

Conference Paper

Gumatere Dance from North Maluku as a Source of Physics Learning: Analysis of Ethnophysical Studies

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Abstract.

Physics is widely implemented in Maluku's regional dances. One of these dances is the north Maluku gumatere dance. This study aimed to analyze the relationship between the concept of physical matter and gumatere dance. In the dance, there are various physical concepts, namely, momentum, impulse, GLB, sound, and elasticity. The research method used was a literature review with descriptive qualitative analysis. The data obtained were then analyzed, verified, reduced, constructed to scientific knowledge and interpreted to the concepts of physics. The results showed that the Saureka-reka dance can be used as a special physics learning resource in class X and XI SMA /MA. Regional dances can be implemented into physics lessons so that students can understand the concepts of physics well.

Keywords: gumatere dance, ethnophysical, source of physics learning.

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1. Introduction

The state of Indonesia is an archipelagic country known as a country with a multicultural, multiethnic, religious, racial, class, and different customs (1). For this reason, it can be concluded that Indonesia has a diversity of local wisdom. Local wisdom is a culture owned by certain communities and in certain places that are considered capable of surviving in the face of globalization because local wisdom contains values that can be used as a means of community development (2,3).

If associated with education, education based on local wisdom is an education based on cultural values prevailing in society (4). Education is an effort made consciously to grow the abilities possessed by every human being through the learning process (5). Learning related to the real world and life processes can be done by exploring the local potential of the region, namely the knowledge (science) that exists in the community (6).

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Learning that integrates traditional knowledge of society with the concept of science is called ethnoscience (7,8). Meanwhile, ethnophysics is the learning of physics connected to the local culture (9). The ethnoscience approach is a strategy for creating a learning environment and designing learning experiences that integrate culture as part of the science learning process (10,11).

Based on the above problems, ethnophysics has the potential to increase students' knowledge. This is in line with Astuti & Bhakti((9) who argues that physics learning based on local culture can be used as teaching material for physics learning in the classroom. This study examines ethnophysics in Gumatere Dance as a source of learning physics.

2. Method

This research is included in the qualitative research method as a literature study. Through this method, researchers can describe the problems discussed clearly and comprehensively. With the literature study method, data is collected for analysis and then presented in the results and discussion to draw conclusions.

The research method used is descriptive qualitative with data collection techniques through observation, questionnaires and interviews. The data obtained were then analyzed, verified, reduced, constructed into scientific knowledge, and interpreted into physics concepts in class X and XI high school physics.

3. Result and Discussion

3.1. The Results

Indonesia is an archipelagic country consisting of various ethnic groups and cultures. This diversity is what makes the Indonesian nation a unique nation compared to other countries in the world. In Indonesia itself, the cultural wealth includes traditional houses, folk songs, traditional dances, traditional clothes, traditional food, historical sites, customs, traditional games and so on, this diverse wealth is known for local wisdom .

Local wisdom found in several groups or indigenous peoples in Indonesia contains many noble values of national culture which are still strong to become the character identity of their citizens (12,13). Local wisdom is also a reflection of the ethnoscience shared by a particular cultural community, one of which is like traditional dance. One of the regions in Indonesia that has local wisdom is Maluku Province with its traditional dance called Gumatere Dance.

TABLE 1: Gumatere Dance Studies as a source of learning physics.

No.	Dance move	Physics concepts
1.	 <p data-bbox="475 795 965 918">At the beginning of the dance, the female dancer performs a movement as in the picture with the direction of the hands to the right and left while stretching a cloth. Meanwhile, male dancers perform the movement of hitting ngana-ngana.</p>	<p data-bbox="970 566 1460 750">The concept of physics related to the movement of a female dancer towards a piece of cloth is strain. Strain is the increase in the length of an object against the initial length caused by the presence of an external force that affects the object. So this has similarities: $\epsilon = \frac{\Delta L}{L_0}$ Information: ϵ : Strain ΔL : length gain (m) L_0 : initial length (m)</p>
2.	 <p data-bbox="475 1534 965 1632">In this stage all female dancers move positions from the front of the male dancer to the back of the male dancer. They move at medium and constant speeds, also still while moving the fabric.</p>	<p data-bbox="970 1108 1460 1243">The physics concept related to female dancers' movements is GLB (Regular Straight Motion). GLB is the motion of an object on a trajectory with a constant (fixed) speed with the equation: $v = \frac{s}{t}$ v : velocity (m/s) s : space (m) t : time (s)</p>

TABLE 1: (Continued).


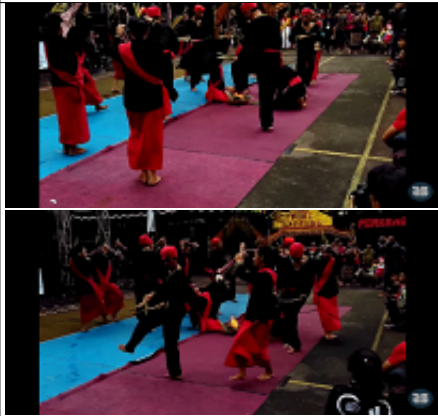

<p>3.</p>	 <p>At this movement, one other female dancer entered and then walked around the circle of male dancers while carrying a tray containing offerings.</p>	<p>The Moment of Inertia is a measure of the inertia of an object to rotate on its axis. The concept of physics related to this movement is the moment of inertia in the model of motion of particles. Then the equation can be obtained: $I = m.R^2$ Information: I : moment of inertia (kg m^2) m : mass of particle (kg) R : distance between particles (m)</p>
<p>4.</p>	 <p>After the female dancer was in the middle and twisted her black cloth, the male dancer shouted "Hey!". Which in the end was followed by the whole dancer spinning around the female dancer who was in the middle in a few moments.</p>	<p>The concept of physics related to the sound of shouting "Hey!" is sound waves (propagating through the medium of air). The formula for the velocity of sound waves in the air (gas) can be written: $V = \sqrt{\frac{\gamma RT}{M}}$ Information: V : velocity of sound (m/s) γ : adiabatic constant R : general constant of gas (8,31 joule/mol K) T : temperature (K) M : relative mass of gas (kg/mol)</p>
<p>5.</p>	 <p>After a while, the entire dancers who had been moving around slowly lined up on the edge of the stage and left only one female dancer who kept dancing at random and one male dancer carrying offerings. At the end of the dance, after the male dancer has placed the offerings, he then carries the female dancer to the edge of the glorification.</p>	<p>The concept of physics relating to the movement of a male dancer holding a female dancer is an undertaking. Effort is a force made to move an object as far as its displacement. Effort occurs when energy is transferred from one system to another. Then the formula of the undertaking is: $W = F.s$ Information: W : work (J) F : force (N) s : switch (m)</p>



Figure 1: Gumatere Dance.

Gumatere dance is one of the traditional dances of the People of Morotai, North Maluku. This dance aims to ask for instructions on the problems, be it about life or natural events. This traditional North Maluku dance performance will usually be played by around 13-30 male and female dancers. Male dancers wear ngana-ngana as their property, while female dancers wear fans. This gumatere dance has its own uniqueness, namely one of the dancers will use a yellow cloth, as well as offerings such as embers and menyana to perform the ritual of asking for instructions for an event.

Gumatere dance can be used as teaching material in learning physics in the classroom. Some concepts of physics, especially mechanics, can be learned from the gumatere dance. Ethnophysical studies on gumatere dance can be seen in table 1.

Table 1 shows that Gumatere Dance can be used as a learning resource with a special ethnoscience approach to the study of physics. One of the materials related to physics is: GLB and efforts for material in class X; and strains, waves, and moments of inertia for the material in class XI.

3.2. Discussion

One of the prospective aspects to be studied as material for physics learning content is culture. Learning culture-based physics or what can be called ethnophysics is the relationship between culture and the concept of physics (9). Applying this kind of culture-based learning has the potential to develop learning methods into active student-centered learning (14,15).

Culturally close learning is based on recognizing culture as a fundamental part (fundamental and important) for education as the expression and communication of an idea and the development of knowledge (16,17). In line with Novia et al who argue,

ethnoscience encourages students to know and learn natural science through the use of the surrounding environment. Integrating local culture into education is very important to fill cultural elements and make culture stronger and able to survive in the era of globalization (18–20)

Gumatere dance is capable of being analyzed and studied based on the physical concepts of each dance movement. understanding the concept of physics in gumatere dance can be used as a source of learning physics in class, so that students are able to understand physics concepts directly with practice. Learning media that directly displays concrete events or daily life that are able to explain physics concepts so that they can be understood by students easily and will be much more effective. The association of ethnoscience in the theories used is very helpful in learning activities that are in accordance with the knowledge and experience of the students themselves.

In line with the research of Munandar et al (21) which analyzed the potential of ethnoscience-based learning, an increase in students' love for bima local culture was found. This suggests that ethnoscience-based physics learning allows students to simultaneously learn science (physics) and local wisdom in the area itself. This is also expected to be able to provide encouragement for students to participate in preserving the surrounding culture.

4. Conclusion

Based on the results and discussion above, it can be concluded that Gumatere Dance can be used as a source of learning physics. Gumatere dance can be studied physically with various physical concepts, namely, GLB, effort, strain, waves, and moments of inertia. By studying physics, students can simultaneously learn their own area's local wisdom simultaneously. Studying physics through local wisdom is expected to be able to increase student knowledge and maintain the existence of local culture so that it is not lost in the era of globalization.

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References

- [1] Matitaputty JK. Nilai-nilai kearifan adat dan tradisi di balik ritual daur hidup (life cycles) pada masyarakat suku nuaulu di pulau seram sebagai sumber pembelajaran IPS: Studi Etnografi di Desa Tamilou Kecamatan Amahai Kabupaten Maluku Tengah. Indonesia: Universitas Pendidikan Indonesia; 2010.
- [2] Alaslan A. Analisis nilai-nilai budaya duan lolat berbasis kearifan lokal pada masyarakat tanimbar di kabupaten maluku tenggara barat. 2021.
- [3] Escobar A. Culture sits in places: Reflections on globalism and subaltern strategies of localization. *Political Geography*. 2001;20:139–174.
- [4] Pradana DA, Mahfud M, Hermawan C, Susanti HD. Nasionalism: Character education orientation in learning development. *Budapest International Research and Critics Institute-Journal*. 2020;3:4026–4034.
- [5] Zuhaeriah Z, Ali M, Yusra Y. The role of Islamic education teachers competency in improving the quality of education. *Journal of Contemporary Islamic Education*. 2020;2:108–130.
- [6] Masfufah FH, Ellianawati E. Peningkatan literasi sains siswa melalui pendekatan Contextual Teaching and Learning (CTL) bermuatan Etnosains. *UPEJ Unnes Physics Education Journal*. 2020;9:129–138.
- [7] Parmin P, Sajidan S, Ashadi A, Sutikno S, Fibriana F. Science integrated learning model to enhance the scientific work independence of student teacher in indigenous knowledge transformation. *Jurnal Pendidikan IPA Indonesia*. 2017;6:365–372.
- [8] Rist S, Dahdouh-Guebas F. Ethnoscience—A step towards the integration of scientific and indigenous forms of knowledge in the management of natural resources for the future. *Environment, Development and Sustainability*. 2006;8:467–493.
- [9] Astuti IAD, Bhakti YB. Kajian etnofisika pada tari piring sebagai media pembelajaran fisika. *SINASIS (Seminar Nasional Sains)*. 2021.
- [10] Dewi CA, Khery Y, Erna M. An ethnoscience study in chemistry learning to develop scientific literacy. *Jurnal Pendidikan IPA Indonesia*. 2019;8:279–287.
- [11] Ibe E, Nwosu AA. Effects of Ethnoscience and traditional laboratory practical on science process skills acquisition of secondary school biology students in Nigeria. *British Journal of Multidisciplinary and Advanced Studies*. 2017;1:35–46.
- [12] Marhayani D. Development of character education based on local wisdom in indogenous people Tengahan Sedangagung. *Journal of Education for Teaching*. 2016;1:66–70.

- [13] Subali B, Sopyan A, Ellianawati E. Developing local wisdom based science learning design to establish positive character in elementary school. *Jurnal Pendidikan Fisika dan Teknologi*. 2015;11:1–7.
- [14] Saragih S, Napitupulu EE, Fauzi A. Developing learning model based on local culture and instrument for mathematical higher order thinking ability. *International Education Studies*. 2017;10:114–122.
- [15] Novitasari L, Agustina PA, Sukesti R, Nazri MF, Handhika J. Fisika, Etnosains, dan kearifan lokal dalam pembelajaran sains. *Seminar Nasional Pendidikan Fisika III 2017*. 2017. p. 81–88.
- [16] Godwin-Jones R. Integrating intercultural competence into language learning through technology. *Language Learning and Technology*. 2013;17:1–11.
- [17] Van Oers B. Learning mathematics as a meaningful activity. *Theories of Mathematical Learning*. Routledge; 2013. p. 103–126.
- [18] Zhao Y. Preparing globally competent teachers: A new imperative for teacher education. *Journal of Teacher Education*. 2010;61:422–431.
- [19] Cleveland M, Laroche M. Acculturaton to the global consumer culture: Scale development and research paradigm. *Journal of Business Research*. 2007;60:249–259.
- [20] Stromquist NP, Monkman K. Defining globalization and assessing its implications for knowledge and education, revisited. *Globalization and Education: Integration and Contestation across Cultures*. 2014;1:1–21.
- [21] Munandar R, Ristanti CI, Busyairi A, Rokhmat J. Analisis potensi pembelajaran fisika berbasis etnosains untuk meningkatkan kecintaan budaya lokal masyarakat bima: pendidikan. *Jurnal Penelitian dan Pembelajaran Fisika Indonesia*. 2022;4.