



Implementation of Ethnomathematics Using the Trello Application to Increase Students' Numeracy And Digital Literacy

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ABSTRACT

This research is motivated by technological advances that are developing more rapidly so that it can be used to improve students' numeracy and digital literacy. This research aimed to analyse the impact of applying Ethnomathematics using the Trello application in increasing university students' numeracy literacy and digital literacy. This research used a survey method on 56 students. The research instruments used were a numeracy literacy test in the mathematics-chemistry one course, a digital literacy questionnaire, and an interview sheet. This research shows that implementing ethnomathematics utilising the application of Trello has several advantages, including increasing university students' numeracy and digital literacy.

Keywords: Ethnomathematics, Trello, Numerical Literacy, Digital Literacy.

ABSTRAK

Penelitian ini dilatarbelakangi oleh kemajuan teknologi yang berkembang semakin pesat sehingga dapat dimanfaatkan untuk meningkatkan literasi numerasi dan digital peserta didik. Tujuan penelitian ini adalah menganalisis dampak penerapan Etnomatematika menggunakan aplikasi Trello dalam meningkatkan literasi numerasi dan digital pada mahasiswa. Penelitian ini menggunakan metode survei terhadap 56 orang mahasiswa. Instrumen penelitian yang digunakan adalah tes literasi numerasi mata kuliah matematika kimia 1, angket literasi digital, dan lembar wawancara. Hasil penelitian menunjukkan bahwa penerapan Etnomatematika menggunakan aplikasi Trello memiliki beberapa kelebihan sehingga dapat meningkatkan literasi numerasi dan digital pada mahasiswa.

Kata Kunci: Etnomatematika, Trello, Literasi Numerasi, Literasi Digital.

INTRODUCTION

The COVID-19 pandemic has had positive and negative impacts on humans. The positive impact is that humans are forced to adapt to the application of technology in various fields (Kusuma, 2020). It cannot be denied that the COVID-19 pandemic has triggered technological developments, and humans are becoming more adept at using and applying technology to facilitate and expedite



various activities, including mathematics learning activities (Irfan et al., 2023). Various specialised applications have been implemented in the mathematics learning process to increase students' numeracy and digital literacy.

During 2020-2022, most learning activities were carried out entirely online (Irfan, et al., 2020). A small number also carried out hybrid learning due to the spread of COVID-19, which has not yet subsided, thus impacting the low numeracy and digital literacy of students still in the medium category (Delima et al., 2023). Because learning is carried out online and hybrid, technology applications are needed that can help make it easier for students to understand the material being taught, as well as being able to increase students' interest and motivation, thus having an impact on improving their numeracy and digital literacy.

Students' interest and motivation in learning mathematics greatly influence students' numeracy and digital literacy (Kusuma et al., 2023), so it is necessary to carry out various learning innovations that make students feel interested, motivated, and think that mathematics is related to real life. One of the learning innovations that can be carried out is implementing an appropriate learning approach, which is combined with technology applications as a learning media. A learning approach that can show the relationship between mathematical concepts and real life is Ethnomathematics (Zhang and Zhang, 2010).

Lisnani et al. (2022) stated that Ethnomathematics is a field of study regarding the relationship between mathematics and cultural elements. The form of this relationship can be shown in applying mathematical concepts in a culture (known as street mathematics) and ways of teaching mathematical concepts adapted to local culture (D'Ambrosio, 1989). Many researchers, such as Prahmana and D'Ambrosio (2020), are interested in Ethnomathematics research, which explores geometric concepts of Yogyakarta batik patterns. Mustika et al. (2022) implemented an Ethnomathematics learning approach for grade IV to grade VI elementary school students. Faiziyah et al. (2022) implemented Ethnomathematics-based questions to grade IX students to improve their creative thinking abilities. Iqrima et al. (2023) implemented Ethnomathematics-based questions to grade VIII students to strengthen mathematical literacy. In this research, Ethnomathematics learning was implemented using the Trello application to increase students' numeracy and digital literacy. It is important because, so far, there has been no research on the application of ethnomathematics assisted by specific technological applications.

Almost all activities in the educational sector utilize technology applications to make things easier and time efficient. Trello is an application that can be used in the educational sector, namely applied in learning activities. Trello is a task management application that organises and monitors student work individually and in groups (Sitanggang et al., 2023). Trello can be accessed anytime and anywhere via personal computer or smartphone. Students can embed attachments as documents (files), images or photos, video links, and other professional communication application links. Apart from that, teachers or lecturers can comment on the results of student work in Trello. So far, research related to using the Trello application in learning has been carried out by Handoko et al. (2022), who implemented Trello in project-based learning to improve junior high school students' creative thinking abilities in science subjects. Mansur et al. (2019) used Trello in problem-based

learning for master's program students in various study programs. Sitanggang et al. (2023) implemented Trello for elementary school teachers to make managing student assignments easier. Because so far, there has been no research on the application of Trello in mathematics learning for students, especially in efforts to increase numeracy and digital literacy, this research is focused on this.

Several researchers have carried out research about numeracy and digital literacy so far. Winarni et al. (2021) carried out learning innovations using mathematics learning videos to improve numeracy and digital literacy in 7th grade junior high school students. Faridah et al. (2022) applied a problem-based learning model to decrease numeracy and digital literacy skills in 5th-grade Madrasah Ibtidaiyah students. Next, Delima et al. (2023) developed numeracy and digital literacy using the comprehensive mathematics instruction (CMI) agent for high school students. Based on these studies, Ethnomathematics has never been implemented using the Trello application to increase students' numeracy and digital literacy, especially for university students.

Based on the description above, this research aims to investigate the impact of applying ethnomathematics using the Trello application to increase numeracy and digital literacy in students at university. It needs to be done because, in this era of digitalization, numeracy and digital literacy skills must be mastered by students at all levels of education.

METHOD

This research uses a survey method. The survey method is a quantitative research procedure that conducts surveys on samples or populations to describe the behaviour or characteristics of the population (Creswell, 2022), while the survey method is a way of collecting primary data through questions given to respondents (Nisa and Susanto, 2022). This research was conducted on 56 students of the BA Chemistry study program, Faculty of Mathematics and Natural Sciences Universitas Padjadjaran, in the Mathematics Chemistry 1 course using purposive sampling. The purposive sampling is a sample selection technique with a specific purpose (Obilor, 2023). This research was conducted on 56 students because the Mathematics Chemistry 1 course consists of 2 classes, each with 28 students. The instruments used in this research were numeracy literacy questions in the form of a description of 5 questions (which was adopted from PISA), a digital literacy questionnaire in the form of a Likert scale containing 18 statements, and an interview sheet containing seven questions (written interview). The instruments have been tested and analyzed previously.

The numeracy literacy indicators used in this research include: (a). have skills related to symbols and numbers in mathematics; (b). able to analyze information presented in pictures, graphs, and tables; and (c). able to solve a problem (Delima et al., 2023). The digital literacy indicators used in this research refer to Delima et al. (2023), namely: 1) skills in reading graphic displays, 2) skills in using digital reproduction to produce something new, 3) hypertextuality skills, 4) skills in evaluating the quality and validity of information, and 5) socio-emotional skills. The digital literacy category used is the frequency distribution rule (Delima et al., 2023), where a score of 52-70 is in the high digital literacy category, a score of 33-51 is in the medium category, and a score of 14-42 is in the low digital

literacy category. Data from the results of the numeracy literacy test, digital literacy questionnaire, and written interview were analyzed descriptively.

RESULT AND DISCUSSION

Numeracy Literacy Test Analysis

The end of this survey research describes the analysis results from data collection of the numeracy literacy test, digital literacy questionnaire, and written interview. The numeracy literacy test was given to 56 students (2 classes, 28 people in each class) at the 5th meeting after receiving learning by implementing Ethnomathematics using the Trello application at the three previous meetings. This test measures students' numeracy literacy after participating in learning activities that applied Ethnomathematics using the Trello application. Based on the test results, the highest score was 92, the lowest was 39, and the average was 64.46. Table 1 below presents the descriptive statistical results of the numeracy literacy test.

	N	Minimum	Maximum	Mean	Std.Deviation
NumLit test	56	39.00	92.00	64.4643	13.17293
Valid N (listwise)	56				

Table 1 shows the average score above 50.00 (i.e. 64.4643). That means the average achieved can be classified as level 5 of 6 criteria (based on PISA 2018). Level 5 criteria indicate the students' numeracy literacy is quite good. Simamora & Saragih (2021) in their research stated that several factors, including influence the learning outcomes achieved by students) students' learning habits, b) interest in learning, and c) motivation, where the learning approach and learning media used also influence students' interest in learning and learning. It means that the application of Ethnomathematics using the learning media application Trello can improve students' numeracy literacy.

Digital Literacy Questionnaire Analysis

Questionnaires were distributed to 56 students at the 5th meeting (the same day after the students finished taking the numeracy literacy test). This questionnaire aims to describe the measurement results of students' digital literacy after participating in the mathematics chemistry course with the implementation of Ethnomathematics using the Trello application. The results of the digital literacy questionnaire analysis are presented in Table 2.

Table 2. Recapitulation of Digital Literacy Questionnaire Analysis Results

Score	Frequency
25 - 35	1
36 - 46	3
47 - 57	2
58 - 68	12
69 - 79	38
Total	56

Based on Table 2, it can be seen that the number of students who got scores between 69 and 79 was 67.85% (38 students). Based on previous observations of researchers, this condition can be influenced by several things, including (a). The students who research subjects are students from the class of 2021, who are included in the "COVID-19 generation", so they are used to applying various technological applications (the COVID-19 generation means the generation of students who have experienced a period of lockdown, so they have to carry out online learning for quite a long time), (b) so far students have never used the Trello application in studying mathematics chemistry one course before. Hence, they are very enthusiastic about learning and using the application well, and (c) because Trello is an application that is easy to use, has a good appearance, and has exciting features. Integrating the application into the Mathematics Chemistry 1 course with an Ethnomathematics approach makes it easier for students to understand the concepts being taught. This is in line with the opinion of Amri et al. (2021), which stated that utilizing technology in learning activities is very effective in increasing students' digital literacy.

Written Interview Analysis

The written interview was conducted using interview sheets to obtain information regarding students' responses to learning using Ethnomathematics assisted by the Trello application, their attitudes towards learning using ethnomathematics assisted by the Trello application, and the obstacles they encountered when learning. The interview sheet contains seven questions. This interview sheet is filled out after students have taken the numeracy literacy test and digital literacy questionnaire. Based on the interview sheet filled out by students, the following information was obtained:

1. Students like learning by implementing Ethnomathematics with the help of the Trello application because it makes them not feel tense (because, in general, students often feel nervous and anxious when studying mathematics).
2. Students are more motivated to learn because they feel that mathematical concepts are related to real life and their culture.
3. Students are more enthusiastic about participating in learning activities because they use applications they have never used before, especially in mathematics.
4. Students better understand the material being taught.
5. Students show a positive attitude towards learning by implementing Ethnomathematics using the Trello application.
6. The obstacles students feel when learning by applying Ethnomathematics using the Trello application include several examples of the relationship between mathematical concepts and their culture. The internet network is unstable, so they have difficulty uploading images, graphs, photos, and videos.

Based on the results of the analysis of numeracy literacy tests, digital literacy questionnaires, and written interviews conducted, it appears that implementation of Ethnomathematics using the Trello application has several advantages as follows:

1. Make students more active during learning activities.

2. Make students more interested and motivated to learn.
3. Make students feel less tense and anxious during learning activities.
4. Make students better understand the material being taught and understand that there is a close connection between mathematical concepts and culture.
5. We are making students more "technologically literate".

CONCLUSION

Numeracy literacy and digital literacy are two basic abilities that every student must have, so it is necessary to find ways to increase these two skills. One way is by applying Ethnomathematics using the Trello application. The research results show that after implementing Ethnomathematics using the Trello application in the Mathematics Chemistry One course, the average score achieved by students on the numeracy literacy test is at level 5 criteria (from 6 levels). Meanwhile, the results of the digital literacy questionnaire showed that 67.85% of students obtained scores in the high category. The written interview results also showed that students had a positive attitude towards implementing Ethnomathematics using the Trello application. Therefore, implementing Ethnomathematics using the Trello application in learning can be an alternative solution to increase students' numeracy and digital literacy.

REFERENCES

- Amri, C., Jaelani, A., & Saputra, H. (2021). Peningkatan literasi digital peserta didik: Studi Pembelajaran Menggunakan *E-learning*. *Jurnal Ilmiah Profesi Pendidikan*, 6(3), 546–551. <https://doi.org/10.29303/jipp.v6i3.291>
- Creswell, J. W., & Creswell, J. D. (2022). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. London: SAGE Publications.
- D'Ambrosio, U. (1989). *Ethnomathematics: Link between Traditions and Modernity*, No. 1, Rotterdam: Sense Publishers. <https://doi.org/10.1093/philmat/s2-4.1.3>.
- Delima, N., Kusuma, D.A., & Jaja, J. (2023). Mengembangkan Literasi Digital dan Numerasi Siswa SMA melalui *CMI Agent*. *Jurnal Pembelajaran Matematika Inovatif (JPMI)*, 6(3), 1213-1220. <https://doi.org/10.22460/jpmi.v6i3.15256>.
- Faridah, N. R., Afifah, E. N., & Lailiyah, S. (2022). Efektivitas Model Pembelajaran Problem-based Learning terhadap Kemampuan Literasi Numerasi dan Digital Peserta Didik Madrasah Ibtidaiyah. *Jurnal BASICEDU*, 6(1), 709-716. <https://doi.org/10.31004/basicedu.v6i1.2030>
- Faiziyah, N., Hanan, N. A., & Azizah, N. N. (2022). Kemampuan Berpikir Kreatif Siswa dalam Menyelesaikan Soal Berbasis Etnomatematika Tipe *Multiple Solutions Task*. *Mosharafa: Jurnal Pendidikan Matematika*, 11(3), 495-506. <https://doi.org/10.31980/mosharafa.v11i3>
- Handoko, A., Anggoro, B. S., Intan, S. R., & Marzuki, M. (2022). Trello: Pengaruh *Project Based Learning* (PJBL) terhadap Kemampuan Berfikir Kreatif Peserta Didik. *Jurnal Pendidikan dan Pembelajaran Biologi*, 6(2), 173-180. <https://doi.org/10.33369/diklabio.6.2.173-180>
- Irfan, M., Kusumaningrum, B., Yulia, Y., & Widodo, S. A. (2020). Challenges during the pandemic: use of e-learning in mathematics learning in higher education. *Infinity Journal*, 9(2), 147-158. <https://doi.org/10.22460/infinity.v9i2.p147-158>
- Irfan, M., Suryaningrum, C. W., Pusporini, W., & Widodo, S. A. (2023). Online learning effect of post pandemic COVID-19: a survey at universities in Indonesian. *Перспективы Науки и Образования Perspectives of Science and Education*, 575. <http://dx.doi.org/10.32744/pse.2023.1.34>
- Iqrima., Zulkarnain, & Kamaliyah. (2023). Soal Matematika dalam Materi Statistika Berbasis Etnomatematika untuk Mengukur Literasi Matematis Siswa. *Plusminus: Jurnal Pendidikan Matematika*, 3(1), 39-50. <https://doi.org/10.31980/plusminus.v3i1.2561>
- Kusuma, D. A., Noto, M. S., & Dwipriyoko, E. (2023). *Hybrid Learning* dalam Perkuliahan Matematika Kimia 1. *Jurnal Nasional Pendidikan Matematika (JNPM)*, 7(2), 254-

262. <http://dx.doi.org/10.33603/inpm.v7i2.7934>
- Lisnani., Yuningrum, T., & Suyono, A. (2022). Ethnomathematics: Exploration Tapis Lampung on Two Dimensional Figure and Social Arithmetic's. *IndoMath: Indonesia Mathematics Education*, 5(2), 85-98. <http://dx.doi.org/10.30738/indomath.v5i2.24>
- Mansur, A. F. U., Alves, A. V., & Torres, R. B. (2019). Trello as Virtual Learning Environment and Active Learning Organizer for PBL Classes: an Analysis under Bloom's Taxonomy. *Proceedings of the PAEE/ ALE'2019, 11th International Symposium on Project Approaches in Engineering Education and 16th Active Learning in Engineering Education Workshop. Tunisia*.
- Mustika, J., Wildaniati, Y., Loviana, S., Merliza, P., Yunarti, Y., & Wulantina, E. (2020). Oemah Matematika: Pendampingan Pembelajaran Matematika Berbasis Etnomatematika untuk Anak-anak di Kelurahan Yosorejo. *Journal of Social Sciences and Technology for Community Service (JSSTCS)*, 3(1), 101-107. <https://doi.org/10.33365/jsstcs.v3i1.1899>
- Nisa, M. A., Susanto, R. (2022). Pengaruh Penggunaan Game Edukasi Berbasis Worldwall dalam Pembelajaran Matematika terhadap Motivasi Belajar. *JPGI: Jurnal Penelitian Guru Indonesia*, 7(1), 140-147. <https://doi.org/10.29210/022035jpgi0005>
- Obilor, E. I. (2023). Convenience and Purposive Sampling Techniques: Are They the Same? *International Journal of Innovative Social and Science Education Research*, 11(1), 1-7.
- Prahmana, R. C. I., & D'Ambrosio, U. (2020). Learning Geometry and Values from Patterns: Ethnomathematics on the Batik Patterns of Yogyakarta Indonesia. *Journal on Mathematics Education*, 11(3), 439-456. <http://doi.org/10.22342/jme.11.3.12949.439-456>
- Simamora, R., & Saragih, E. M. (2021). Pengaruh Kebiasaan Belajar dan Minat Belajar Siswa terhadap Hasil Belajar. *Jurnal Matematics Paedagogic*, 6(1), 45-52. <https://doi.org/10.36294/jmp.v6i1.2344>
- Sitanggang, R., Situmorang H., & Manurung, I. H. G. (2023). Pemanfaatan Trello sebagai *Project Management* di SDN 060937 Kotamadya Medan. *Jurnal Abdimas Mutiara*, 4(1), 76-81.
- Winarni, S., Kumalasari, A., Marlina., & Rohati. (2021). Efektivitas Video Pembelajaran Matematika untuk Mendukung Kemampuan Literasi Numerasi dan Digital Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 0(2), 573-583. <https://doi.org/10.24127/ajpm.v10i2.3345>
- Widiantari, N. K. K., Suparta, I. N., & Sariyasa. (2022). Meningkatkan Literasi Numerasi dan Pendidikan Karakter dengan E-Modul Bermuatan Etnomatematika di Era Pandemi COVID-19. *Jurnal Ilmiah Pendidikan Matematika*, 10(2), 331-343. <http://doi.org/10.25273/jipm.v10i2.10218>
- Yulia, Y., Irham Ishak, W., Perbowo, K. S., & Adi Widodo, S. (2023). Literacy and numeracy teaching and learning in pandemic outbreak: a case study of private primary school in rural area. *Jurnal Pendidikan Progresif*, 13(2), 151-164. <http://doi.org/10.23960/jpp.v13.i2.202301 ISSN 2087-9849>
- Zhang, W., & Zhang, Q. (2010). Ethnomathematics and Its Integration within the Mathematics Curriculum. *Journal of Mathematics Education*, 3(1), 151-157.