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# *Play in Scientific and Mathematical Non-Formal Education. Bagh Chal, a Tigers-and-Goats Game*

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Scientific education must be addressed to contributing to citizenship education (Acevedo, 2004).
This approach influences which sciences and mathematics are to be taught, and how these disciplines are to be taught.
Playful education and educational environments organized around games foster important STEM-related skills (Bergen, 2009; Ferguson, 1995; Fernández-Oliveras & Oliveras, 2014, 2015; Newcombe, 2010; Williford, 1992).
Non-formal contexts favour enquiry-based approaches, active participation, and motivation (Eccles & Templeton, 2002).

## Methods

Ethnomathematical Microprojects (Oliveras, 2005) are interdisciplinary work plans, designed around a sociocultural object of interest. They aim for meaningful learning through active and responsible participation fostering intercultural education.
We have adapted this methodology to the study of games as ethnomathematical sociocultural objects, creating what we term Playful Projects. These are sequences of learning, communication, and reflective action activities.

Playful Projects encompass a wide variety of sociocultural, scientific, and mathematical aspects. They are specially addressed to non-formal educational contexts.
Playful Projects are conducted in one-hour sessions in which the research team encourages player enquiries, registers relevant observations, and makes audiovisual recordings.

## Results

**Playful Project "Bagh Chal, a Tigers-and-Goats Game"**

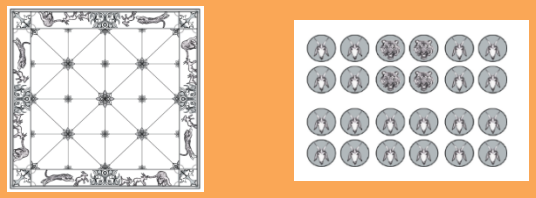

Fig. 1. Bagh Chal board and pieces

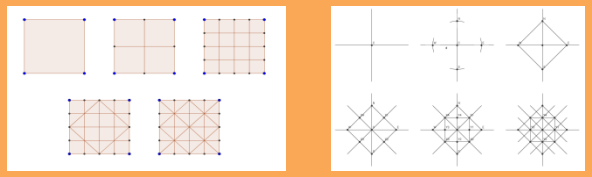

Fig. 2. Different board construction procedures

This Nepali game represents a hunting scenario in which 4 tigers and 20 goats compete. Tradition says it was created by Mandodari, daughter of Mayasura, King of the Asuras, and apsara nymph Hema.
STEM-related aspects participants work: spatial thinking and orientation, abstract codification, argumentation, strategy, problem solving, deductive reasoning, biological interactions such as predation, other technological and artistic skills.

## Conclusion

World board games, here considered ethnomathematical sociocultural objects, have great interest and potential from a STEM educational perspective, enabling rich and motivating activities to be designed around them. Through these activities, participants can develop multiple skills.
The Playful Projects methodology is presented as a holistic approach to playful teaching with the aim of contributing to scientific and mathematical education in non-formal contexts. Also, a specific activity sequence designed around the Nepali traditional game bagh chal is presented, accompanied by STEM-related aspects of interest.

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