Jurnal MATH-UMB.EDU
Vol 13, (3), 2026

IMPLEMENTATION OF THE TEAMS GAMES TOURNAMENT (TGT) LEARNING MODEL BASED ON THE E THNOMATHEMATICS APPROACH OF LUBUK LINGGAU CITY TOURISM TOWARD JUNIOR HIGH SCHOOL STUDENTS' MATHEMATICAL CONNECTION ABILITY

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Received: 09-06-2026 Revised: 29-06-2026 Accepted: 10-07-2026 Published: 22-07-2026

Abstract

This study was conducted to investigate the effect of the Teams Games Tournament (TGT) learning model, integrated with an ethnomathematical approach based on tourist attractions in Lubuk Linggau, on the mathematical connections made by junior high school students. This study used a quantitative approach with a pre-experimental method and a single-group pretest-posttest design. A total of 20 eighth-grade students participated in this study. Data collection was carried out through pretest and posttest measurements of mathematical connections, supported by observation forms and interview guidelines. The ethnomathematical approach was implemented by using the Watervang tourist attraction as a contextual learning resource for teaching plane geometry. The collected data were analyzed using descriptive statistics techniques and N-Gain analysis to determine the improvement of students' skills after the learning intervention. The results showed that the implementation of the ethnomathematical-based TGT learning model made a positive contribution to improving students' mathematical connections. Through learning activities that integrate geometric concepts found in real objects at the Watervang tourist location, students are able to connect mathematical ideas more effectively and recognize their relevance to everyday situations. These results suggest that integrating ethnomathematics into the TGT learning model can be a meaningful and effective alternative for building mathematical relationships among students in the early years of secondary education.

Keywords: Teams Games Tournament, Ethnomathematics, Mathematical Connection Ability, Plane Geometry, Watervang Tourism

INTRODUCTION

Mathematics serves as a fundamental field of study that helps students develop logical reasoning, systematic thinking, critical judgment, and creativity. By engaging in mathematics learning, students can enhance higher-order thinking skills that are essential for solving various problems (Nugroho et al., 2021).

Recent research shows that mathematical connection skills contribute to improved understanding of concepts, abilities in problem solving, and students' confidence in learning mathematics (Marlina et al., 2026).

Mathematical connection skills remain a challenge in mathematics learning. Many students are able to solve routine problems but struggle to connect multiple mathematical concepts within a single problem. This leads to students' inability to apply mathematics in everyday life. Various studies have shown that low mathematical connection skills are influenced by teacher-centered learning and the lack of real-world contexts in the learning process (Marlina et al., 2026).

One alternative that can be used to address these problems is the use of a cooperative learning model. Cooperative learning provides opportunities for students to learn actively through group collaboration, discussion, and social interaction.

One cooperative learning model widely used in mathematics is the Teams Games Tournament (TGT) model integrates group learning activities with academic games and tournaments to increase students motivation and participation during learning. Various studies have shown that the application of the TGT model contributes to the improvement of students' mathematics learning outcomes, learning activities, mathematical communication skills, and problem-solving abilities.

The research findings of Nadila Uswathun (2025) highlighted the effectiveness of the Teams Games Tournament (TGT) learning model in strengthening students' mathematical communication ability. Compared with conventional learning approaches, the TGT model enabled students to achieve more substantial improvements in their mathematical competencies.

Other research shows that the application of the TGT model combined with learning media can significantly improve students activity and learning outcomes. Dani (2026) found that the use of TGT assisted by Canva increased student activity and learning completion because students were more active in participating in discussions and academic competitions.

In addition to using innovative learning models, mathematics learning also needs to be linked to the students' culture and environment. One approach currently being widely developed is ethnomathematics. This approach emphasizes the connection between mathematical concepts and culture, traditions, and community activities. Various studies over the past five years have shown that ethnomathematics can improve students' conceptual understanding, mathematical representation skills, mathematical connection skills, and learning motivation (Pratama, 2026).

Ayu et al., (2022) explain that ethnomathematics plays a crucial role in helping students understand mathematical concepts through cultural contexts close to their lives. Cultural integration in mathematics learning not only improves conceptual understanding but also helps preserve local culture.

The findings reported by Sarah et al. (2022) revealed that geometric concepts are widely found in local Indonesian culture, such as traditional houses, historic buildings, traditional textile motifs, places of worship, and tourist attractions. These findings indicate that geometry learning has great potential to be developed Through an ethnomathematics approach (Nugroho et al., 2021).

Lubuk Linggau City has various tourist attractions that can be utilized as resources for ethnomathematics-based mathematics learning. One such attraction with significant potential is Watervang. Watervang is a historic tourist destination featuring various geometric shapes, such as rectangles, triangles, trapezoids, circles, and other geometric figures (Widada et al., 2020).

Utilizing the Watervang tourist attraction in mathematics learning allows students to explore geometric concepts contextually, making learning more meaningful. Research conducted by Virliani et al., (2026) demonstrated that embedding ethnomathematical aspects within mathematics learning can support the enhancement of students' mathematical connection ability. The study emphasized that cultural and environmental contexts serve as meaningful learning resources that enable students to associate mathematical ideas with real-life experiences and develop a deeper conceptual understanding.

In addition, Marlina et al., (2026) found that ethnomathematics-based teaching materials were able to improve students' mathematical connection abilities because students found it easier to understand the relationships between mathematical concepts through familiar contexts.

Based on various previous studies, it can be concluded that the TGT learning model and the ethnomathematics approach both have the potential to improve students' mathematical abilities. However, research that combines the TGT learning model with the ethnomathematics approach based on local tourism in Lubuk Linggau City, especially Watervang tourism, is still very limited. Therefore, this research was undertaken to examine the influence of the Teams Games Tournament (TGT) learning model integrated with an ethnomathematics approach based on Lubuk Linggau City tourism on junior high school students' mathematical connection ability in the topic of plane geometry (Virliani et al., 2026).

METHOD

The study utilized a quantitative research framework in which a single group of participants was assessed before and after the instructional treatment through a One-Group Pretest–Posttest design.

This research design was selected to examine the effect of implementing the Teams Games Tournament (TGT) Learning model integrated with an ethnomathematics approach based on tourism objects in Lubuk Linggau City on students' mathematical connection ability. A description of the research design is presented in Table 1.

Table 1. Stage Experiment

Pretest	Treatments	Postest
O_1	X	O_2

Description: O_1 = pretest, X = treatment using the TGT learning model based on ethnomathematics, and O_2 = posttest.

This investigation took place at a junior high school in Lubuk Linggau City, with the school's identity intentionally withheld for confidentiality purposes. The research involved 20 eighth-grade students who were selected using purposive sampling. The instructional content focused on plane geometry, and learning activities were supported by the use of the Watervang tourist attraction as a contextual resource grounded in ethnomathematics.

Several instruments were utilized to gather the research data, including tests of mathematical connection ability, classroom observation sheets, and interview protocols. Students' mathematical connection ability was evaluated by comparing their performance on assessments administered before and after the implementation of the learning intervention. The evaluation covered three main aspects: students' ability to establish relationships among mathematical ideas, connect mathematical knowledge with concepts from other fields, and use mathematics to address problems encountered in everyday situations.

The learning process was conducted in three sessions. The first session was used for the pretest. The second session was used to implement the Teams Games Tournament (TGT) learning model based on an ethnomathematics approach. At this stage, students were divided into groups and engaged in discussions, academic games, and tournaments related to geometric shapes based on geometric objects found at the Watervang tourist attraction. The third session was used for the posttest and interviews.

To provide an overview of students' performance, the obtained data were subjected to descriptive statistical analysis, which included measures of central tendency and dispersion such as the mean, maximum value, minimum value, and standard deviation.

The increase in students' mathematical connection skills was calculated using the N-Gain formula. The results of the N-Gain calculation are then interpreted into high, medium, and low categories.

$$g = \frac{Score\ Postest - Score\ pretest}{Score\ maximum - Score\ pretest}$$

RESULTS AND DISCUSSION

This study was conducted to examine the impact of applying the Teams Games Tournament (TGT) learning model based on the ethnomathematics approach to tourism in Lubuk Linggau City on students' mathematical connection skills in the topic of plane figures. The research data were obtained through a mathematical connection ability test administered before treatment (pretest) and after treatment (posttest). The pretest and posttest results were examined through descriptive statistical procedures to provide an overview of students' mathematical connection ability before the learning intervention and to evaluate the changes that occurred after the treatment.

Table 3. Summary of Students' Pretest and Posttest Descriptive Statistics

Statistics	**Pretest**	**Postest**
Number of students	20	20
Highest score	58	88
Lowest score	40	74
Mean	49,00	80,55
Standard deviation	5,10	4,12

The analysis of the research data revealed a marked increase in students' mathematical connection ability following the learning intervention. This improvement was evidenced by the rise in the average score from 49.00 before the implementation of the learning program to 80.55 after the intervention. These results indicate that the integration of ethnomathematical contexts into the Teams Games Tournament (TGT) learning model played an important role in strengthening students' ability to establish mathematical connections. Next, an analysis was carried out on the improvement of students' mathematical connection abilities using the N-Gain formula.

Table 4. N-Gain Calculation Result

Category	**Number of students**	**Percentage (%)**
High	12	60
Medium	8	40
Low	0	0
Total	20	100

Based on the N-Gain analysis, an average value of 0.62 was obtained, which is in the moderate category. This indicates that the TGT learning model based on the ethnomathematics approach is effective in improving students' mathematical connection skills.

The results of the N-Gain calculation show the level of improvement in students' mathematical connection abilities after participating in learning using the Teams Games Tournament (TGT) model based on the ethnomathematics approach to Lubuk Linggau City tourism.

Student Activity Observation Results Observations are carried out during the learning process to determine students activities during learning.

Table 5. Results of Students Activity Observations

Courage to express opinions	Percentage (%)
Activeness in group discussions	88
Cooperation between group members	90
Participation in academic games	92
Participation in tournaments	95
Courage to express opinions	85
Average	90%
Category	Very Good

Based on observations, students demonstrated good engagement throughout the learning process. Group discussions, academic games, and tournaments encouraged active students participation. Interview Results.

Interviews were conducted with several students after the lesson was completed. The results indicated that students found it easier to grasp the concept of plane figures because the learning was connected to real-world objects found at the Watervang attraction. Furthermore, students felt more motivated to participate in the lesson because of the games and tournaments, which made the learning environment more enjoyable. Discussion

The findings of this study suggest that the integration of the Teams Games Tournament (TGT) learning model with an ethnomathematics approach based on tourism contexts in Lubuk Linggau City contributed positively to the development of students' mathematical connection ability in plane geometry topics. This improvement can be observed from the increase in students' achievement after participating in learning activities that incorporated the TGT model and utilized the Watervang tourist attraction as a contextual source of learning.

Mathematical connection skills are one of the essential skills students must possess in learning mathematics. This ability enables students to connect various mathematical concepts, relate mathematics to other disciplines, and apply mathematical concepts in everyday life. According to the OECD (2023), Students are expected to possess the ability to integrate mathematical concepts and transfer their understanding to a variety of contexts, as this competence is crucial for addressing the challenges of twenty-first-century learning and life.

The findings suggest that the improvement in students' mathematical connection ability was facilitated by the TGT instructional model. This approach created an interactive learning environment in which students actively participated in teamwork, educational game activities, and tournament-based learning experiences. These activities encourage students to exchange ideas, discuss, and build conceptual understanding together, making the relationships between mathematical concepts easier to grasp.

The findings of this study align with those of Uswathun (2025), who stated that the Teams Games Tournament (TGT) learning model contributes to the enhancement of students' mathematical communication abilities because it provides an active, enjoyable learning experience and encourages direct students involvement in learning. Through group collaboration and healthy academic competition, students become more motivated to understand the material being studied.

In this study, an ethnomathematics approach was implemented through the use of the Watervang tourist attraction in Lubuk Linggau City as a learning resource for plane geometry. Various facilities and buildings in the Watervang tourist area contain geometric elements that can be used as learning media.

Students were encouraged to identify rectangles, squares, triangles, trapezoids, and circles found within the tourist area. This activity helped students connect the concept of plane geometry to real objects they encounter in their daily lives.

The results of this study support the findings of Iskandar et al (2022) who stated that various cultural objects and local environments contain geometric concepts that can be used as resources for mathematics learning. The study showed that traditional houses, historic buildings, tourist attractions, batik motifs, and various other cultural products have great potential as ethnomathematics-based mathematics learning media.

The use of tourist attractions as learning resources is also in line with research by Wulandari et al (2024), which states that ethnomathematics learning provides a more contextual and meaningful learning experience because students learn through environments close to their lives. In addition to improving understanding of mathematical concepts, this approach can also foster students' appreciation for the culture and potential of the local area.

The results of this study indicate that students more easily understand the relationships between mathematical concepts when learning is linked to real-world contexts. This finding supports the research of Kusuma and Dwipriyoko (2021), who stated that ethnomathematics-based learning can improve students' mathematical connection skills because mathematical concepts are not learned in isolation but are instead connected to real-world situations familiar to the students.

Furthermore, Busrah and Pathuddin (2021) explain that ethnomathematics serves as a bridge between formal mathematics taught in schools and students' real-life experiences. This way, students not only understand formulas and problem-solving procedures but also the meaning and application of mathematical concepts in real life.

The improvement of students' mathematical connection skills is also supported by the research results of Pathuddin et al (2021), which showed that implementing ethnomathematics in mathematics learning can increase students engagement in the learning process. When students perceive that the material being studied is related to their environment, their motivation and interest in learning tend to increase.

Based on observations, students appeared active throughout the learning process. They participated in group discussions, collaborated on assignments, participated in academic games, and competed in tournaments. These activities demonstrate that the TGT model is capable of creating an interactive and enjoyable learning environment.

This finding aligns with research by Hia et al (2025), which states that cooperative learning combined with contextual activities can increase students participation and engagement in mathematics learning. Furthermore, research by Fitriyah (2021) shows that using cultural context in mathematics learning can increase students motivation because it makes learning more engaging and relevant to their lives.

Interviews revealed that most students found it easier to understand the concept of geometric shapes when they related them to objects found at the Watervang tourist attraction. Students also stated that the games and tournaments made the learning process more enjoyable than conventional learning. These results support research by Maulina et al (2023), which found that students responded positively to ethnomathematics-based learning because it helped them understand the material more concretely.

The findings of this study are also in line with the research of Qonitah and Kusaeri (2024) which showed that students who learn using an ethnomathematics approach have better mathematical connection skills than students who learn using conventional methods. Research by Qomarisyahda et al. (2025) also concluded that ethnomathematics-based learning can improve mathematical connection skills because students are trained to connect mathematical concepts with various life contexts.

Furthermore, the results of this study support the research of Virliani et al (2026), who found that ethnomathematics-based learning significantly improved junior high school students' mathematical connection skills. According to the study, the use of local cultural and environmental contexts in mathematics learning helps students understand the relationships between mathematical concepts more deeply.

This research finding is also supported by research by Marlina, Hidayat, and Supriatna (2026), which states that ethnomathematics-based teaching materials can improve students' mathematical connection skills because the learning is presented in a context close to their experiences. This makes it easier for students to understand the relationship between mathematical concepts and real-world situations.

In addition to mathematical connection skills, ethnomathematics-based learning also contributes to support the enhancement of students' mathematical abilities thinking skills. Research by Sakdiyah (2025), Arafah et al (2025), and Azzahra et al (2025) shows that integrating local culture into mathematics learning can improve students' mathematical thinking skills, representational skills, and problem-solving abilities.

Of local culture in mathematics learning can also improve students' numeracy literacy because they learn using contexts close to everyday life. This aligns with research by Agustin et al (2025), which shows that ethnomathematics research continues to develop because it has been proven to improve various students' mathematical abilities while preserving local culture.

Overall, the results of this study indicate that the implementation of the Teams Games Tournament (TGT) learning model based on the ethnomathematics approach to tourism in Lubuk Linggau City is able to create active, contextual, and meaningful learning. Through a combination of cooperative activities, academic games, and the use of the Watervang tourist attraction as a learning resource, students gain learning experiences that help them understand the relationship between mathematical concepts and their application in everyday life. Therefore, this learning model can serve as an alternative approach mathematics instructional activities aimed at enhancing junior high school students' mathematical connection skills in the material of flat shapes.

CONCLUSION

The findings of this study demonstrate that the implementation of the Teams Games Tournament (TGT) learning model, integrated with an ethnomathematic approach based on the tourism context in Lubuk Linggau, has positively contributed to the mathematical connections students make when learning plane geometry.

The results showed an increase in the students' mathematical connections, with an average score rising from 49.00 before the implementation of the program to 80.55 after the intervention. Furthermore, observations and interviews indicated that the students responded positively to the learning process. They were more active in discussions, expressed their opinions, and were more motivated to participate.

Therefore, the Teams Games Tournament (TGT) learning model, based on an ethnomathematic approach to tourism in Lubuk Linggau, can be used as an innovative, contextual, and effective alternative to mathematics education to improve students' mathematical connections in the lower years of secondary education.

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