



The Ethnoscience of Oro Kino-Kino Traditional Play to Stimulate the Collaborative Skill and Learning Outcomes of Physics Learning

Albert Lumbu^{1,2}, I Ketut Mahardika¹, Supeno¹, and Wachju Subchan¹

¹The Doctorate Programs of Science Education, Universitas Jember, Jember, Indonesia

²Physics Education, Universitas Cenderawasih, Jayapura, Indonesia

albertlumbu@gmail.com

Abstract

Ethnoscience-based knowledge helps produce new ways of managing the learning process. Ethnoscience is a bridge to explain knowledge in a society scientifically. This research aims to determine the ethnoscience of the traditional game Oro Kino-kino to stimulate collaboration skills and learning outcomes in physics learning. This research is a literature review and field observation. The data collection technique for this literature study is to use a database search tool to search for literature sources and field observations of the traditional game, oro kino-kino, starting from the terms of the game, number of players, rules, and steps. Ethnoscience of traditional games has been carried out by researchers in the principles of physics and the form of physics concepts in learning physics in everyday life. Integrating ethnoscience into physics learning is very important because it significantly impacts efforts to increase learning motivation, interest in learning, cooperation, and student learning outcomes. Ethnoscience in traditional games is very suitable for and familiar to students. The traditional game Oro Kino-kino in physics learning has the potential to make a positive contribution to increasing student motivation. The traditional game Oro Kino-kino in physics learning is related to the material of dynamics and equilibrium of rigid bodies because it can stimulate collaboration skills.

Keywords: ethnoscience; local wisdom; physics learning; traditional game of oro kino-kino

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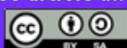
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INTRODUCTION

This 4.0 industrial revolution indicates related information technological finding implementation in the industrial world (Aceto et al., 2019). This era presents challenges and obligations for many states, including Indonesia, to prepare the future generation with excellent graduate

education and 21st-century skills. The skills include communication, collaboration, critical thinking, creativity, and global competitive capability (Rosana et al., 2021; Van Laar et al., 2017; Widiyatmoko et al., 2023). The 21st century is full of cognition. This century has spread information and



developed technology. The characteristics of the 21st century include technological development and information communication with vast synergy (Kwangmuang et al., 2021; Schultz & Schultz, 1998).

Indonesia is a state with various local wisdoms. Local wisdom is the way of life of a community in a particular area regarding the natural environment in which they live (Alimah, 2019). Unfortunately, local wisdom has faded along with technological development (Khotimah, 2021). One of the solutions is introducing the Indonesian culture to school learners (Jamalludin et al., 2021). The traditional game is among the wisdom of locals (Hariyono et al., 2023). Local wisdom preservation requires an integrated approach, including physics learning (Mungmachon, 2012; Rumiati et al., 2021). Ethnoscience learning with traditional games, such as Oro Kino-Kino, is interesting, especially when the learning is associated with physics learning.

Most citizens in Papua Province live in villages with specific and unique features. The citizens living in Papua belong to some groups. This ecosystem brings the diversity of the local natives in terms of culture. Studies about the traditional knowledge of Papua citizens, especially local citizens, are limited to inventory studies (Triwiyono & Adiwikarta, 2015).

Ethnoscience is a review activity based on the science of the local traditional natives, based on inherited beliefs and myths (Nwafor & Ozioko, 2018; Rahayu & Sudarmin, 2015). Ethnoscience is inseparable from trial-error knowledge, but the science is not translated into scientific knowledge. This happens because ethnoscience at the local or regional levels has no starting point as the realization of trial-error cognition.

Traditional games have characteristics that have elements of

tradition and are closely related to traditional habits in a particular community group. Papua has a rich cultural heritage (Yektingtyas & Modouw, 2017). Ethnoscience is explored in many contexts, but exploration in the Papua Sentani context is rare.

This game could develop collaborative skills and the ability to collaborate effectively. The skill could improve respect for other groups and train flexibility and compromise to reach commonly shared objectives by assuming collaborative tasks as a collective responsibility and respecting every individual contribution (Trilling & Fadel, 2009). Collaborative skills are the key to achieving an effective learning process. This skill is useful in the real world. Collaboration is a social interaction and specific learning process in which the participants actively and constructively solve problems (Lee et al., 2015). The collaborative skill of learners is noticeable in the task provision with some elements, such as determining the objectives, creating the plan, selecting and choosing the strategy, trying solutions, revising the plan, and many more. Traditional games could accommodate the activities. One of them is the traditional game of Oro Kino-Kino.

The integrated traditional game could improve the learners' collaborative skills in physics lessons. However, this integration presents challenges for the teachers. The physics learning at junior high and senior high schools, especially in Papua, specifically in Jayapura, does not attach to the local culture, although Papua has many cultural diversities for learning materials. The learning in Papua has also not been fully applied to technological development. The associated physics concepts with the local culture are familiar with ethnophysics. This physics learning is useful for developing the learners' cognition, psychomotor skills, and

morals (Putranta, 2023; Thapliyal et al., 2022).

Cultural-based physics learning or ethno-physics provides local cultural association with the concept of physics (Atmojo, 2012; Misbah et al., 2024; Misbah et al., 2023). Ethno-physics could encourage the learners to recognize their cultures. The local potency from each region of Indonesia is useful as the contextual learning medium (Budiarti, 2022; Ibe & Nwosu, 2017). This routine experience becomes part of the local culture (Budiarti, 2017; Muhammad et al., 2022). Local wisdom preservation is important to integrate with physics learning (Deta, 2023; Fitriah et al., 2021; Misbah et al., 2020). This research aims to determine the ethnoscience of the traditional game Oro Kino-kino to stimulate collaboration skills and learning outcomes in physics learning.

METHOD

This research applies a literature review study (Hossain, 2020; Susanti et al.,

2022) and field observation. The researchers reviewed the literature to determine various theories and formulate the research objectives. The data collection technique for this literature study uses a database search tool to search for literature sources. Data collection began by using traditional game keywords and stimulating collaboration skills in Google Scholar. The researchers obtained articles from 35 library sources. Then the articles were screened by skimming, namely reading the journal's core, focusing on the topic, suitability of the journal content, suitability of sources known from the abstract, keywords, introduction and conclusion, and finally, 25 articles were obtained in Table 1 journal-title data. The researchers conducted field observations about the traditional Oro Kino-Kino game, starting with the game requirements, the number of players, the regulations, and the steps.

Tabel 1 Journal title data

No.	Journal
1	Preliminary research in developing smartphone-based e-module learning materials using the ethno-STEM approach in 21st-century education. <i>Journal of Physics: Conference Series</i> , 1876(1)
2	The Role of Physics Teachers in the Era of Industry Revolution 4.0. <i>Difraksi</i> , 1 (1), 48-52.
3	Engklek Game Ethnoscience-Based Learning Material (Egeblm) To Improve Students' Conceptual Understanding and Learning Motivation. <i>Indonesian Journal of Science Education</i> , 12(4), 635-647
4	The Effect of Applying the Ethno-STEM-Project-Based Learning Model on Students' Higher-Order Thinking Skill and Misconception of Physics Topics Related to Lake Tempe, Indonesia. <i>Indonesian Journal of Science Education</i> 12(1), 1-13.
5	Analysis of Physics Concepts in the Traditional Game Kerapan Kereweng as Physics Teaching Material. <i>Jurnal Ilmu Fisika Dan Pembelajarannya (JIFP)</i> , 5(2), 48-54.
6	Analysis of Physics Concepts in Traditional Game of Gasing as Physics Teaching Material. <i>Navigation Physics: Journal of Physics Education</i> , 3(2), 74-79
7	Analysis of Physics Concepts in Games Traditional Tajog. <i>Proceedings of the 2nd International Conference on Physical Education, Sport, and Health (ICoPESH 2022)</i> , 1, 47-52
8	Development of Vygotsky's Theory and Implications in Mathematics Learning at Mis Rajadesa Ciamis. <i>Primary: Jurnal Pendidikan Guru Sekolah Dasar</i> , 11(1), 35
9	Determining Students' Higher Thinking Skills Profile Using Creative Problem-Solving Model Indicators Integrated with Predict-Observe-Explain. <i>Indonesian Journal of Science Education</i> , 12(3), 387-400
10	Project-Based Learning Via Traditional Game in Physics Learning: Its Impact on Critical Thinking, Creative Thinking, and Collaborative Skills. <i>Indonesian Journal of Science Education</i> , 12(2), 286-292.

- 11 The Influence of Caologium Discussion Learning Based on Engklek Games on Physics Learning Outcomes. *Jurnal Pendidikan Fisika*, 5(1), 47
- 12 Physics Learning Integrates Ethnoscience Traditional Games. *Konstan - Jurnal Fisika Dan Pendidikan Fisika*, 6(2), 66–73
- 13 Development of an Android-Based Ethnophysics Application in the Traditional Game Gasing to Improve Students' Understanding of Physics Concepts. *Jurnal Inovasi Dan Pembelajaran Fisika*, 10(1), 63–73.
- 14 Analysis of the Physical Concept of Mechanical Energy in the Traditional Game Engrang as Physics Learning Material. *Jurnal Pendidikan Fisika*, 9(2), 131
- 15 Exploration of the physics concept of equilibrium of rigid bodies in traditional game of engklek as physics learning material. *OPTIKA: Jurnal Pendidikan Fisika*, 7(1), 109–120
- 16 Developing Physics Comic Media a Local Wisdom: Sulamanda (Engklek) Traditional Game Chapter of Impulse and Momentum. *Journal of Physics: Conference Series*, 1397(1)
- 17 Exploration Concept of Physics on Local Wisdom in Traditional Game Angkle (Engklek) as Student Teaching Material. *Berkala Ilmiah Pendidikan Fisika*, 11(1), 40.
- 18 Ethnophysics Study of the Concept of Work and Energy in the Aceh Traditional Game “Taloe Yeye” as Physics Teaching Material. *Berkala Ilmiah Pendidikan Fisika*, 11(1).
- 19 Literature Review on the Use of Educational Physics Games in Improving Learning Outcomes. *Journal of Physics: Conference Series*, 1805(1).
- 20 The Development of Interactive Learning Media of Parabolic Motion Lesson Materials with Patil Lele Traditional Games. *Berkala Ilmiah Pendidikan Fisika*, 9(2), 126
- 21 Exploration of Physics Concepts Based on Local Wisdom Kolecer Traditional Games. *PENDIPA Journal of Science Education*, 5(1), 70–78
- 22 Study of traditional games about physics ethnoscience learning in the Tambusai district. *Toward Adaptive Research and Technology Development for Future Life*, 2689(17)
- 23 The development of ecosystem education game based on Baluran National Park for senior high school. *Journal of Physics: Conference Series*, 1465(1)
- 24 Identification of Science-Physics Concepts in The Traditional Game of Bambu Gila and Its Implementation in Learning. *Edu Sciences J*, 4(1), 1–10.
- 25 Development of Ethnoscience Multimedia Learning to Improve the Cognitive Skills of Elementary School Students in Lubuklinggau City. *Jurnal Basicedu*, 4(1), 13–21

RESULTS AND DISCUSSION

Physics Learning and Problems

Physics is a discipline of science that contributes to technological advancement. Therefore, in this 4.0 industrial revolution era, the young generations must have excellent competencies, soft skills, critical thinking, creativity, communication skills, and collaboration (Azis & Yulkifli, 2021; González-Pérez & Ramírez-Montoya, 2022; Susanti et al., 2019). In subjects in physics, big students are still considered the most challenging in influencing their understanding of concepts explained by the teacher (Hariyono et al., 2023; Kulgemeyer et al., 2020). The inability of students to integrate knowledge and experience in the environment about draft physics caused part of the big learning physics at

school to the nature of the theoretical (Martawijaya et al., 2023; Werth et al., 2023).

Indonesia is a country with various heritages and local wisdom. However, the era of development made the local wisdom fade out. Thus, local wisdom needs specific preservation. In the educational field, local wisdom preservation requires traditional game integration into learning (Afkarina & Sudarti, 2021). Integrating physics learning with traditional games can attract learners and encourage their understanding of physics material (Astuti & Bhakti, 2022). Technological development is becoming more advanced and negatively influences the local wisdom of Indonesia. Therefore, local wisdom preservation must integrate physics learning (Mardana et al., 2022).

The collaboration skills include five skills. They are (1) collaboration, (2) flexibility, (3) responsibility, (4) compromise, and (5) communication (Trilling & Fadel, 2009). Learners could collaborate in groups effectively with various teammates. Learners could collaborate with various individuals, starting with those with contributions and those with adaptations to all team members. Learners could also collaborate and take responsibility while leading the teams. They could also initiate and promote self-management, collaborate and discuss to solve problems collectively and compromise to reach common objectives. The learners could collaborate and create effective communication within the groups.

Vygotsky's constructivism emphasizes constructing the learners' understanding by interacting socially with other individuals (Fitriani & Maemonah, 2022). The surrounding cultures of the learners, such as language, belief, and skill, influence the content of the knowledge. Cognitive development, based on Vygotsky, explains that the sociocultural environment significantly influences children's cognition. Vygotsky perceives the development of children as consisting of conflict and never-ending dialectic resolution. This matter establishes the cognition of the children by solving the problems and internalizing the problems (Hyun et al., 2020; Trisnayanti et al., 2023; Wang & Liu, 2021). Physics learning provides optimum results for the learners to construct knowledge and find the answers to problems by promoting learning (Khoiri et al., 2023). This explains that traditional games improve physics learning outcomes (Ashar, 2017).

Some developed and applicable traditional games are suitable for physics learning. Traditional games such as spinning tops are useful for learning the physics material about circular motion,

inertia moment, frictional force, angular momentum elasticity, and gyroscopic effect (Astuti & Bhakti, 2022; Gifani et al., 2023; Larkin et al., 2021). A traditional game, such as playing stilts, is useful for learning the mechanic energy material (Rumiati et al., 2021). A traditional game, such as playing cranky, is useful to learn about rigid object balance, parabolic motion, Newton law, and momentum (Febrianty et al., 2023; Fita et al., 2019; Rizki et al., 2022; Sari et al., 2023). Traditional games such as Aloe Yeye are useful for learning material about power and energy (Nurianti & Azizah Lubis, 2023). Traditional games such as *tajong* are useful for learning materials about kinetic energy (Mardana et al., 2022). The traditional such as *Patil lele*, the catfish shaft, is useful for learning parabolic motion (Jamalludin et al., 2021). The traditional game, such as *Kolecer* is useful for learning the materials of equilibrium, pressure, the first Newton law, the second Newton law, power and energy, energy kinetic, and circular motion (Sholahuddin & Admoko, 2021). Traditional games are important to develop and apply in learning physics

Learning physics through integrating traditional games and physics learning is associated with routine life (Asra et al., 2021). The integration of this ethnoscience into physics learning is important and significantly improves the learning outcomes and motivations of the learners. Preferring familiar local games would make the learners happy when they could play them. The learners could also think logically and reflect on many things by observing other learners while interacting and playing the game.

Introduction of Oro Kino-Kino Game

The traditional game of Oro Kino-Kino from Sentani Papua is child-traditional. The gameplay is a field of hexagonal figures. The figure is useful as the game

zone or area on a field or other flat areas. The figures are usually made from chalk, charcoal, and wood drawn on the ground. The Sentani community of Jayapura Regency plays this game. Male or female children could play this Oro Kino-Kino game with an ace thing or go. The most important component of the game based on physics lessons, such as physics, chemistry, and biology, covers the aspect of experimenting (Alvionita et al., 2020; Li & Tsai, 2013; Samon & Levy, 2021). The experimental activity may involve the traditional gameplay, Oro Kino-Kino from Sentani Papua. Figure 1 Gaco is in box 1; the player is ready to play and jumps to box 1.

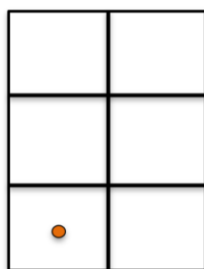


Figure 1 Gaco is in box 1

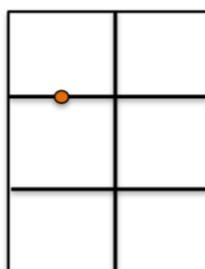


Figure 2 Gaco is above the line

Figure 2 Gaco is above the line; the player cannot continue the game and is replaced by the next player.

The Perspective of Oro Kino-Kino Game in the Physics Learning

Game traditional oro kino-kino in every movement. There is a connection with learning physics draft dynamics and equilibrium objects. Draft dynamics at the moment player standing, moment gaco Still in hand player, there is a connection with material Newton's law I.

Players jump from one box to box. Next, there is style action and style reaction, so there is a connection with Newton's third law. Draft equilibrium object tough moment: The player stands with two legs, or stands one leg of the body, which needs an equilibrium object. Based on type motion, equilibrium objects can also be classified as two, viz equilibrium translation and rotation. Draft dynamics and equilibrium objects are tightly related to culture games often carried out by Papuan children, particularly the traditional Oro Kino-kino children Sentani Papua.

The traditional game is useful for improving social, emotional, and cognitive development. Here are the benefits of traditional games: (1) improving creativity and imagination, (2) improving social skills, (3) improving motoric skills, (4) improving moral values, and (5) improving cultural diversity. Playing traditional games also has many benefits, such as learning the concepts of physics lessons (Rumiati et al., 2021; Zeng et al., 2020). The game's concepts could facilitate teachers delivering the learning materials to the learners.

Implementing local wisdom in learning is important. Implementing traditional wisdom could lower the intensity of using gadgets and its negative effects, such as the individualistic and opportunistic habits of the learners (Limba et al., 2023). Learning physics requires a pleasant atmosphere and conditions (Hidaayatullaah et al., 2021).

Technological advancement in the 21st century has significantly affected education, especially the implementation of technology in learning media. One of the learning outcome improvements with accurate and interesting media is - integrating the educational physics game (Suliyannah et al., 2021). Studies found that traditional games of the community represent scientific knowledge and are applicable in physics learning (Asra et

al., 2023). Traditional games can potentially develop the concept of physics (Sholahuddin & Admoko, 2021).

The traditional game, Oro Kino-Kino, could be a school learning medium. Learning media are applicable to conveying the message and stimulating the learners' attention, intention, reasoning, and learning intention to reach specific objectives (Satria & Egok, 2020). Learning media could be objects from the teachers to the learners. These objects convey information about a learning process to facilitate and attract the learners' intentions.

Many learners complain that physics is difficult to learn due to the many formulas (Asmita, 2022). Therefore, learners must be encouraged to learn physics by promoting meaningful and interesting learning activities. Strategies could include applying traditional games of the local community to physics learning, such as Oro Kino-Kino.

This traditional game, Oro Kino-Kino from Sentani, is associated with agility and dexterity training to improve the learners' communication and collaborative skills. The training also involves training the learners to learn in groups and express their emotions. The process of eliciting information and establishing meaning requires the learners to collaborate with their classroom peers (Saenab et al., 2019).

CONCLUSION

From the explanations, the traditional game, Oro Kino-Kino from Sentani Papua, can potentially stimulate collaborative skills and the learning outcomes of school physics learning. The game could (1) motivate the learners to promote local cultural potentials (from the traditional game) in the surrounding environment, to collaborate, and to discuss the language topics within physics learning; (2) encourage teachers to identify and mediate the local culture with the traditional game in the

community environment of the Sentani area during the physics learning process. (3) Observation results show that every movement of the traditional oro kino-kino game is closely related to the concepts of material physics, dynamics and equilibrium rigid bodies.

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