolescents delinquency, and so on. It should be a big concern for us as educators as we need a solution or a wisdom/policy. that can bridge between culture and education is ethnomathematics.

Ethnomathematics is a form of mathematics influenced or based on culture. By means the application of ethnomathematics in education, especially mathematics education, it is expected that later students will be able to better understand mathematics and their culture and later it will be easier for educators to instill cultural values by themselves into students, so that cultural values which are part of the nation's character are embedded since in students [2]. The success of learning mathematics can be achieved if various components are considered in the pedagogical aspect including the cultural background of the students. The use of cultural context allows students to explore mathematics more realistically. However, thinking about the cultural context of mathematics has also been followed by many critical questions and challenges to be resolved. The criticism of ethnomathematics is especially concerned on the question of the difference between mathematics and ethnomathematics, the philosophy underlying ethnomathematics, and how far culture can affect one's mathematical ability [3].

Learning experiences in schools that are relevant to the lives of students will help students solve problems faced in everyday life and can provide experience how to socialize with the community. Learning needs to be well designed, planned. It should not only prioritize the knowledge aspect, but also provide a sufficient portion to shape the attitudes and character of students. In practice, there are still many teachers who have not been able to compile SSP (Subject Specific Pedagogy) as required by the government. In fact, if the teacher can develop an ideal and complete SSP, and can carry out classroom learning in accordance with the SSP that has been prepared, then the learning activities in the classroom will be directed [4].

Teaching materials allow students to learn a competency in a coherent and systematic manner so that they are cumulatively able to master all competencies in a complete and integrated manner. According to Fitriawanawati et al. (2018) teaching materials can function as: (1) Guidelines for teachers who will direct all their activities in the learning process, as well as a substance of competence that should be taught to students; (2) Guidelines for students who will direct all their activities in the learning process, as well as a substance of competence that should be studied/mastered; and (3) evaluation tools for achievement/mastery of learning outcomes.

Mathematics education in the era of society 5.0 must be able to identify and understand the role of mathematics in life. It also should be able to make the right decisions and use mathematics in life as citizens who are constructive, caring, and reflective. Based on the literature review, this study aims to determine the effectiveness of ethnomathematical-based Subject Specific Pedagogy in learning mathematics.

2. Methods

This scientific article was prepared by using the Systematic Literature Review (SLR) method. In Indonesia, a systematic literature review is a literature review method that identifies, reviews, evaluates, and interprets all available research. In this kind of method, researchers conduct reviews and identify journals in a structured manner which in each process follows the steps that have been set [5]. To complete this research, researchers collected journal articles from Google Scholar, Research Gate, SINTA, DOAJ, and Scopus. The keywords are Subject Specific Pedagogy and Ethnomathematics. The articles collected were only articles published in the period 2010 to 2020. From various articles, the researchers selected 19 articles that were

closely related to the keywords used. In the next step, the researchers categorized the articles related to the application of Subject SSP in mathematics learning, the application of ethnomathematics, and the application of ethnomatmatics-based SSP in mathematics learning to determine the effectiveness.

3. Finding and discussion.

Learning Instrument SSP (Subject Specific Pedagogy) is an integrated preparation of learning tools at the subject level in a comprehensive manner that includes units: syllabus, lesson plans, student teaching materials, Student Worksheets (LKPD), and learning assessments. Through teaching materials, it is possible for students to learn a competency in a coherent and systematic manner so that they are cumulatively able to master all competencies as a whole and in an integrated manner. Teaching materials function as 1) Guidelines for teachers who will direct all their activities in the learning process, as well as a substance of competence that should be taught to students, 2) Guidelines for students who will direct all their activities in the learning process, as well as a substance of competence that should be studied/mastered, 3) evaluation tools for achievement/mastery of learning outcomes.

Ethnomathematics is an interesting and becomes current issues in mathematics learning. Learning by linking cultural issues with mathematical concepts becomes a separate study with the goal that through this learning, students are able to know their culture well and are able to maintain local culture as a mirror of national culture. Articles reviewed based on search engines found the following articles:

Tabel 1

Search Results Related to Ethnomathematical Articles and pedagogy in Mathematics Learning

Author/s	Journal/Proceeding	Title	Conclusion
[6]	International Conference on Learning Innovation	<i>Thematic Subject Specific Pedagogy Based on Local Wisdom as a Means to Improve Primary School Students' Character</i>	The thematic subject-specific pedagogy products that are developed locally can improve student character as seen from the results of the student worksheet
[7]	<i>International Journal on Teaching and Learning Mathematics,</i>	Development of mathematical learning instruments based on ethnomathematics in character education learning.	The development of ethnomatematics based mathematics learning instuments in strengthening character education produced mathematical learning instruments (syllabus, materials learning, student whorksheets) which is contain Indonesian cultural values and character education values.
[8]	<i>In Ethnomathematics and its diverse approaches for mathematics</i>	<i>Ethnomathematics and Its Pedagogical Action</i>	Concept of ethnomathematics isprimeval: recognizing, in every corner of the planet, the different emergence of



	<i>education. Springer, Cham</i>	<i>in Mathematics Education</i>	perceptions of space and time and the techniques of observing, comparing, classifying, ordering, measuring, quantifying and inferring and, as consequently, different styles of abstract thinking
[9]	<i>JETL (Journal Of Education, Teaching and Learning</i>	Improving Problem-Solving Ability and Character in Subject-Specific Pedagogic with Heuristic Strategy	Heuristic strategy can improve students' problem-solving ability and develop their character containing SSP. The ideal SSP development will have the correct process impact and expected results as the process of initiating future generations to be able and ready to compete and stand side by side in the era of the global community (learning to do and learning to live together) in an integrated manner in mathematics learning.
[2]	Prosiding Seminar Nasional Etnomatnesia	Ethnomathematics-Based Subject Specific Pedagogy (SSP) Development Scheme to Improve Elementary School Students' Mathematical Literacy	Subject Specific Pedagogy Scheme which includes syllabus, lesson plans, textbooks, ethnomathematics-based assessment that can improve elementary school students' mathematical literacy
[3]	<i>Eurasia Journal of Mathematics, Science and Technology Education</i>	On the importance of an ethnomathematical curriculum in mathematics education	Mathematics education is influenced by cultural values. Thus, the importance of developing and implementing a mathematics curriculum that combines elements and cultural values and factors from daily life and students' society. The curriculum in which learning instrument combine cultural elements and environmental factors contribute to increasing students' motivation to learn mathematics and improves academics in this subject.



- [10) *Teaching Mathematics and Its Applications* Pacific ethnomathematics: Pedagogy and practices in mathematics education Ethnomathematics views teaching as a rich and diverse endeavor built on a wide range of knowledge and skills about students, pedagogy and culture. Innovative approaches based on real-world applications are essential for engaging students in contextual, continuous learning. all discoveries, student experiences and applications of mathematics are realized and given equal opportunities for access and achievement.
- [11] *Journal of physic* Ethnomathematic Worksheet by Scientific Aproachs Based on the trial analysis, it was shown that the Ethnomathematics-based Workbook with a scientific approach to improve mathematics learning outcomes in secondary schools met criteria as valid, practical and effective. The effectiveness criteria seen from the analysis of student achievement tests of 75% have been achieved and an average score of 67.5 or a value above the Minimum Completeness Criteria (KKM) of 65 and the percentage of classical completeness reaching 83.33% from the standard 75%
- [12] *Journal of Humanistic Mathematics,* of Pedagogy on the Ethnomathematics-Epistemology Nexus: A Manifesto The finding of the study of epistemology and ethnomathematics are: (1) think mathematically and it is our responsibility as educators to recognize and appreciate students' mathematical reasoning modes; (2) critical principles of epistemology especially those that apply to mathematics; (3) basic nomenclature and hypotheses related to ethnomathematics; (4) the organic and intrinsic relationship between these two fields; and (5) the ethnomathematics of mathematics pedagogy facilitates students' understanding of the cultural aspects of mathematics.



(Laurens, 2017)	Jurnal LEMMA	Ethnomathematical Analysis and Its Application in Improving the Quality of Learning	The results showed that mathematical concepts that can be explored in the culture of the Maluku people are the concepts of numbers, especially fractions, place values, and geometry, especially tiles. By integrating culture in instilling the concept of fractions in 4th grade students of SD Negeri Teladan, it shows an increase in students' understanding of the concept as indicated by the high gain score of 0.57. Students' understanding of regional specialties that indirectly fosters the character of love for the homeland.
[14]	<i>Journal Mathematics Education</i>	on Students' critical mathematical thinking skills and character: Experiments for junior high school students through realistic mathematics education culture-based	School level variables, early math skills, and RME culture-based each providing a good role towards the achievement and improvement of mathematical critical thinking skills of students. Of the three variables, variables of RME culture-based provides the best role for the achievement and improvement of mathematical critical thinking skills of students. This shows that the efforts of teachers in the learning provide a better role than the role of other variables.
[4]	Jurnal Pendidikan Karakter	Model Subject Specific Pedagogy Tematik Integratif Untuk Pengembangan Karakter Hormat Dan Tanggung Jawab Siswa	Based on the results of the research and discussion, the following conclusions can be drawn. First, based on expert judgment, the SSP instrument is declared valid or feasible to improve the character of respect and responsibility in the thematic integrative learning for class IV. This is evidenced by the scores of each component of the CNS, which are in the 'Good' category. Second, based on the test results, the SSP device has proven to be effective in



- increasing the respect and responsibility of students through integrative thematic learning in grade IV, SDN Karanganyar I.
- [15] Journal of Needs Analysis of Mathematics and the Development of Mathematics Education Subject Specific Ethnomathematical Pedagogy to Improve Critical Thinking Skills Teachers can carry out effective ethnomathematical-based learning to improve critical thinking skills, planning is needed. This planning activity can be done by developing SSP including lesson plans, worksheets and ethnomathematical-based instruments to improve students' critical thinking skills.
- [16] *Revista Latinoamericana de Etnomatemática: Perspectivas Socioculturales de La Educación Matemática* Ethnomodeling as a Pedagogical Tool for the Ethnomathematics Program. The pedagogical approach that connects the cultural aspects of mathematics with the academic aspects is denominational ethnomodeling, which is a process of translation and elaboration problems and questions taken from the system that are part of the student's reality.
- [17] *Proceedings of the Eighth International Mathematics Education and Society Conference* Ethnomathematics: Connecting Cultural Aspects of Mathematics through Culturally Relevant Pedagogy An ethnomathematical and culturally relevant pedagogy based approach to the mathematics curriculum is intended to create relevant mathematics content for students. By providing students with content and an approach to mathematics that enables them to successfully master academic mathematics. The ethnomathematical approach to the mathematics curriculum is considered a pedagogical vehicle to achieve such goals, through learning tools
- [18] *Jurnal Pendidikan Matematika Raflesia,* Ethnomathematics Effectiveness in Improving Students' Mathematics Comprehension Ability Ethnomathematics-based mathematics learning is effective in students' mathematical understanding abilities. It is proven that from the results of the study and several indicators of students'

Vasquez, E. L. (2017)..	<i>Journal of Education and Human Development</i>	Ethnomathematics as an Epistemological Booster for investigating Culture and Pedagogical Experience with the Young Offender or Prison School Communities	understanding ability. It is stated that there is an ethnomathematical influence on students' mathematical understanding abilities, namely in terms of identifying, translating, interpreting symbols, understanding and applying mathematical ideas, making an exploration (estimation) and solving mathematical problems. . The ethnomathematics program is based on several available research studies on cultural and pedagogical experiences in education as an epistemological impetus for carrying out field studies. In addition, the analyzed studies can contribute to the planning, implementation and evaluation of pedagogical projects.
[19]	<i>Advances in Social Science, Education and Humanities Research</i>	<i>Ethnomathematics and Outdoor Learning to Improve Problem Solving Ability</i>	The results showed that mathematical problem solving abilities of students after being given ethnomathematics with outdoor learning models were higher than before being given the learning models.
[1]	<i>Jurnal Prisma</i>	Exploring Ethnomathematics: Mathematics as a Cultural Product	This study takes several activities which include: (1) exploring forms of ethnomathematics and (2) analyzing the integration of ethnomathematical-based RME at the primary and secondary education levels. Data collection uses observation and documentation techniques, in addition to literature review (review). In general, the three techniques are used together and complement each other. Data were analyzed descriptively qualitative.

The learning process requires good planning. The response will be strong if the stimulus is also strong. Both planning and learning process can produce good achievements through quality learning evaluations. The development of an ideal SSP will have the right process impact and the expected results as a process of starting a next generation that is capable and ready to compete and do teamwork in the era of global society (learning to do) and learning to live together) in an integrated manner in learning mathematics (Darma et al. al., 2019).

Culturally responsive pedagogy and teaching are especially important regarding the increasing ethnic, social and cultural diversity in US schools today. 63 of the 100 largest school districts have culturally diverse student numbers. Considering the diversity of schools, teaching practices that build on what students know are critical to the success of the school as a whole looking on the central role of large-scale standardized tests of student achievement to improve K-12 education such as CCSS Mathematics. CCSS requires a much higher level of cognitive engagement, including what, how, and how much teachers must teach and know (Furuto, 2014). The presented problems can be in the form of cultures that are often encountered by students, allowing students' understanding to be explored because they have the ability to understand problems because the problems displayed are often encountered in everyday life. Some examples of ethnomathematical concepts presented include traditional games (Fitrianawati et al., 2018). Through this game, students can recognize mathematical concepts taught in schools, especially elementary schools. The same thing is also shown according to (Agustin et al., 2018), students initially learn in theory the traditional methods of mathematics education and then apply it in practice. This research produces learning instruments for teaching mathematics with character-based ethnomathematics as a strengthening of education that has been implemented in schools. This makes students familiar with Indonesian culture, in addition to social interaction in learning mathematics is shown to strengthen activities in the classroom when teachers teach or even students work on student worksheets.

4. Conclusion

Subject Specific Pedagogy (SSP) based on ethnomathematics is a study that can be applied in learning mathematics. The results of a literature review of 19 research articles that study pedagogy, and ethnomathematics with components of syllabus, lesson plans, student teaching materials, Student Worksheets (LKPD), and effective assessments in learning mathematics. It can be seen from several studies which show that by developing the SSP with cultural elements, it is able to grow students' character and cultural insight. The application of an ethnomathematics-based learning model or approach to mathematics can improve problem solving and critical thinking skills. Meanwhile, ethnomathematics-based learning instrument can improve mathematical literacy. Future research studies are expected to develop ethnomathematical-based learning instrument that can improve literacy studies and other mathematical abilities.

5. Acknowledgments

I am thankful to the Daging who has reviewed the grammar. I am thankful to Universitas Mercu Buana Yogyakarta which has funded the tuition fee for the doctoral program at Universitas Negeri Semarang, Indonesia.

References

[1] Zaenuri and N. Dwidayati, "Menggali Etnomatematika : Matematika sebagai Produk Budaya," in *PRISMA, Prosiding Seminar Nasional Matematika*, 2018, vol. 1, no. 1, pp. 471–

- 476, [Online]. Available: <https://journal.unnes.ac.id/sju/index.php/prisma/%0Ahttps://jurnalmahasiswa.unesa.ac.id/index.php/mathedunesa/article/view/249%0Ahttps://sinta.ristekbrin.go.id/journals/detail?id=146>.
- [2] M. Fitriawanati, M. Sintawati, Marsigit, and E. Retnowati, "Skema Pengembangan Subject Spesific Pedagogic (Ssp) Berbasis Ethnomatematika Untuk Meningkatkan Literasi Matematika Siswa Sekolah Dasar (SD)," *Pros. Semin. Nas. Etnomatnesia*, pp. 360–366, 2018.
- [3] A. Q. Fouze and M. Amit, "On the importance of an ethnomathematical curriculum in mathematics education," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 14, no. 2, pp. 561–567, 2018, doi: 10.12973/ejmste/76956.
- [4] S. Prayitno and M. Wangid, "Model Subject Specific Pedagogy Tematik Integratif Untuk Pengembangan Karakter Hormat Dan Tanggung Jawab Siswa," *J. Pendidik. Karakter*, no. 2, p. 120330, 2015, doi: 10.21831/jpk.v0i2.8623.
- [5] S. Afsari, I. Safitri, S. K. Harahap, and L. S. Munthe, "Systematic Literature Review: Efektivitas Pendekatan Pendidikan Matematika Realistik Pada Pembelajaran Matematika," *Indones. J. Intellect. Publ.*, vol. 1, no. 3, pp. 189–197, 2021, doi: 10.51577/ijpublication.v1i3.117.
- [6] M. T. Adityas, "Thematic Subject Specific Pedagogy Based on Local Wisdom as a Means to Improve Primary School Students' Character," 2019, pp. 235–240, doi: 10.5220/0008410402350240.
- [7] R. D. Agustin, M. Ambarawati, and E. D. Kartika, "Development of mathematical learning instruments based on ethnomathematics in character education learning," *Int. J. Teach. Learn. Math.*, vol. 1, no. 1, p. 24, 2018, doi: 10.18860/ijtlm.v1i1.5353.
- [8] U. D'Ambrosio and M. Rosa, "Ethnomathematics and Its Pedagogical Action in Mathematics Education," 2017, pp. 285–305.
- [9] Y. Darma, D. T. Suratman, A. S. Yani, and U. Desy, "IMPROVING PROBLEM-SOLVING ABILITY AND CHARACTER IN SUBJECTSPECIFIC PEDAGOGIC WITH HEURISTIC STRATEGY," vol. 29, no. 7, pp. 1937–1942, 2015.
- [10] L. H. L. Furuto, "Pacific ethnomathematics: Pedagogy and practices in mathematics education," *Teach. Math. its Appl.*, vol. 33, no. 2, pp. 110–121, 2014, doi: 10.1093/teamat/hru009.
- [11] R. H. Hirzi and M. Gazali, "Ethnomathematic Worksheet by Scientific Aproachs," in *Journal of Physics: Conference Series*, 2020, vol. 1539, no. 1, doi: 10.1088/1742-6596/1539/1/012078.
- [12] I. Izmirli, "Pedagogy on the Ethnomathematics--Epistemology Nexus: A Manifesto," *J. Humanist. Math.*, vol. 1, no. 2, pp. 27–50, 2011, doi: 10.5642/jhummath.201102.04.
- [13] theresia laurens, "ANALISIS ETNOMATEMATIKA DAN PENERAPANNYA DALAM MENINGKATKAN KUALITAS PEMBELAJARAN," *J. LEMMA*, vol. 3, no. 1, 2017, doi: 10.22202/jl.2016.v1i3.1120.
- [14] A. L. Palinussa, "Students' critical mathematical thinking skills and character: Experiments for junior high school students through realistic mathematics education culture-based," *J. Math. Educ.*, vol. 4, no. 1, pp. 75–94, 2013, doi: 10.22342/jme.4.1.566.75-94.
- [15] R. Richardo, A. Martyanti, and S. Suhartini, "ANALISIS KEBUTUHAN PENGEMBANGAN SUBJECT SPECIFIC PEDAGOGY ETNOMATEMATIKA UNTUK MENINGKATKAN KEMAMPUAN BERPIKIR KRITIS," *J. Math. Math. Educ.*, vol. 8, no. 2, 2018, doi: 10.20961/jmme.v8i2.25848.
- [16] M. D. C. O. Rosa, "Ethnomodeling as a Pedagogical Tool for the Ethnomathematics Program," *Rev. Latinoam. Etnomatemática Perspect. Sociocult. la Educ. Matemática*, vol. 3, no. 2, pp. 14–23–23, 2010.

- [17] M. Rosa, D. C. Orey, M. Rosa, and D. C. Orey, "Ethnomathematics: Connecting Cultural Aspects of Mathematics through Culturally Relevant Pedagogy," in *Proceedings of the Eighth International Mathematics Education and Society Conference, Vols 1-3*, 2015, pp. 898–911.
- [18] Sarwoedi, D. O. Marinka, P. Febriani, and I. N. Wirne, "Efektifitas Etnomatematika dalam Meningkatkan Kemampuan Pemahaman Matematika Siswa," *J. Pendidik. Mat. Raflesia*, vol. 03, no. 02, pp. 171–176, 2018, [Online]. Available: <https://ejournal.unib.ac.id/index.php/jpmr/article/view/7521>.
- [19] W. Widada, D. Herawaty, A. F. D. Anggoro, A. Yudha, and M. K. Hayati, "Ethnomathematics and Outdoor Learning to Improve Problem Solving Ability," 2019, doi: 10.2991/icetep-18.2019.4.