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Numeracy Literacy Skills and Pancasila Student Profiles through the Implementation of Ethnomathematics-Based STEAM

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ABSTRACT

This study investigates the implementation of ethnomathematics-based STEAM learning and its impact on numeracy literacy skills and the Pancasila Student Profile of students at SDN Karangnangka II. The research aims to integrate local cultural values into mathematics education and assess its effectiveness in enhancing students' numeracy literacy. A mixed-method approach with a sequential exploratory design was used. Data were collected through observations, interviews, and tests. Ethnomathematics elements were identified within Asta Tinggi Sumenep, including its main gate, tomb dome, and landmark, which incorporate various geometric shapes. The learning process followed the steps: Observe, New Idea, Innovation, Creativity, and Society, integrating six dimensions of the Pancasila Student Profile. The implementation of ethnomathematics-based STEAM learning significantly improved students' numeracy literacy. Pre-test and post-test results showed an increase in average scores from 48.00 to 81.00. Normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) indicated that data were normally distributed ($p > 0.05$). A paired-sample t-test revealed a significant effect ($p = 0.001 < 0.05$), confirming the positive impact of this learning model. The findings highlight the effectiveness of integrating local cultural elements into STEAM education. The approach fosters both numeracy literacy and the development of Pancasila Student Profile competencies, aligning education with cultural heritage. Ethnomathematics-based STEAM learning enhances students' numeracy literacy and character development. Future research should explore its scalability and long-term benefits in broader educational contexts.

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1. INTRODUCTION

Education in the modern era demands students to possess skills not only limited to cognitive abilities but also 21st-century skills such as critical thinking, creativity, collaboration, and communication (Aini et al., 2022; Rantio & Aly, 2023). One fundamental skill highlighted in various global education policies is numeracy literacy. Numeracy literacy is the ability to count and includes understanding mathematical concepts that can be applied in daily life, decision-making, and problem-solving (Ar et al., 2023; Faozi et al., 2020). Amid the fourth industrial revolution and rapid technological advancements, this skill becomes crucial in preparing an adaptive and competitive generation on the global stage. The STEAM (Science, Technology, Engineering, Arts, and Mathematics) education approach has been widely recognized as an effective method to enhance numeracy literacy (Aini & Yasid, 2022; Ar & Aini, 2023). STEAM encourages the integration of disciplines with a creative interdisciplinary approach, providing students with holistic and relevant learning experiences. However, despite the many benefits STEAM offers, this approach is often generic and lacks consideration of local cultural contexts. Culturally appropriate education can increase student engagement and strengthen concept understanding through more meaningful experiences (Aini, 2021).

In Indonesia, local cultural values cannot be separated from the education system (Wahab, 2023). One approach that can bridge modern education with local culture is ethnomathematics. Ethnomathematics refers to the study of how mathematical concepts are applied in various cultures, combining local knowledge with formal mathematics education. This approach enriches students' learning experiences and helps them understand that mathematics is an integral part of daily life, imbued with cultural values (Aini et al., 2023; Ar et al., 2024; Puspitorini et al., 2023). In line with efforts to strengthen cultural values in education, the Indonesian government has developed the Pancasila Student Profile as a guideline for shaping students' character. This profile includes six dimensions: faith and piety to God Almighty and noble character, global diversity, cooperation, independence, critical reasoning, and creativity. Integrating these values into learning is expected to shape students who are not only academically intelligent but also have strong character and can contribute positively to society.

However, in practice, several challenges hinder the optimal achievement of numeracy literacy skills and the strengthening of the Pancasila Student Profile. Data from the Program for International Student Assessment (PISA) shows that Indonesian students' numeracy literacy is below the international average. This indicates an urgent need to improve learning approaches that focus on cognitive aspects and integrate cultural contexts and character values. Additionally, although the Pancasila Student Profile has been adopted in the curriculum, effective implementation methods in mathematics and STEAM learning are still limited. Based on this background, this study aims to examine the effectiveness of the STEAM approach based on ethnomathematics in enhancing numeracy literacy skills and strengthening the Pancasila Student Profile. This research is expected to contribute to developing a learning model that is not only academically relevant but also contextual and rooted in local culture. Thus, the results of this study are expected to provide solutions to the challenges faced in mathematics education in Indonesia.

STEAM combines five main disciplines, namely science, technology, engineering, arts, and mathematics (Yuniar et al., 2020). The implementation of STEAM learning (science, technology, engineering, arts, mathematics) is an innovative approach designed to equip students with the critical and creative skills needed in the era of globalization and digitalization. This learning emphasizes the importance of integrating five interrelated main disciplines, thus creating an interdisciplinary learning experience that is relevant to everyday life (Fadhilah et al., 2024). In its application, STEAM invites students to think holistically through project-based learning, hands-on experiments, and team collaboration. Students not only learn theory but also engage in the creative process to find real solutions to complex problems. Technology, engineering, and art drive innovations that can be done in learning, while science and mathematics provide a strong theoretical foundation to support more meaningful learning. STEAM was developed according to global needs and in accordance with the Merdeka Curriculum currently being used (Aini, Misbahudholam AR, et al., 2024). The Merdeka Curriculum is a breakthrough in the Indonesian education system that focuses on developing student competencies through flexible, relevant, and student-centred learning (Fitriyah & Wardani, 2022). The Merdeka Curriculum emphasizes the importance of providing space for creativity, freedom of thought, and learning that is in accordance with students' interests and talents. In this context, STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning is a very relevant method and supports the vision of the Independent Curriculum (Andhianto et al., 2024).

Overall, STEAM in the Independent Curriculum provides opportunities for students to learn actively, creatively, and holistically. Through this approach, students are expected to not only be able to master knowledge but also have essential 21st-century skills to face global challenges in the future while still adhering to the cultural values and character of the nation (Armadi et al., 2022) because this curriculum was born from the various cultural diversities that exist in society (Aini & Ridwan, 2021). Based on this, it is necessary to integrate local culture into the learning process while still realizing humans who are able to compete in the global era and are able to preserve culture amidst the development of the times (Faiz & Kurniawaty, 2020). One of the integrations of local culture in learning is ethnomathematics. Ethnomathematics is an integration between culture and mathematics (Iswara et al., 2022). Ethnomathematics highlights local wisdom, cultural patterns, and traditional practices that contain mathematical values while emphasizing that mathematics does not belong to one group or culture alone but is part of a rich and diverse global heritage (Wulandari et al., 2022). Ethnomathematics aims to support students in understanding the application of mathematics in everyday life. The application of ethnomathematics also brings out cultural wisdom so that it can motivate students to learn mathematics (Syahputri, 2023).

Ethnomathematics is a learning process that integrates local cultural values into mathematics teaching. Ethnomathematics sees mathematics not only as a collection of abstract theories that are often considered difficult by students (Aini et al., 2020; Ramdhani & Wahab, 2021) but as part of everyday practices in various cultures, which reflect local wisdom and people's ways of life. Students are invited to understand mathematical concepts through their cultural context. Thus, mathematics becomes closer and more relevant to everyday life as part of identity and cultural heritage (Aini, 2021; Febriana et al., 2022; Wahab, 2023). The flexible Merdeka Curriculum allows teachers to develop learning materials that are connected to local and global realities. In ethnomathematics, students not only learn mathematics but also the cultural values, history, and traditions that exist around them. This encourages student involvement in more contextual and authentic learning and increases pride and appreciation for their cultural heritage. In order to create inclusive and meaningful education, the ethnomathematics-based STEAM learning process has potential. By integrating modern scientific and mathematical concepts with traditional cultural values, the learning process not only enriches the way students view the world but also connects science with their identity to face global challenges with critical skills and creativity while equipping them with an appreciation for diverse cultural heritages. Both encourage learning that not only emphasizes intellectual intelligence but also strengthens the relationship between science, technology, art, and cultural values inherent in everyday life (Nasution et al., 2024). This is in line with the principles of the Independent Curriculum, which emphasizes the Pancasila Student Profile Strengthening Project, which aims to produce students with critical, creative, and independent thinking skills, strong character, love for culture, and the ability to face global challenges with a deep understanding of their identity (Aini, Hidayatillah, et al., 2023; AR et al., 2023).

The Pancasila Student Profile is a concept designed as a guideline to shape the character and competence of students in Indonesia in accordance with the values of Pancasila, the basic ideology of the state (Rahayu et al., 2023). Based on the Merdeka Mengajar Platform of the Ministry of Education, Culture, Research, and Technology, the Pancasila Student Profile is a collection of abilities expected of students, which are derived from the principles of Pancasila. The Pancasila Student Profile has 6 dimensions, namely: 1) faith, devotion to God Almighty, and noble character, 2) global diversity, 3) independence, 4) cooperation, 5) critical thinking, and 6) creativity. In the context of national education, the Pancasila Student Profile aims to create individuals who are not only intellectually intelligent but also have good morals, social responsibility, and awareness of diversity (Masjudin & Suastra, 2023). This is realized through various learning efforts that are holistic, integrative, and relevant to current developments but still uphold the culture and values of Pancasila. In addition, the Merdeka Curriculum is an effort to transform education in Indonesia, which focuses on developing students' basic competencies, including literacy and numeracy (Priantini et al., 2022).

The low numeracy literacy among Indonesian students has become a significant concern in various national and international educational evaluations (AR et al., 2022; Ayuningrum et al., 2023). PISA results show that most Indonesian students struggle to understand and apply basic mathematical concepts in real-life contexts (Aini Ar et al., 2024). This issue affects students' academic performance and their ability to face the increasingly complex and technology-based challenges in the workforce (Aini, Misbahudholam AR, et al., 2024). Additionally, the STEAM approach adopted in various educational institutions remains general and lacks consideration of local cultural contexts (Ambarwati & Kurniasih, 2021). This makes learning less relevant to students' daily life experiences, ultimately affecting their motivation and engagement in the learning process. The lack of local cultural values integration in mathematics education also hinders efforts to strengthen students' cultural identity and character (Nadiroh et al., 2023). On the other hand, although the Pancasila Student Profile has been integrated into the national curriculum, implementing these values in learning still faces various challenges (Ar et al., 2024). One of the main challenges is how to connect these values with technical subjects like mathematics. The lack of effective learning models to integrate numeracy literacy, STEAM, and Pancasila values indicates a need for more in-depth research.

Existing literature shows that the STEAM approach has been widely applied in various countries to enhance 21st-century skills, including numeracy literacy. However, most of these studies focus on integrating disciplines without considering local cultural contexts. Research on ethnomathematics as part of mathematics education has also been conducted, but it is rarely linked to the STEAM approach holistically. Additionally, research connecting numeracy literacy with character formation, particularly in the context of the Pancasila Student Profile, is still minimal. Most studies focus on the cognitive aspects of numeracy literacy without considering how these skills can contribute to students' character development. The lack of research integrating these three elements—STEAM, ethnomathematics, and the Pancasila Student Profile—indicates a gap in the literature that needs to be filled.

This study offers a new approach by integrating STEAM, ethnomathematics, and the Pancasila Student Profile into a holistic learning framework. This multidimensional approach enhances students' cognitive skills and strengthens their character and cultural identity. This research significantly contributes to developing a more relevant and meaningful learning model by incorporating local values into STEAM learning. Additionally, this study provides strong justification for the importance of contextual and culture-based education in improving the quality of national education. The results of this research are expected to be used to improve curricula and learning strategies in various educational institutions and contribute to the international literature on culture-based education. Thus, this research is not only relevant to the academic context in Indonesia but also has the potential to be applied in various countries with diverse cultural backgrounds. The proposed approach in this study can serve as a model for other countries seeking to integrate local cultural values into modern education.

2. METHODS

The study's subjects were all students at SDN Karangnangka II during the 2024–2025 school year. The researcher chose them at random. This research site was chosen because: 1) limited resources make it hard for teachers to come up with effective and interesting ways to teach; 2) traditional teaching methods focus on memorization over understanding, which makes it harder for students to develop the critical and creative thinking skills that are important for the Pancasila Student Profile; 3) many students find math hard and scary, which makes them less interested and motivated to learn; and 4) ethnomathematics-based STEAM education has not been used before. This study uses a mixed-methods approach, which means that both quantitative and qualitative methods are used together in one study to get a better idea of the subject being studied. Aini, Misbahudholam AR, et al. (2024) say that this method lets researchers combine statistics and narrative data to get deeper insights and make the results more reliable. When either quantitative or qualitative approaches alone aren't enough to fully explore the study topic, mixed methods are often used. The study uses sequential exploratory methods, which means that researchers first collect and analyze qualitative data, and then they collect and analyze quantitative data (Gustini & Samsudin, 2022). The main goal of this design is to look into something in depth using qualitative data, in this case the use of ethnomathematics-based STEAM learning. Then, quantitative data will be used to support or add to the initial findings, especially when it comes to students' numeracy literacy skills and the Pancasila Student Profile. Trisnowali and Arifin (2023) say that STEAM learning has five stages: the observation phase (Observe), the ideation phase (New Idea), the invention phase (Invention), the production phase (Creativity), and the social phase (Society).

At the same time, local cultural values are used to add ethnomathematics into the process of teaching math. With the help of an ethnomathematics-based STEAM program, this study looked at students' Pancasila Student Profile and their ability to read and write numbers. Based on Windisch (Rezky et al., 2022), numeracy literacy skills are shown by communication skills, mathematical skills, representation skills, reasoning and argumentation skills, the ability to choose problem-solving strategies, and the ability to use language and symbolic operations well. There are six parts to the Pancasila Student Profile: 1) devotion to God Almighty and good character; 2) diversity around the world; 3) freedom; 4) teamwork; 5) critical thinking; and 6) creativity.

Table 1. Ethnomathematics-Based Steam Learning Steps

Ethnomathematics-Based STEAM Learning	Learning Process to Improve Numeracy Literacy Skills and Realize the Pancasila Student Profile
Observe	Students are motivated to observe various phenomena/issues found in the daily life environment (students believe in, are devoted to God Almighty, and have noble morals) that are related to the concepts in the learning being discussed (mathematization skills).
New Idea	Students observe and seek additional information (independently) about various phenomena or issues related to the topic being discussed (global diversity) based on patterns or principles found in the observation stage. After this, students think of new ideas from the existing information (representation skills). At this step, students need skills (the ability to choose strategies to solve problems) and analysis (critical reasoning).
Innovation	Students are asked to describe what needs to be done so that the ideas generated in the previous new idea step can be applied (reasoning and argument skills). This aims to create practical and new solutions based on the ideas that have been developed.
Creativity	This step involves implementing all suggestions and opinions from the discussion (mutual cooperation) regarding ideas that can be applied (creative). Students work on their creative aspects, integrating elements of design, aesthetics, and innovation, including the use of artistic techniques and mathematical techniques to improve the final result.
Society	This is the last step that students must have from the ideas produced by students (communication skills) in the form of a value that can be useful for social life (the ability to use language and symbolic operations). This aims to assess the impact of solutions or creations on society and the environment and reflect on how the solution meets needs or solves problems. At this stage, ethnomathematics is integrated into the form of cultural values that can be observed by students so that students can analyze the cultural values that exist in the mathematics learning that has been learned.

As part of this study, data was gathered through interviews and observations to find out how and why STEAM learning based on ethnomathematics was used in the classroom and how the Pancasila Student Profile of the students was used. It was possible to observe students as they learned and talk to their teachers and three students whose test scores showed they had a range of skills. The researcher also made a test with story questions to see how well people could read, write, and do math. To get qualitative data from the observation sheet and interview sheet, the following steps were taken: 1) reducing data, 2) showing data, 3) validating or triangulating data, and 4) drawing a conclusion. At the same time, the test instrument was looked at to get numeric data from the students' pre- and post-test scores to find out how to complete the students were in the traditional sense. A paired sample t-test with a significance level of 0.05 was also used to look at the test results and see how STEAM learning based on ethnomathematics affected the students' reading, writing, and math skills at SDN Karangnangka II. Before, the normality test (Kolmogorov Smirnov and Shapiro-Wilk) with sig. >0.05 was used for a preliminary test.

3. FINDINGS AND DISCUSSION

This research is a mixed method research with a sequential exploratory design to determine the implementation of ethnomathematics-based STEAM learning to improve numeracy literacy skills and realize the Pancasila Student Profile in the era of independent learning. The initial stage of this research is qualitative research, which analyzes the results of observations and interviews. The next stage is quantitative research, which explores the results of the tests given, namely pre-test and post-test. The research begins with the provision of a pre-test that must be completed by students, followed by the implementation of the learning process. Based on the results of the observations that have been made, the teacher carries out the learning process with the following steps:

Step 1. As part of science integration, the instructor describes geometric shapes and their uses in daily life in the observation step (Observe). The teacher prompts students to think about various geometric shapes in their environment. Local cultural aspects and mathematical principles are introduced and explored in this stage. Students are encouraged to observe STEAM-related products or practices. The teacher shows a picture of Asta Tinggi, a Sumenep Regency spiritual and cultural landmark, or historical relic. Sumenep Sultanate monarchs and nobility are buried here. Student groups used to pray for the ancestors buried there. This describes the Pancasila Student Profile: God-believing, morally upright pupils. To grasp math principles like symmetry, proportion, and repetition, the teacher has students inspect the Asta Tinggi building's carvings and construction. Asta Tinggi illustrates how local culture relates to math curriculum principles.

Step 2. Students use cultural and mathematical phenomena to generate new ideas in the new idea step. Based on mathematical concepts (representation skills), students create new solutions or innovations after observing carvings, building structures, or ethnic motifs. These are Pancasila Student Profile dimensions: independent, internationally varied, and critical thinking. The teacher uses GeoGebra to reconstruct geometric patterns like Asta Tinggi Sumenep's tomb carvings to help students think of new concepts. Redrawing these themes in GeoGebra helps students identify triangles, squares, circles, and geometric shapes. GeoGebra can help children comprehend math and culture interactively and technologically. PowerPoint can help students visualize their observations and understanding of Asta Tinggi's mathematical elements (the capacity to identify problem-solving solutions).

Step 3. In the innovation step, students develop and apply new ideas that they have previously developed into real solutions or innovative products to train students' reasoning and argumentation skills. The teacher invites students to create curved-sided geometric shapes using the pop-up technique as a form of engineering to build geometric models that can appear in three dimensions when opened. This technique can display geometric shapes such as cubes, blocks, triangular prisms, hexagonal pyramids, quadrilateral pyramids, spheres, cylinders, and cones. Pop-up geometric models using cardboard are an exciting way to combine geometry concepts with artistic creativity. The pop-up technique allows the creation of 3D models that appear when opened from a flat shape, providing an immersive visual experience.

Step 4. In the creativity step, in this context, the aim is to develop a deep understanding and relevance in learning mathematics by linking it to local culture and practices. At this stage, the teacher, as a facilitator, checks the 3D geometric models that students have made. Students work on their creative aspects, integrating elements of design, aesthetics, and innovation, including using artistic and mathematical techniques to design 3D spatial models. The teacher provides suggestions for the results of students' work while still giving students the freedom to develop their creativity according to the results of their thinking. At this stage, students present the results of the 3D spatial models that have been made to be evaluated together. Each student can provide suggestions or input on the results of their friends' work and improve the design of the spatial model together. This shows the dimensions of the Pancasila Student Profile, namely cooperation and creativity, which are applied in the learning process.

Step 5. Students evaluate and comprehend how their knowledge and abilities affect society and culture in the value stage (Society). The goal is to relate learning to the social context and give pupils a deeper understanding of its relevance. The teacher invites students to Asta Tinggi, an old tomb complex in Sumenep, Madura, East Java. Sumenep Sultanate monarchs and nobility are buried here. Asta Tinggi represents the Sumenep kingdom's past glory and greatness. Culturally significant, this location attracts tourists, pilgrims, and residents. Asta Tinggi became a royal mausoleum in the 18th century when the Sumenep Sultanate was at its pinnacle. The Sumenep kings and their families, notably Sultan Abdurrahman Pakunataningrat, one of the most prominent, were buried in this tomb. Sultan Abdurrahman also helped improve connections between Sumenep and other island kingdoms. Its Islamic, Javanese, and Madurese architecture makes Asta Tinggi famous. Beautiful buildings with intricate Madurese carvings make up this funerary complex. The grand entrance gate has enormous arches and reflects Islamic influence. The tomb complex has stone walls and big, decorative tombstones. The gates and pavilions of this complex combine Madurese and Javanese architecture with a mystical edge. At this stage, the teacher allows pupils to observe Asta Tinggi's traditional building forms that use symmetry, proportion, or geometry and explain the mathematical concepts they understand from practical instances. Students are asked to verbally describe ethnomathematics they find to improve their communication abilities in addition to demonstrate it connected to spatial mathematics. The following are Asta Tinggi Sumenep ethnomathematics.

3.1 The main gate of Asta Tinggi Sumenep

The main gate of Asta Tinggi Sumenep consists of two walls of the same size, meaning the length and width of the left and right walls are identical. Corresponding points on both walls are the same distance from the axis of symmetry. The axis of symmetry is an imaginary line that divides a shape into two parts that mirror each other. The corresponding sides on both walls have the same length. This shows that the two walls are mirror copies of each other. In many cultures, including local cultures in Sumenep, symmetry is often used in architectural design to create balance and harmony. Gates or entrances to essential buildings usually have symmetrical designs to show beauty and order.

3.2 Tomb Dome

Several tombs in Asta Tinggi have a roof. The roof on the tomb in Asta Tinggi Sumenep combines cube and cone shapes; the design integrates three-dimensional geometry with aesthetic and functional elements. The bottom of the roof is a cube that can function as the main structure or foundation. The cube has six sides of equal length and perpendicular angles, giving it a solid and structured shape. This cube provides stability and durability to the entire construction. A cone is placed on top of the cube as the roof of the roof. The cone has a circular base and tapers to a point at the top, giving it a conical and pointed shape. The cone shape often gives an elegant impression and allows for good rainwater flow. The roof used on the tomb in Asta Tinggi consists of a cube as the main structure and a cone that protects the top of the tomb. This cone can have various sizes and slopes according to traditional design or local aesthetics.

3.3 Asta Tinggi main landmarks

Two iconic buildings in Asta Tinggi Sumenep house sacred burials. Pangeran Pulang Jiwa, Pangeran Jimat, Temenggung Tirtonegoro, and Panembahan Notokoesoemo are buried. These buildings and tombs honour historical persons' contributions to society. The initial building has block, tube, and half-sphere shapes. Build the block into the building's foundation. This block has six rectangular sides and perpendicular angles. This shape underpins the construction and supports the above elements. A tube with two circular bases and curved sides rises above the block. This design creates a chic, spacious space. With its half-sphere canopy, the tube is protected from the elements and attractive. Half-spheres are three-dimensional shapes sliced by horizontal planes. This shape gives the building a smooth, curving top. Rainwater drains better with this form. The second building has overlapping pyramids and blocks. The building's basis is the blocks. Building blocks with six rectangular sides and perpendicular angles provide a solid base. Stability and strength support the elements above it. A pyramid on top of the blocks is the building's roof. The pyramid's rectangular base and four triangular sides meet at one place. This gives a peaked form and prominence. Conical pyramids are used in architecture to add interest and drain rainfall. Two overlapping pyramids are layers of pyramids. A higher, more layered design results from this complicated visual impact. The two overlapping pyramids have a larger lower pyramid on blocks at the bottom. An upper pyramid sits above the lower first pyramid, producing a tiered and conspicuous appearance.

Students learn how to calculate the surface area and volume of integrated geometric shapes in this value step (Society) as well as the shape of the Asta Tinggi building. The teacher illustrates surface area calculation and asks various questions to help pupils learn math. Students gladly answer teacher questions and can calculate the surface area and volume of geometric forms. Three students with low, medium, and high talents were interviewed by the researcher. The interviews showed that 1) the learning process improves numeracy literacy through a contextual approach that connects mathematics with local culture; 2) encourages students to realize the Pancasila Student Profile values; 3) connects mathematics with real-world applications that strengthen students' understanding of abstract mathematical concepts; and 4) fosters respect for local culture.

Table 2. Reliability test results

Alpha Cronbach	N of Item
.855	30

At the end of the study, the teacher gave a post-test to determine students' numeracy literacy skills in the form of 5 story questions that integrate culture so that it can make it easier for students and increase insight into local culture. Previously, in the initial stage, the researcher had given a pre-test to determine the initial abilities of students. The pre-test and post-test results of students at SDN Karangnangka II showed that the average scores were 48.00 and 81.00, respectively. This shows increased numeracy literacy at SDN Karangnangka II after implementing ethnomathematics-based STEAM learning. Furthermore, a normality test was carried out as one of the prerequisite tests in statistical analysis used to determine whether a data distribution follows a normal distribution. The following are the results of the normality test of research data using SPSS software.

Table 3. Normality Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Pretest	.105	32	.200	.953	32	.160
Posttest	.098	32	.200*	.970	32	.523
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

In the Kolmogorov-Smirnov test, the sig. The value for the pre-test and post-test is 0.200, which indicates a sig. Value>0.05 so that the data is usually distributed. In the Shapiro-Wilk test, the sig. The value for the pre-test is 0.160, and the sig. The value for the post-test is 0.523, which indicates a sig. Value>0.05 so that the data is usually distributed. Furthermore, the test results were tested using the *paired sample t test* Test, which is one of the parametric statistical tests used to compare the average of two groups of related or paired data. This Test is often used to see if a significant difference exists between two conditions experienced by the same group. In this study, the *paired sample t test* Test was used to check the average difference in students' numeracy literacy ability scores. The following are the results of the *paired sample t test* Test with SPSS software.

Table 4. Paired Sample t-test

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig. (2-tailed)
Pair 1	pretest – posttest	-33.00	8.45	1.50	-36.05	-29.95	-22.00	32	.001

The output results show $Sig.\ (2 - tailed)$ of 0.001 <0.05, so it can be concluded that ethnomathematics-based STEAM learning influences students' numeracy literacy skills in grade IV of SDN Karangnangka II. The overall results of the research data analysis show that the implementation of ethnomathematics-based STEAM combines modern science and technology concepts with cultural heritage, such as the architectural form of the Asta Tinggi building. Through this learning, students are invited to understand mathematics in the context of their own culture so that the relevance of mathematics in everyday life is more visible.

Students learn geometry, symmetry, and mathematical patterns found in traditional buildings in Asta Tinggi Sumenep. They can analyze the forms of spatial structures in the building structure to better understand the mathematical concepts applied in architecture. Ethnomathematics-based STEAM learning directly improves numeracy literacy skills because students are involved in solving real problems in a local context. Students learn about geometric shapes such as cubes, cones, blocks, and cylinders by analyzing local buildings (for example, the tomb dome or the main gate at Asta Tinggi). Thus, they memorize formulas and understand how these concepts are applied in traditional architecture. This is in line with the research results showing that STEAM learning based on local wisdom affects students' numeracy literacy skills (Aini, Misbahudholam AR, et al., 2024). STEAM learning based on ethnomathematics is in line with the 6 dimensions of the Pancasila Student Profile, not only encouraging academic skills and the development of student's character. In the process, learning is carried out more flexibly and contextually, where teachers act as facilitators and students have more freedom to explore knowledge relevant to their environment by the times and by the current Merdeka Curriculum.

4. CONCLUSION

This study conducted at SDN Karangnangka II demonstrated that ethnomathematics-based STEAM learning effectively integrates cultural heritage into mathematics education by incorporating the steps of Observation, New Ideas, Innovation, Creativity, and Society, in alignment with the six dimensions of the Pancasila Student Profile. The research findings showed that analyzing the ethnomathematical elements of Asta Tinggi Sumenep—such as the main gate, tomb dome, and landmark structures, which feature various geometric forms—enhanced students' comprehension of mathematical concepts while simultaneously fostering a deeper appreciation for their cultural heritage. The results suggest that implementing ethnomathematics-based STEAM learning not only makes mathematics more relatable and applicable to students' everyday lives but also strengthens cultural identity and creativity. However, this study is limited by its focus on a single school and a relatively small sample size, which may affect the broader applicability of its findings. Additionally, variations in location, local cultural elements, and educational contexts may influence the effectiveness of this approach. Therefore, future research should aim to apply ethnomathematics-based STEAM learning across diverse schools and regions, examine its long-term impact on students' mathematical reasoning, and assess teacher readiness and training needs for successfully integrating ethnomathematics into the STEAM curriculum.

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REFERENCES

Aini, K. (2021). Analysis of the online learning process during the Covid-19 pandemic. Journal of Teacher and Learning Studies, *4*(1), 218-228.

Aini, K. (2021). Student learning independence through blended learning type flipped classroom during the covid-19 pandemic. Digital Literacy Journal, *1*(1), 42-49.

Aini, K., AR, M. M., Hodairiyah, H., Arifa, S., & Astutik, C. (2023). Innovation of Independent Curriculum Learning Through E-Comic Development Training for Teachers of Sdn Kebunagung in Sumenep. Jurnal Abdimas Bina Bangsa, *4*(2), 1622-1635.

Aini, K., Hidayatillah, Y., AR, M. M., Bahri, S., & Astuti, Y. P. (2023). Training Project Strengthening Pancasila Student Profile at SDN Palongan. Bubungan Tinggi: Journal of Community Service, *5*(2), 659-669.

Aini, K., Prihandoko, A. C., Yuniar, D., & Faozi, A. K. A. (2020, May). The students' mathematical communication skill on caring community-based learning cycle 5E. In *Journal of Physics: Conference Series* (Vol. 1538, No. 1, p. 012075). IOP Publishing.

Aini, K., Indraswari, N. F., & Ridwan, M. (2022). Strengthening Students' Mathematical Understanding Through Tutoring at the "Rumbel Pena" Learning House. Manhaj: Journal of Research and Community Service, *11*(2), 207-217.

Aini, K., AR, M. M., & Ridwan, M. (2024). Growing Numeral Literacy Skills through Science, Technology, Engineering, Arts, Mathematics Based on Local Wisdom. *MIMBAR PGSD Undiksha*, *12*(1).

Aini, K., & Ridwan, M. (2021). Students'higher order thinking skills through integrating learning cycle 5e management with islamic values in elementary school. *Al-tanzim: Jurnal Manajemen Pendidikan Islam*, *5*(3), 142-156.

Aini, K., & Yasid, A. (2022). Students' high-level thinking skills through hybrid learning. Basicedu Journal, *6*(5), 7775-7781.

Ambarwati, D., & Kurniasih, M. D. (2021). The Influence of Problem Based Learning Assisted by Youtube Media on Students' Numeracy Literacy Skills. Cendekia Journal: Mathematics Education Journal, *5*(3), 2857-2868.

Andhianto, P. A., Fitriani, Y., & Nuroniah, P. (2024). Implementation of Project-Based STEAM Learning Strengthening the Pancasila Student Profile (P5) in PAUD Units. Murhum: Journal of Early Childhood Education, *5*(1), 314-326.

Ar, M. M., & Aini, K. (2023). The Implementation of Ecoliteracy as a Learning Resource to Improve Environmental Care Attitudes in Elementary Schools. In *Elementary School Forum (Mimbar Sekolah Dasar)* (Vol. 10, No. 1, pp. 122-134). Indonesia University of Education. Jl. Mayor Abdurachman No. 211, Sumedang, Jawa Barat, 45322, Indonesia. Web site: https://ejournal. upi. edu/index. php/mimbar/index.

Ar, M. M., Aini, K., & Hidayatillah, Y. (2024). Interactive Learning Media Development Training to Improve Elementary School Teachers' Digital Literacy-Numeracy in the Era of Independent Learning. Darmabakti: Journal of Community Service and Empowerment, *5*(01), 111-125.

AR, M. M., Aini, K., & Armadi, A. (2023). Students' Numeracy Skills Through Steam-Based Big Book Learning Media. Pendas: Scientific Journal of Elementary Education, *8*(3), 2894-2902.

AR, M. M., Asmoni, A., Aini, K., & Wardi, M. (2024). The Relationship of the 5th Batch Campus

Teaching Program to Literacy and Numeracy Skills in Elementary Schools. *AL-ISHLAH: Jurnal Pendidikan*, *16*(2), 1999-2011.

AR, M. M., Hardiansyah, F., Aini, K., Armadi, A., & Astutik, C. (2023). SDGs-Based Educational Game Training in an Effort to Form Character Through Strengthening the Pancasila Student Profile Project for Teachers of Mi Ziyadatul Ulum, West Kambingan Village. Jurnal Abdimas Bina Bangsa, *4*(1), 416-424.

AR, M. M., Zainuddin, Z., Aini, K., & Mutia, T. (2022). Analysis of Numeration Literacy Program Implementation In Low Class Learning. *Edumaspul: Jurnal Pendidikan*, *6*(2), 3134-3137.

Armadi, A., AR, M. M., & Aini, K. (2022). Training and Coaching Strengthening Character Education Based On School Culture InThe Upper Class Of Madrasah Ibtidaiyah Nurul Islam Tamidung Batang-Batang. *Mattawang: Jurnal Pengabdian Masyarakat*, *3*(2), 144-151.

Ayuningrum, A., Mabruroh, M., & Dewi, R. S. (2023). Analysis of literacy and numeracy teaching materials in elementary schools. Journal on Education, *6*(1), 9257-9267.

Fadhilah, P. N., Wardatussaidah, I., & Wardhani, P. A. (2024). Analysis of the steam approach in science learning in elementary school class V. Pendas: scientific journal of elementary education, *9*(2), 3280-3294.

Faiz, A., & Kurniawaty, I. (2020). The existence of local wisdom values of kaulinan and kakawihan barudak as an effort to instill national identity values. *Jurnal Education and Development*, *8*(4), 27-27.

Faozi, A. K. A., Fatekurohman, M., Aini, K., & Yuniar, D. (2020, May). Student's problem solving abilities in project based learning (pjbl) based on learning community (lc). In *Journal of Physics: Conference Series* (Vol. 1538, No. 1, p. 012070). IOP Publishing.

Febriana, R., Kurniasih, A., Setiyaningsih, E., & Maharani, O. P. (2022). Exploration of ethnomathematics at the Jogja monument. Pedagogy: Journal of Mathematics Education, *7*(1), 39-48.

Fitriyah, C. Z., & Wardani, R. P. (2022). Independent curriculum paradigm for elementary school teachers. Scholaria: Journal of Education and Culture, *12*(3), 236-243.

Gustini, D. (2022). Penggunaan Model Picture and Picture Untuk Meningkatkan Kemampuan Membaca Pemahaman Teks Cerita Fabel Siswa Sd. *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, *8*(2), 2138-2149.

Iswara, H. S., Ahmadi, F., & Da Ary, D. (2022, September). Implementation of Ethnomathematics in Independent Curriculum Through Cultural Hybridity in Semarang City. In Proceedings of the National Postgraduate Seminar (Vol. 5, No. 1, pp. 447-453).

Masjudin, M., & Suastra, I. W. (2023). Critical Analysis of Pancasila Student Profile Characters Reviewed from the Perspective of Educational Philosophy. Empiricism Journal, *4*(2), 486-498.

Nadiroh, S. M., Purbasari, I., & Ermawati, D. (2023). Analysis of the Implementation of Pancasila Student Profile Based on Literacy Culture at SDN 1 Brantaksekarjati. Journal on Education, *5*(3), 8602-8609.

Nasution, M. D., Nasution, I. S., & Sari, S. P. (2024). Students'collaborative skills with an approach ethno-steam project otk-otok game context in mathematics learning. *Jurnal tarbiyah*, *31*(1), 17-31.

Rahayu, D. N. O., Sundawa, D., & Wiyanarti, E. (2023). Pancasila Student Profile as an Effort to Form the Character of Global Society. Visipena, *14*(1), 14-28.

Priantini, D. A. M. M. O., Suarni, N. K., & Adnyana, I. K. S. (2022). Analysis of the independent curriculum and the independent learning platform to realize quality education. Journal of Quality Assurance, *8*(02), 238-244.

Yuniar, D., Prihandoko, A. C., Aini, K., & Faozi, A. K. A. (2020, May). The analyze of students' creative thinking skills on Lesson Study for Learning Community (LSLC) based on Science, Technology, Engineering, and Mathematics (STEM) approach. In *Journal of Physics: Conference Series* (Vol. 1538, No. 1, p. 012072). IOP Publishing.