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Exploring symmetry concepts through Hindu's wedding rituals: Ethnomathematics and ethnomodelling perspectives

Kharika Parajuli[1], Bidya Nath Koirala[2*]

[1]*Golden Nature Boarding School, Nepal*
[2]*Tribhuvan University, Nepal*

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ABSTRACT

This study explores the concepts of geometric symmetry embedded in Hindu marriage ritual activities. A community-based descriptive ethnographic approach was employed in a Hindu-majority community in Pokhara, Kaski District, using local participants' experiences and the researchers' lived observations. Data were collected through observations, field notes, photographs, videos, and reflective insights, and analyzed using a data reduction process to generate meaningful themes. The findings reveal that Hindu marriage rituals incorporate diverse symmetry concepts and properties, including vertical and horizontal lines of symmetry, infinite lines of symmetry, as well as rotational and translational symmetry. These forms of symmetry align with key topics taught in school geometry. The results demonstrate that mathematical ideas, particularly geometric symmetry, naturally emerge from traditional cultural practices, supporting culturally responsive teaching and learning. Integrating Hindu ritual practices into classroom instruction can enhance students' and teachers' conceptual understanding through visualization and contextualization, while providing accessible and well-designed learning resources. Furthermore, such integration promotes creativity, critical thinking, and entrepreneurial skills, contributing to engaging and meaningful learning experiences. The study highlights a strong connection between cultural traditions and formal geometric concepts, and have practical implications for teachers, students, and policymakers in developing context-based teaching strategies, curriculum reforms, and professional development programs.

INTRODUCTION

The meaning of a symmetry word can be interpreted differently by different individuals. But for this paper, we have used the term symmetry as a fundamental concept that permits mathematics, arts and beauty. When a shape has been turned, rotated, shifted, or folded in half and remains identical to its original form, this is known as symmetry. Symmetry is not only a key concept and extremely valuable in school geometry, but also its concepts can be seen crucially in diverse cultures, in nature, traditional cultural practices and day-to-day work activities. It is seen in the Hindu marriage rituals as well. For example, the bride and groom wear seven chakras by holding fire torches in the marriage. They take seven rounds in Kanyadan (offering a daughter to the son-in-law), which symbolises lifelong commitment, support and love. The arts of creating design, doing activities, symbolic action and constructing shapes in the mandap (a sacred, ceremonial, pure and elevated place), handicrafts are examples of the connection of beautiful symmetry concepts. These ideas, suggested by Parajuli and Koirala (2022a, 2025), emphasise contextual understanding of the

*Corresponding author: koiralabidyanath@gmail.com

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symmetry concepts. There, we can see a visual representation illustrating four types of lines of geometric symmetry, which are mentioned in school mathematics in general and geometry in particular.

As per recent literature, symmetry is not only a mathematical property, but it is also a profound cognitive tool deeply connected to human perception and structural thinking. It helps us recognise balance, pattern, and structure in the physical and cultural world. This is also across cultural and lived experiences (Öçal & Öçal, 2021). Vande Walle et al. (2019) further define symmetry as the congruence between parts of an object, where one half mirrors the other, reinforcing its relevance in both natural and designed environments. Therefore, symmetry is a fundamental concept of mathematics that permeates art, culture, and nature meaningfully. Symmetry fosters spatial reasoning and aesthetic appreciation, making it an ideal bridge between abstract mathematics and tangible, culturally grounded experiences, making learning not only easier but also deeply meaningful and joyful. Therefore, the connection between mathematical principles and Nepali Hindu cultural wedding activities can help enhance students' knowledge construction and appreciation of symmetry concepts through lived experiences that are culturally relevant (Johnson & Moldavan, 2023; Parajuli, 2023b; Parajuli & Koirala, 2025).

Hence, symmetry, a rule that is a fundamental concept in geometry, refers to the invariance of a shape or object. That means the shape or object or structure remains the same or invariant, or doesn't change its shape and features under transformations. However, this paper also aligns with Prabawati & Amarulloh's (2025) perspective, who indicated that each individual's day activities, within their particular group culture practices, customs and celebrations of social rituals, their lived experiences have strong connections with mathematics. They can find the symmetry of tangible objects and other mathematical concepts, too. These practices exemplify how everyday Brahmin cultural activities naturally embody mathematical ideas, illustrating the core principles of ethnomathematics and ethnomodelling. In this paper, ethnomodeling refers to an approach that helps to develop mathematical models for teaching and learning by connecting with various marriage cultural ceremonies through practices that are observed and embedded. If these activities are represented and analysed through mathematical knowledge and concepts is known as ethnomathematics. Therefore, ethnomodeling refers to an approach that represents cultural practices through the construction of mathematical models to facilitate teaching and learning for studying and applying ethnomathematical perspectives. Thus, ethnomathematics makes use of modelling by attempting to use it to establish a relationship between the local conceptual framework (emic) and the mathematics embedded in relation to local designs.

Following on the ideas of these authors and drawing from our own academic, cultural, and research experiences in ethnomodelling and ethnomathematics-based teaching, training, and learning, we have sought to actively engage students, teachers, and teacher educators in classroom and training contexts focuses on exploring various areas of school mathematics such as arithmetic, geometry transformation and symmetry and algebra sequence and series connecting them with cultural practices, including Hindu marriage rituals and diverse locally generated artifacts. As a transformative practice of co-learners and mentors, we are encouraging them to learn mathematics linked with diverse cultural practices like rekhi (sacred linear platform for performing worship), Hawankunda (sacred fireplace), construction, chalno (bamboo-made sieve), natural leaves of the various plants, dhaka cloth patterns, honeycomb patterns, temple design, kitchen used items and day-to-day activities through a web of spiral design. We continuously encourage them to engage to see and explore through multi-dimentations, innovative and critical perspectives connecting ideas with geometry, algebra, and arithmetic through mathematical modelling, real visualisation and animating them using technology and mathematical software GeoGebra (Parajuli & Koirala, 2022a; 2022b; 2025). In doing so, we noted the importance of Rosa and Orey's (2024) finding that teachers should actively bring cultural practices into mathematics instruction in classroom practices to enhance students' understanding through an ethnomathematical and ethnomodelling perspective for the construction of knowledge critically through meaning-making processes for authentic and meaningful learning. Following the work by Koirala and Parajuli (2022) and Parajuli and Koirala (2022a; 2022b), we also engaged ourselves and the students in the cultural interaction of marriage

rituals and the art of drawing rekhi for learning and teaching from the ethnomathematics and ethnomodelling perspective.

Ethnomathematics refers to the mathematical knowledge and practices embedded within the cultural traditions, lifestyles, and everyday activities of local communities, often passed down orally through generations. This knowledge is deeply rooted in tasks such as cooking, building homes, weaving, and playing traditional games, especially those carried out by women. When students learn to link the traditional knowledge of their communities with formal mathematics, their curiosity, engagement, and sense of connection to the subject increase. This approach establishes mathematics not just as a textbook subject but as knowledge experienced and applied at all levels of life. It challenges educational colonialism by recognising local knowledge and takes concrete steps toward making education multicultural and inclusive. The combined use of ethnomathematics and ethnomodeling reduces the gap between students, teachers, and communities, transforming mathematics education into a practical approach.

Therefore, the terms "ethnomathematics" and "ethnomodelling" were coined by D'Ambrosio, who is also called the father of ethnomathematics (D'Ambrosio, 1990). In doing so, we noted the importance of the ideas of Fantinato and Leite (2020) in the same areas. We found ethnomathematics as a genuine process of understanding and developing mathematical concepts embedded within cultural traditions, lifestyles, and everyday activities passed down through generations and done through practices in a particular local community of different cultures. On the other hand, ethnomodeling is the study of mathematical ideas and procedures translated and elaborated by different living cultural groups' practices into mathematical models, formulas, languages, and principles by connecting them mathematics curriculum in a holistic process. This kind of approach helps to make teaching and learning more relevant to get contextual reality and lifelong and student-centred suggested by Koirala and Parajuli (2022), Orey and Rosa (2021), Parajuli and Koirala (2025) and Setiaputra et al. (2025). The combined use of ethnomathematics and ethnomodeling is linked with special activities in the Hindu wedding process, in which the authors try to reduce the gap between Western cultural mathematics classroom practices to decolonization for meaningful understanding of the relationship between mathematics and community activities.

Working with the students and teachers as well, we came to an understanding that each culture contains geometry, algebra, probability, mathematical analysis and symmetric transformation. If we encourage students to engage and unveil them, they will retain mathematics in a multi-dimensional and innovative way, which critically helps to save in their minds for a long time (Apriandi & Ayuningtyas, 2022; Rosa & Orey, 2023). We were also aware that visual shapes are fundamental to understanding concepts, formulae and building other reasons and proofs in geometry (Uygun, 2020). They are also helpful in teaching and learning theoretical and practical knowledge, together with community experience. In the process of wedding ceremonies, we noted that the priest has constructed square mandapas. The wedding house is decorated with flags of different colours. Relatives were made a garland of green dubo grass and zari for exchanging brides and grooms in marriage. The gold ornaments of various designs and the mangal sutra are given to the bride. The students and authors realised that the decorated things, materials used, places and ornaments contain symmetry.

In this backstop, we explored gaps in the learning of cultural mathematics and classroom mathematics: we noted that they must be complementary but we found that they are alienated to each other. This made use set the purpose of this article to explore the symmetry concepts and their types in geometry transformation,particularly reflective, rotational, and translational, embedded in Hindu marriage rituals to make these two mathematics complementary to each other. It also examines the educational value of using culturally grounded resources to contextualise mathematics. Based on the purpose, this research study answered the following two research questions:

1. What types of lines of symmetry are embedded in the traditional Hindu marriage wedding practices (e.g., every piece created for activities like constructing the mandap, decorative bunting flags, and the design of ornaments, etc.)?
2. How can geometrical knowledge of symmetry generated from Hindu wedding practices be effectively integrated into classroom teaching and learning to enhance contextual and meaningful learning?

In response to these two questions, we adopted a naturalist ethnographic method, supported by a relevant theoretical framework enabling deeper exploration of the types of lines of symmetry by reasoning embedded in cultural practices and traditions. Symmetries are observed in Hindu wedding places and rituals. The squire *Mandap* (fireplace), the triangular shape decoration paper, the oval shape *dubo* (aspicius grass) garland and the gold chain, the half circular trumpet, Doli (palanquin) are the symmetries of Hindu cultural marriage. The pictures of these symmetrical shapes are seen in the pictures in the analysis section of this paper. Using these shapes and context, this article focuses on the linkage of different types of line of symmetry concepts.

METHODS

Naturalistic ethnography research method

As suggested by Scott-Fordsmand (2025), the method is consistent with the aims of the research design, which seeks to develop empirically grounded theories. This study used a naturalistic ethnographic research process. This method is a flexible and pragmatic way of using available resources and looking for a pertinent framework for analysis. It also helps to conduct research inquiry pragmatically and flexibly as suggested by Madden (2022), Scott-Fordham (2025), and Timmermans and Tavory (2022). As a result, their recommendation, in conjunction with our research and personal lived experience as the Hindu community, has shown that this method is crucial for delving in-depth into our community's marriage rituals and understanding their insights and perspectives. Through this method, we are the researchers and also participants also observed and studied very closely how a Brahmin community conducts the cultural and marriage ritual practices and how people are doing during these activities. It also helps to understand what kind of mathematical content and concepts emerge and can be generated from those activities and contexts. It provided us with rich, holistic, and contextual insight into the complexity of the Hindu wedding ceremony and social insight, comprehensive views of the various cultural practices, and qualitative data for analysis obtained from the sociocultural perspective (Liamputtong, 2023; Scott-Fordsmand, 2025; Taherdoost, 2022). Having been born, raised, and lived within the same Brahmin community and with extensive academic experience in mathematics teaching and learning and training, we also used Huang's (2023) ideas to explore how our own lived experiences, along with the community's traditional practices and wisdom, can be meaningfully linked to generate symmetrical types, shapes, and rules. As a result, we have demonstrated the importance of this approach for delving deeply into a community and comprehending it.

Study location

The area of this research was Pokhara of Kaski District, Nepal. We collected data during the wedding process by engaging directly with one's family and culture. Since the first author's daughter participated in the marriage-related ceremony, such as engagement, she also provided an insider's understanding and observation of the entire organisational process. The first author also observed participants' engagement for five consecutive days, took photos and videos with prior consent of the marriage organisers, priest, and bride well as groom.

Data collection tools and producers

In alignment with the recommendations of Scott-Fordsmand (2025), we collected the data by adopting multiple methods of inquiry, including in-depth inquiry to facilitate a holistic and contextually grounded understanding of this research problem. In the first step, we engaged in and participated in the wedding ceremony for up to five days regularly. We undertook close participant observations, informal conversations, and first-hand experiences of every piece of art, artifact, created activity, the construction process of mandop, and purchased designs of ornaments. In every event, how they managed, we figured out from the insider the line of symmetry concepts and mathematical patterns, as suggested by them (Soebagyo & Luthfiyyah, 2023). We also had an informal conversation with the available people at the wedding. The accumulated experiences and ideas from observation suggested by Bakerville and Myers (2015) and Yudito et al. (2021) were the source of information to figure out symmetrical concepts, shapes, and ideas.

Authenticating or trustworthiness of the study

Following Lincoln and Guba's (1985) book on Naturalistic Inquiry, we used four terms to ensure the trustworthiness of the research findings. Among them criteria of credibility and reliability inherently establishing the rigour and reliability of the authenticity of this study. They are credible to ensure the accuracy of the findings through persistent observation and member checking. We engaged in prolonged fieldwork, which included sustained observation of our local marriage and wedding practices and repeated interactions with participants. We are the authors from the same community, so our life experiences are also reflected in depth, critically, and described in depth. Data were collected through multiple in-depth sources. We triangulated multiple sources of evidence, interviews, observations, and contextual notes and enhanced the accuracy of interpretations. We also provided a thick description of the context of the Hindu wedding ceremony and cultural practices. Transferability to claim its applicability in the new context by supplying the thick description; dependability for the consistency of this research process through the use of inquiry audit by the Sanskrit scholar; and confirmability to reduce our Hindu biases through peer debriefing. This detailed observation of the Hindu marriage context allows us to judge the relevance of our insights beyond the study site. We also critically reflect on our life experiences. Hence, by carefully observing in-depth Brahmin wedding community practices and patterns, conducting interviews with diverse participants, and systematically documenting the analytic process, we sought to uphold the trustworthiness of the data. Hence, we believe that these strategies collectively were given to strengthen the credibility and reliability of this qualitative study's findings. In this paper, we used the words ethnomathematics as the local knowledge (emic) to academic mathematics concept linkage in this paper. Therefore, we derived the mathematical ideas, procedures, images and practice from the Hindu wedding culture ritual.

Data analysis and interpretation

In accordance with the guidelines of Bjerre-Nielsen and Glavind (2022) and Creswell and Poth (2016), we followed a systematic seven-step (see I to 7 here) methodological framework, which rigorously guided us in the collection, analytical procedures, and interpretation for the meaning-making process. They were:

1) Determining whether the problem is appropriate to be investigated using an ethnographic approach.
2) Finding Brahmin wedding cultural ceremonies to study.
3) Selecting themes or issues to be used as research in wedding culture.
4) Observing wedding ceremonies.
5) Determining the type of ethnography to be used.
6) Gathering information through in-depth observation, field photos, and videos taken by an Android mobile and
7) Listing the sets of mathematical shapes and concepts from marriage activities as the final product for analysis and interpreting the meanings, functions and consequences of their actions and practices in the Hindu wedding.

The data thus collected were authenticated through triangulation and then categorised into groups. Wolcott's ethnographic method of description, analysis, and interpretation and the qualitative analysis process were also used for data analysis in this study. The purpose of the collection and observation was to allow us to replay, watch, and be seen throughout when presenting and analysing the data (Sarantakos, 2013) and also as a way of confirming the findings. Figure 1 presents its details.

FINDINGS

Translational and vertical axis of symmetry on wedding venue

As a sign of sanctity, auspiciousness, and safety of marriage, colourful designs of decorative triangular-shaped festoons called Torana that are made from leaves, flowers, fabric, and other items, are hung at the main entrance of the wedding venue. Such activities were used to bring positive energy to make the wedding venue attractive, colourful, holy, happy, and enthusiastic as shown in Figure 2.

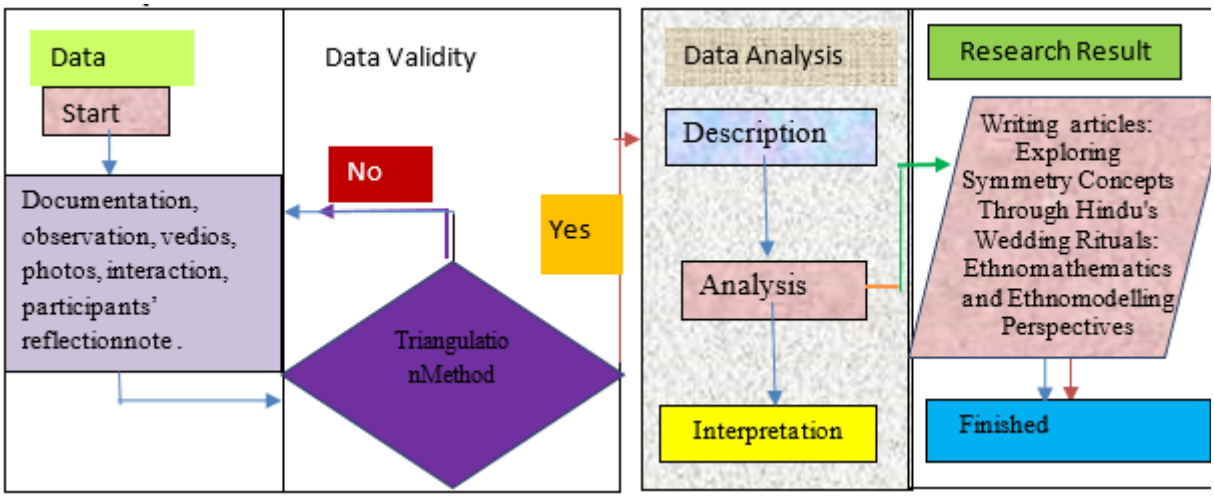

Figure 1. Flowchart of data collection and analysis approach in ethnomathematics of wedding ceremony

Figure 2. Single and composite translational symmetry generated from decorative bunting flags

In Hindu weddings, the entrance gates of both the bride's and groom's homes are adorned with sacred festoons and decorations to honour the deities and warmly welcome guests. Figure 1 captures a culturally rich movement where neighbours and invited relatives gather at a beautifully decorated gate to respectfully receive the groom's procession (Janti) during the first author's daughter's wedding. There, our students and we both had noted reflection, vertical lines of symmetry, and translation together that split a welcome or form into two equal parts while reflecting by vertical lines as shown in Figure 2. Students in written notes expressed that they were genuinely delighted to engage in such an enriching mathematics learning environment, which encouraged them to think critically. Through visualization, they gained a deeper understanding of translation, vertical lines of symmetry, and the connections to their own cultural wedding practices. The spelt parts we saw there are identical to each other. We also called this line the mirror line, or axis of symmetry, because it splits symmetrically in a vertical way. At the welcoming entry gate, the bariyats (marriage procession) are welcomed with those arrangements and hospitality. was decorated with many colourful triangular shapes pasted on long ropes. There, the students, including us, saw mixed reflection and verified them before writing down on paper. The students reconstructed these shapes and festoons into imaginary vertical lines parallel to the y-axis. They tested the single translation equivalent to reflection, followed by reflection parallel to the y-axis as well in Figure 2.

Reflectional symmetry (vertical mirror) through visualization of Garlands

In weddings, the bride and groom exchange garlands made of green dubo and zari. This garland is called "Varmala" (auspicious wedding garland) as shown in Figure 3. It is considered a symbol of love, respect, and commitment to each other and also a demonstration of acceptance of the bride and groom to each other. When a bride and groom wear garlands, the left and right sides of each garland often look the same. This is a wonderful example of 'vertical reflectional symmetry.' We can draw a

Figure 3. Green Dubo and Zari Garlands for exchanging brides and grooms

Figure 4. Lines of symmetry from the display visible part of the constructed wedding Mandap and used materials

vertical line down the center of the garland; on both sides we can see match like an image on a mirror. Also, when the couple stands side by side, their matching garlands can show symmetry across a vertical line between them.

Figure 3 shows how the students' informants generated meaningful vertical line of symmetry concepts in geometry, and they came up with the idea to use their knowledge in the classroom environment. The garlands contain a vertical line of symmetry, as we have seen one identical half of its mirror image of the other half on a vertical line at the center if we fold it**.** The yellow imaginary line is drawn on it, or the fold on the garlands shows symmetrical halves. In Figure 3 we can see the properties that one half of it mirrors the image of the other half when we place the mirror on a vertical line at the centre.

Rotational and four lines of symmetry together from Mandapand decoration design

A Mandap (wedding platform)is a temporary, square-shaped structure constructed for the purpose of marriage ceremonies. When constructing the wedding mandap, its boundaries are marked using a specific four-hand-span measurement (local) taken of the bride or groom. Following this measurement, the Mandap is constructed as a square. A fireplace is constructed in its center as shown in Figure 4.

It is decorated with flowers and greenery, textiles, and crystals. Banana trees are placed at the four corners of the Mandap. Our students and we together saw rotational symmetry of order 4 and lines of symmetry together in the center part of the mandap, shown on the left side of Figure 4. If we rotate (turn) the center point of the square mandap by 90^0,180^0 ,90^0, 270^0 and 360^0, we can see exactly the same shape. In Figure 4, mantras are pronounced by the priest. The bride and groom offer charu (a mixture of rice, barley, butter, etc.) in the fire. This is called homam. Four possible lines of symmetry can also be made in the mandap. The first author tested by drawing and demonstrating four lines and can see the left side and middle side of Figure 4**.** Similarly, various colors decorated materials like cylindrical drums, circular-shaped items, and round breads, symbolizing we can make infinite numbers of lines of symmetry.

Figure 5. Vertical line of symmetry from artistically crafted traditional bridal Palanquin

Figure 6. Infinity and vertical line of symmetry from golden jewelry Mangalsutra and Rani necklace worn by the bride in the neck in wedding

Vertical line of symmetry from Chamdani/ Doli (traditional bridal Palanquin) equipment

Traditionally, reflecting cultural and ceremonial importance, doli orchamdani, artistically crafted wooden palanquins, are used to carry a bride inside during a wedding for her farewell, marking the beginning of her journey from her parental home to a new chapter in life. The Doli (palanquin) is a platform made of several long sticks joined together, with the ends of two sticks sticking out on both ends of the Doli for the Doli carriers to hold it when the bride is seated on it during the farewell ritual at her maternal house. Panchebaja (a group of five musical instruments) is played as a farewell Nepali song with a precise note.

Figure 5 displays the bride's brothers carrying "Chamdani/doli," symbolizing their love, respect, and protective role with depth and strength of familial bonds. We can see the concept of a vertical line of symmetry as if it folds originally; we can see both sides perfectly reflecting on the mirror, enhancing its aesthetic appeal and cultural significance, which can also be divided into two identical shapes.

Line of symmetry from Mangalsutra, Rani necklace design

Figure 6 shows the necklace that the bride wears gives the idea of a vertical, horizontal, and diagonal infinite number of lines of symmetry that divide it into two halves, as these all pass through the centre.

DISCUSSION

This section presents the discussion that contains a description of the study result. Then,we compare the findings using reputable scientific journals and the literature.This study highlights the powerful resources and context for pedagogical potential while integrating culturally situated knowledge, particularly from Hindu wedding rituals, into the teaching and learning of school geometry line of symmetry. The visual representations in Figures 1 to 6 provide compelling evidence

of various geometric lines of symmetries, concepts, shapes and principles on vertical, rotational, and reflective forms, embedded within ritual artifacts and practices. From the layout of the wedding *Mandap* constructed using local units such as *hat* and *bitta*, we can convert it into equivalent standard measurements like cm, m, and feet. Also, from the intricate patterns in *rekhi* drawings and the aesthetic symmetry in traditional ornaments like the *mangalsutra* and *rani haar*, we can develop the geometric shapes with actual measurements from these cultural decorative things. They reflect a deep reservoir of scientific reasoning, logical structure, and deeply aesthetic value-laden. As such, Hindu wedding rituals offer a living repository of mathematical ideas, particularly in geometry transformations reflection or line of symmetry, with significant pedagogical implications from the perspective of ethnomathematics and ethnomodelling. How might we move beyond abstract, decontextualized instruction and toward meaningful engagement rooted in students' lived experiences?

This study builds upon and extends the findings from the work of Parajuli and Koirala (2022a, 2022b), Parajuli et al. (2023), Parajuli and Koirala (2024**,** 2025), and Rosa and Orey's (2024) who argue that ritual and local cultural practices in Hindu communities weeding ceronomies are imbedded with mathematical as well as geometrical thinking. This environment can function rich source of visualization for geometry line of symmetry concepts learning critically. Their ethnographic studies demonstrated that learners grasp abstract 2D and 3D concepts and properties in line of symmetry concepts more effectively in teaching and learning when these concepts are contextualized within familiar cultural experiences to the students. Aligning with ethnomathematics emic or local knowledge in learning, which emphasizes the mediation of symmetrical knowledge, properties and shapes through cultural activities, their used instruments and activities, this study shows that students' cognitive and social engagement with local practices can be significantly enhanced when mathematical ideas are connected visually to their lived realities thinking creatively.

The symmetrical structures within the Hindu wedding context, such as mandap construction designs using locally used units' hat and bitta or the repeated, mirrored motifs in traditional ornaments and handicraft weebing design are not merely decorative. They carry cognitive, symbolic, and didactic value. Such practices reflect what Prahmana and D'Ambrosio (2020), Parajuli and Koirala (2025), Syahnia et al., (2024), and Yusran et al., (2024) call "ethnomathematics where geometrical knowledge is not imposed externally but emerges organically from cultural logic and practice. This challenges the dominant narrative of geometry teaching and learning as a culturally neutral discipline and instead aligns with the perspectives advocated by Parajuli and Koirala (2022a, 2022b), Parajuli (2023), Parajuli and Koirela (2024, 2025) who conceptualized ethnomathematics develop through this context as the relationship between mathematics, cultural practices link with cultural for classroom resources materials that embedded in diverse cultural practices. Therefore, not only Hindu wedding rituals but also teaching and learning linked with students' diverse cultures help to improve.

The practices and materials used that we see in Figure 1 to 6 help generate various symmetries, single and composite reflection (vertical line of symmetry) and other geometry shapes, knowledge can be linked. Using this context, we can search the process and answer questions such as, how can we use such color rekhi, the design of constructed mandaps, and their used artistic materials and gold designs for teaching and learning shapes, concepts, and properties in geometry and other areas? How can we harvest students' diverse ritual activities into meaningful mathematics practices? How can we engage students in learning geometry and other areas of mathematics through their ritual cultural practices and used equipment? And how can their ritual practices transform mathematical knowledge? Figure 1 to 6 help to know the answers to the aforesaid questions.

Integrating such culturally situated knowledge into the curriculum can also promote both equity and engagement, especially among students from traditionally marginalized or underrepresented communities. Furthermore, these findings resonate with the view that mathematics education should recognize and harness students' cultural backgrounds as assets rather than deficits (Gay, 2013). The results that we found resemble the findings of Parajuli and Koirala (2022a, 2022b), and Parajuli (2023). It says that Hindu wedding places, traditional practices, used equipment, and activities give many mathematical concepts practically. It is there in other religions but in different forms and structures (Parajuli et. al, 2023; Parajuli, 2023; Parajuli & Koirala, 2025). This finding advocates for integrating ethnomathematics into school curricula, harnessing

cultural practices, rituals, used artifacts and temple arts of design as potent resources for advancing mathematical education.

As Briones et al., (2023), Koirala and Parajuli (2022), and Wulandari et al. (2024), argue, embedding cultural activities and elements in pedagogy not only enhances conceptual understanding but also fosters identity affirmation and a sense of belonging in the learning process. However, teacher and teachers educator need for the knowledge, skils and pedagogical design on how to implement ethno math realte with academic math from pedagogical perspective the classroom practices minimizing the gap of theory and praticial application. Similarly, in alignment with Amidi et al., (2025) the study we found that when the meaningful hindu cultural weeding ceronomial contexts are combined with learner teacher and learner autonomy, mathematics learning becomes deeper, more relevant, understandable, applicable and more enduring. Thus, ethnomathematics and ethnomodelling provide a powerful pedagogical pathway for developing mathematically literate, culturally grounded, and independent learners transforming cultural experiences into mathematical knowledge in the Nepali context.

As claimed by the works of literature Abasi and George (2025), Arsaliev (2017), Koirala and Parajuli (2022), and Rosa and Orey, (2025), ethnomodelling is an interdisciplinary framework that is the intersection of cultural anthropology, academic mathematics, and mathematical models. Hence, we can establish the relations between Hindu wedding practices connecting with the mathematical modeling process by elaborating on deeply rooted mathematical concepts, problems, and questions of line of symmetry by exchanging the local for standard measurement units and line of symmetry using construction designed and shaped of square mandaps, symmetrical doli (palanquins), sacred duboa garlands, and intricately designed ranihaar necklaces. These shapes and measurement units can be exchanged into standard units to interpret, analyze, explain, and solve real-world problems globally. We can develop the models of 3D shapes like square-based cuboids through visualization by transforming culturally embedded practices into meaningful teaching and learning models.

As Parajuli and Koirala (2025) and Orey (2025) propose, as they claimed, constructing a square mandap using equal measurements of four hat bitta on all four sides and diagonals can demonstrate perpendicular bisectors for teaching properties of squares in school geometry. Similarly, rotational symmetry can also be modelled and translated from local measurement units (e.g., hands, fingerspans) into standardized measurement systems. It can be tested by rotating the mandala by 90^0, 180^0, 270^0, or 360^0; we can get congruent shapes as rotational symmetry. Such contextual mathematical modelling not only validates indigenous practices but also creates life-connected, engaging pedagogical resources that align with students' lived experiences. Ethnomodeling, in this sense, brings mathematics closer to the learner by embedding it within cultural realities, promoting deeper cognitive engagement and value-based learning using the Brahmin wedding.

Integrating insights from ethnomathematics and ethnomodelling into formal geometry school curriculum, particularly the concept of symmetry, supports global efforts to decolonize mathematical knowledge and promote context-sensitive, culturally responsive pedagogy (Pathuddin & Nawawi, 2021; Pradhan, 2023). This study, grounded in the context of Hindu wedding traditions practices, demonstrates that every cultural community possesses its embedded mathematical knowledge, which, when recognized and incorporated into classroom practice, can create inclusive and engaging learning environments. Students from diverse backgrounds bring unique cultural experiences that, when shared, foster collaborative learning, reflective thinking, and the development of cultural identity (Mustika et al, 2022; Orey & Rosa, 2020). Participant perspectives in this study further affirm that cultural practices, such as those seen in ritual symbolism and design, enhance students' understanding when mathematics is taught through their lived experiences. These findings align with socio-ethnomathematics, constructivist and inquiry-based approaches, where learners actively construct knowledge through interaction, contextual relevance, and exploration. Such transformation in pedagogy requires teachers to be equipped with cultural awareness, creative instructional strategies, and familiarity with local knowledge systems (Parajuli, 2024). Through thoughtful engagement, students realize that learning mathematics through cultural contexts can foster critical thinking, creativity, self-direction, and meaningful understanding (Pradhan et al., 2021 and Yusran et al., 2024).

To do this, there is a great need for teachers' support. Here, students realized that learning mathematics linked with diverse cultures like Hindu wedding activities can provide transformative practice, critical, creative, critical self-direction, and self-directional effectiveness (Munthahana & Budiarto, 2020). For this, students and teachers should have ideas of local knowledge, creative approaches, and research techniques Parajuli and Koirala, (2025) as cultural projects and self-motivation with respect for otherness, which helps mutual understanding between different cultural practices to school classroom practices. Incorporating ethnomathematics and Ethnomodelling teaching and learning can encourage teachers and students to incorporate culturally relevant, meaningful discourse, facilitating broader dialogue between students, teachers and the environment. This approach not only strengthens mathematical learning but also promotes mutual respect, intercultural dialogue, and the integration of meaningful cultural discourse into everyday classroom practice.

We all know that the aim of mathematics education from a multicultural viewpoint is to help students reflect upon their culture, learn from it and finally feel reachful in mathematics learning (Pradhan et al., 2021). In this context, Gay (2013), and Prabawati and Amarulloh (2025) have suggested that for a deeper understanding of the geometry properties and concepts, we practically need to vary and contextualise mathematics to make it meaningful, authentic, and applied. This finding is also consistent with the findings Syahnia et al., (2024) and Yusran et al., (2024) who found that school-level students are still in the concrete operational stage while mathematics is an abstract subject and that students taught from an ethnomathematical viewpoint yield better memory, to increase critical thinking and better success in learning and earning scores than those taught from a traditional method. It also helps establish the fact that ethnomathematics approaches can be used in the research to create effective models through computer animation technology.

CONCLUSION

Based on the analysis, discussion, and findings, this ethnographic study concludes that Hindu wedding rituals function as living mathematical spaces in which geometric symmetry is culturally rooted, visually performed, and socially shared. Used arts and celeberation of weeding ceronomy practices such as the mandap, dubo and doli garlands, ornaments, necklaces, rectangular decorative pieces, and ceremonial instruments naturally embods symmetric in general and reflection and vertical lines of symmetry in particular through their balanced forms and patterned designs. Within these practices, symmetry emerges not as an abstract geometric rule but as a meaningful cultural expression experienced through real objects, shared narratives, and collective participation. By engaging me in interpreting both their own and others' wedding traditions, the study shows that geometric understanding is constructed through observation, interaction, dialogue, and modelling. Students move beyond identifying symmetry to experiencing it in culturally familiar contexts, deepening both conceptual understanding and emotional engagement. This process also nurtures pride in cultural heritage and affirms local knowledge as a legitimate source of mathematical insight. The findings further indicate that Hindu marriage activities provide accessible and powerful pedagogical resources when teachers adopt culturally responsive, reflective, and inclusive practices. Through ethnomathematics and ethnomodelling process, culturally grounded traditions become cognitively rich learning environments that support meaningful, relevant, and culturally sustaining mathematics education.

Implication of the study

We are sure that this study provides compelling evidence that mathematics teachers can effectively integrate Hindu cultural, local tradition-grounded activities, such as wedding garland exchanges and ceremonial flags, into their instructional approaches, enabling students to generate mathematical understanding from cultural practices. Mathematics teachers can apply these ethnomathematics and ethnomodelling approaches to help students generate mathematics from their cultural activities of celebrating rituals and arts of drawing rekhi in Mandap. Teacher educators can also create meaningful learning experiences, bridging students' lived cultural experiences with academic school mathematics. They can enable students to search for mathematics and link it with the school math with minimal clues from them. This type of practice can foster deeper engagement in conceptual understanding and motivation among learners. The policymakers, on the other hand,

can decide to redesign the curriculum and teacher training packages so that teacher educators, teachers, and students can generate mathematics from their culture, go for modelling, and relate their learning to school mathematics relevantly and meaningfully.

Limitations of the study

The cultural practices connected to the Hindu Brahmin marriage ritual are the only focus of this study. It focuses on the connection of school academic mathematics with the usage of ornamental flags, the shape and placement of wedding mandaps, and traditional items like the ceremonial palanquin (doli), gold necklaces, etc. The study only focused on how the properties and concepts of lines of symmetry might be illustrated using various activities and instruments of marriage and weddings. The results are context-specific and might not apply to other cultural.

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Ethics approval and consent to participate	This research was done by obtaining the consent of research participants.
Competing interests	The authors declare that no conflicting interests in publishing this article.

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