PAEDAGOGIA
Jurnal Penelitian Pendidikan
http://jurnal.uns.ac.id/paedagogia

DOI : 10.20961/Paedagogia.v29i2.121137
Vol. 29, No. 2, 2026, pp. 304-312
p-ISSN 0126-4109
e-ISSN 2549-6670

The Influence of Ethnoscience-Technology-based Science Instructional Design on the Learning Interest of Junior High School Students in Nagekeo Regency

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Keywords: *Ethnoscience-Technology-based Science; Junior High School; Learning Interest; Students*

Article history
Received: 13 June 2026
Revised: 29 June 2026
Accepted: 29 June 2026
Published: 30 June 2026

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DOI: 10.20961/paedagogia.v29i2.121137

Abstract: Current educational issues center on technology, cultural integration, and the challenge of equity. The primary focus is on how to cultivate a generation of critical, digitally literate individuals while preserving local moral values amidst the onslaught of global culture. The purpose of this study was to analyze the effect of science instructional designs based on ethnoscience-technology on the learning interests of junior high school students in the Nagekeo district. This research used quantitative methods to analyze teachers' abilities to design ethnoscience-technology-based instructional designs and students' learning interests when taught by teachers. The participants were science teachers and students at junior high schools in Nagekeo District, NTT. Data collection techniques used questionnaires and observation sheets, and the analysis used quantitative descriptive and correlational analyses. The results showed that teachers have linked the science material taught with cultural activities in Nagekeo district and included technology (ethnoscience-technology). Furthermore, there is a very strong and significant positive relationship between the quality of science teachers' instructional designs based on ethnoscience-technology and the learning interest of junior high school students in Nagekeo Regency, with r=0.981. The conclusion of this research explains that science teachers in Nagekeo district have designed ethnoscience-technology-based science instruction, and it correlates with students' learning interests.

How to cite: Kasi, Y. F., Widodo, A., Samsudin, A., Riandi & Shidiq, A. S. (2026). The Influence of Ethnoscience-Technology-based Science Instructional Design on the Learning Interest of Junior High School Students in Nagekeo Regency. *PAEDAGOGIA, 29*(2), 304-312. DOI: 10.20961/paedagogia.v29i2.121137

INTRODUCTION

Teachers are professional educators who are believed to possess good attitudes, knowledge, and skills that are continuously developed throughout their teaching activities (Dapudong, 2014; Lipscombe *et al.*, 2020). Teachers' competencies are expected to lead to effective instruction, improve the quality of education, and produce competent students. 21st-century learning requires teachers to prepare students with the skills needed for the era of globalization and the Industrial Revolution 4.0. Steps that teachers can take include building 4C skills (Critical Thinking, Communication, Collaboration, and Creativity) in students (Afida, 2023). Among them, science teachers are required to master Pedagogical Content Knowledge (PCK) (Rochintaniawati *et al.*, 2018), play an active role in lesson management (Benedict *et al.*, 2022), and be able to design topics that are relevant to students' life to produce meaningful learning (Kavanagh *et al.*, 2019). Science teachers can connect students' prior knowledge with the materials to be learned (Al-Balushi *et al.*, 2020). Previous studies have shown that teachers with well-constructed teaching conceptions and approaches influence students' science learning outcomes (Wang *et al.*, 2015). Therefore, the quality of science education is related to teachers' knowledge of the subject matter and appropriate teaching practices (Cordova & Linaugo, 2022).

In fact, research results revealed that the ability of science teachers in teaching in Indonesia is categorized as poor (Innaha, 2017). In addition, Suyamto et al. (2020) revealed that the average teacher score on the TPACK aspect falls in the low category. Furthermore, it is noted that many teachers in

Indonesia still have limited teaching skills because they rely on only one or two teaching methods to teach content (Widodo, 2017). The impact of ineffective teacher implementation of learning is directly related to students' low understanding of science material. However, the abundant local science resources in NTT can be integrated into classroom science learning, thereby helping students understand scientific concepts. The implementation of ethnoscience-based science learning will be able to improve student learning outcomes (Sudarmin et al., 2016). Previous research has shown that ethnoscience learning has an impact on improving students' scientific literacy (Atmojo et al., 2019; Yuliana et al., 2021; Dewi et al., 2021). Furthermore, preliminary interviews with science teachers in Nagekeo Regency, NTT, revealed that they had never conducted science lessons utilizing local science from students' daily lives (Kasi et al., 2020). These findings indicated the need for technology-assisted, culture-based science learning to improve teacher competency, ultimately fostering students' interest in learning.

Science for the people of NTT province is inseparable from societal development, including values, norms, beliefs, and cultural values. In relation to the implementation of scientific concepts, the people of NTT already possess local science that they use to simplify their lives. This local science is reflected in various forms, such as the selection of measuring instruments, agricultural and fishing equipment, traditional house construction, rice field design, and traditional musical instruments. Soko *et al.*, (2017) in their research have identified NTT traditional culture that can be integrated into classroom instructions such as traditional measurement systems: tradition in Ende district using *moso* like *jari* (fingers) as a unit of length, Newton's law and its application in *Pasola* activities in Southwest Sumba district which shows the concept of particle motion dynamics, temperature transfer in the *tatobi* traditional ritual, which is a series of activities aimed at warming the mother's body after giving birth in a room with a fireplace that is relevant to the concept of temperature, heat, and heat transfer in physics, work and energy in the traditional way of moving large stones for graves from Sumba known as *tena watu* explains the concept of work and energy. And sound waves on the Sasando musical instrument, originating from the Rote district, are produced by a bamboo tube that serves as the instrument's frame. For the Nagekeo district area, Kasi *et al.* (2022) revealed the existence of science concepts in the traditional game *Dhongi Koti* (playing spinning tops), which can also be integrated into science learning for the concepts of Newton's law, friction, and pressure.

These local science resources in NTT provide teachers with opportunities to conduct ethnoscience-based science learning. For example, for evaluating learning outcomes, incorporating ethnoscience contexts into test items allows students to engage with scientific concepts through culturally relevant situations, which can enhance construct representation and reduce potential bias (Oktaviani *et al.*, 2026). Novitasari *et al.* (2017) explained that an ethnoscience approach, in which local cultural aspects of students' daily lives are integrated into science lessons, can positively impact students. An ethnoscience approach can transform science subject, which tends to be less popular among students, into something they enjoy and are interested in (Suryani *et al.*, 2022). Furthermore, the current curriculum direction also emphasizes that science subjects can be supported by involving local culture and wisdom (Tamam & Fikriyah, 2026). The concept of science in culture can be integrated into science education as a method, model, and learning medium to improve students' conceptual understanding, creative and critical thinking, scientific literacy, and problem-solving skills (Kasi *et al.*, 2021).

In addition, in this era of technological advancement, a teacher needs: 1) a foundation for effective teaching by utilizing technology, 2) an understanding of the representation of a concept using technology, 3) pedagogical techniques that use technology in a constructive way to teach content, 4) knowledge of what makes a concept difficult or easy to learn and how technology can help overcome these problems in students, and 5) knowledge of how technology can be used to build existing knowledge into new knowledge and strengthen old knowledge (Koehler & Mishra, 2009). The integration of digital technology into classroom instructional practices is no longer an option but a crucial requirement to prepare students to compete in the 21st century. Furthermore, the TPACK framework, defined as the interaction between content, pedagogy, and technology, both theoretically and practically, produces the types of flexible knowledge needed to successfully integrate the use of technology into lesson planning and classroom teaching practices (Koehler & Mishra, 2013). In this regard, teachers' understanding of the integration of technological, pedagogical, and content knowledge is essential for producing effective

teaching practices that facilitate learning and foster students' interest in learning (Harris *et al.*, 2009; Chen & Jang, 2019; Kasi *et al.*, 2022).

Ethnoscience-technology based learning is expected to create meaningful instruction, thereby increasing students' learning interest. The purpose of this study is to analyze the influence of ethnoscience-technology-based science instructional design on the learning interest of junior high school students in the Nagekeo district. The problems are formulated as 1) how is the design and implementation of ethnoscience-technology based science instruction by teachers in Nagekeo district? and 2) how is the relationship between the implementation of ethnoscience-technology based instruction and students' learning interest?

METHOD

Research Design

This study used a quantitative method, in which the data collected were analyzed to assess teachers' ability to design ethnoscience-technology-based lesson plans and students' learning interests when taught by teachers. The quantitative data collected included analyses of teachers' learning designs and students' learning interests. Specifically, student learning interests were explored using a questionnaire assessing students' interest in their teachers' learning practices. The quantitative data obtained were then interpreted to conclude the influence of ethnoscience-technology-based learning designs on increasing students' learning interests. Data collection techniques used questionnaires and observation sheets.

Participants

The participants of this study were teachers and their students at 4 junior high schools. The sample in this study consisted of Science teachers and students at 4 junior high schools in Nagekeo Regency, NTT. A total of 4 science teachers expressed their willingness and each science teacher was given a teacher code ranging from G1 to G4. All teachers expressed their willingness to be interviewed regarding their biodata and to have their learning designs assessed. The school leadership also granted permission to conduct the research and agreed to include the school's name in the research results. The data of science teacher participants are shown in Table 1.

Table 1. Science teacher participants in the research

Participant Data	Number of Participants
District:	
Aesesa	1
Boawae	2
Nangaroro	1
Education Background:	
Bachelor of Physics Education	2
Bachelor of Biology Education	2
Bachelor of Chemistry Education	-
Bachelor of Natural Science Education	-
Teaching Experience:	
3 - 6 years	2
7 - 10 years	1
11-18 years	1
Sex:	
Male	3
Female	1

Meanwhile, student participant data is shown in Table 2.

Table 2. Student participants in the research

School Code	Number of teachers	Teacher Code	Number of Students
SMP A	1	G1	28
SMP B	1	G2	28
SMP C	1	G3	22
SMP D	1	G4	23

Instruments

The instruments used in this study were assessment sheets of teachers' lesson plans and a questionnaire assessing students' interest in ethnoscience-technology-based science instruction conducted by teachers. Quantitative data on learning designs and students' learning interests were collected by researchers using an assessment rubric. The learning design research rubric focused on the use of ethnoscience and technology, while the learning interest focused on how enthusiastic students became in participating in their teachers' learning. Details of the research instruments are presented in Table 3 below.

Table 3. Research Instrument

Instrument	Assessment Target	Indicators
Assessment sheet of the teacher's lesson plan	ethnoscience-technology-based science instructional design	1. Appropriateness of technology use and approach selection for Nagekeo cultural activity-based science learning materials (IG1) 2. Appropriateness of technology use and model selection for Nagekeo cultural activity-based science learning materials (IG2) 3. Appropriateness of technology use and media selection for Nagekeo cultural activity-based science learning materials (IG3) 4. Appropriateness of technology use and method selection for Nagekeo cultural activity-based science learning materials (IG4) 5. Use of technology that is relevant to the teaching method and appropriate to the material within the Nagekeo cultural context (IG5)
Questionnaires	Student learning interest related to the implementation of instructions by teachers	1. Enthusiasm for participating in the lesson (IS1) 2. Interest in learning science (IS2) 3. Teacher clarity in assigning assignments (IS3) 4. Ease of understanding science concepts and the importance of science in life (IS4) 5. Teacher use of media (IS5) 6. Teacher use of technology (IS6)

Research Procedures

This research was conducted through three stages, namely the preparation stage starting from field studies and requests for permission to conduct research in schools including to teachers and students; which was continued with the implementation stage, consisting of analysis of science teacher instructional designs with an ethnoscience-technology approach and distribution of student interest questionnaires on learning by their teachers; and the final stage, namely processing and analysis of research data including analysis of the relationship between the implementation of ethnoscience-technology-based instructional designs and student learning interests in the classroom.

Data analysis

Quantitative data on ethnoscience-technology-based science instructional designs and students' learning interests were analyzed using quantitative descriptive analysis. Science teacher instructional design data was obtained in the form of scores (1-4), which were converted to values 0-100, which were then categorized into five categories for teacher instructional designs as shown in Table 4.

Table 4. Category of ability to design lesson plans

Percentage (%)	Category
85 ≤ x ≤ 100	Very Good
70 ≤ x < 85	Good
55 ≤ x < 70	Fair
40 ≤ x < 55	Poor
0 ≤ x < 40	Very Poor

(source: Prihastuti, 2021)

Meanwhile, data on students' learning interests was analyzed by calculating the average of participants' answers for each answer choice in the form of a score (1-4). This data was then categorized into five categories for student learning interests, as shown in Table 5.

Table 5. Student learning interest categories

Score Interval	Category
X > 3,40	Very Good
2,80 < X ≤ 3,40	Good
2,20 < X ≤ 2,80	Fair
1,60 < X ≤ 2,20	Poor
X ≤ 1,60	Very Poor

(source: Widoyoko, 2009)

Furthermore, to examine the influence of the science teacher's ethnoscience-technology-based learning design on students' learning interest, a correlation analysis was conducted.

RESULT AND DISCUSSION

The characteristics of ethnoscience-technology-based instructional designs are that science material for junior high school students is linked to cultural activities in Nagekeo Regency, and in delivering it to students, technology is utilized, such as using laptops, LCDs, and displaying videos/images/phenomena related to the lesson. The average instructional design assessment scores for 4 teachers across 5 indicators are shown in Table 6 below.

Table 6. Average Score of Teacher Instructional Design Assessment

No	Indicator	Score (%)
1	IG1	93,7
2	IG2	99,8
3	IG3	99,6
4	IG4	93,7
5	IG5	93,7
	Average	96,1

Based on the results of the lesson plan analysis, the average teacher score was 96.1, making it fall into the very good category, indicating that an ethnoscience and technology approach was incorporated into their lesson plans. Teachers have linked the science material taught to cultural activities in Nagekeo Regency and incorporated technology, which is also relevant to the pedagogy and material presented. Science teachers, while still learning, have begun to incorporate the benefits of technology into their lesson plan designs, meaning teachers have gained new information that technology can actually

help their teaching practices in the classroom. The science teacher has created a lesson plan for the classification of living creatures, which is linked to the traditional hunting ritual of Toa lako/ndai/hunting, which always begins with the burning of the hunting location by showing a video and using an LCD and laptop. Findings by Kafyulilo *et al.* (2016) indicated that teachers who began creating science animations using PowerPoint and recording videos for use in their teaching can improve their integration of technology, knowledge, and skills. In the context of the ethnoscience approach, Soko *et al.* (2015) explained that teachers in NTT have implemented culturally context-based science instruction (cultural context-based modules). The teachers have incorporated the cultural context of Nagekeo Regency, adapted the science material to it, and utilized technology in their lesson delivery, as shown in Figure 1.

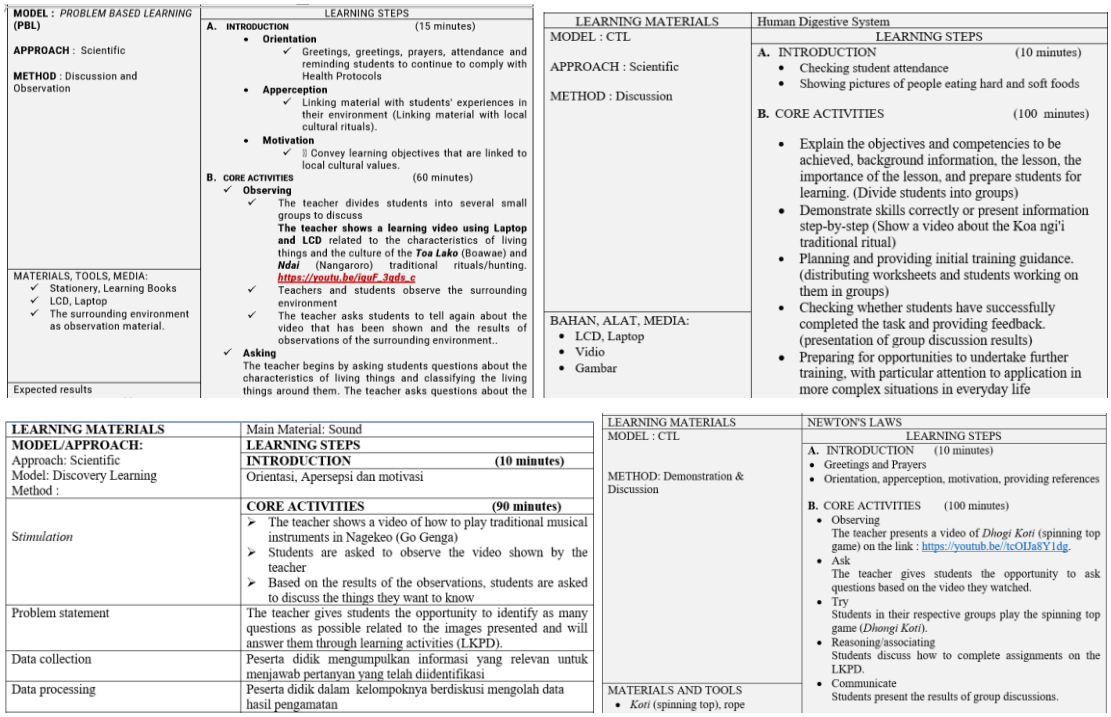

Figure 1. Science Lesson Plan Based on Ethnoscience-Technology

Science teacher G1 created a lesson plan on the classification of living things (and the extinction of biodiversity) related to the traditional Toa lako/ndai/hunting ritual, which always begins with the burning of the hunting ground. Science teacher G2 designed learning objectives for the human digestive system and linked it to the Nagekeo cultural ritual of *ngo'a ngi'i* or tooth filing. Similarly, Science teacher G3 used traditional game tools/materials such as *koti*/spinning tops as learning media to teach Newton's laws. Teacher G4 also uses the traditional Nagekeo musical instrument *Go Genga* to explain the concept of sound to her students. Furthermore, all teachers G1-G4 have utilized technology in delivering their materials, such as making videos to upload to YouTube, showing videos using LCDs and laptops, and also PowerPoint presentations. These results indicated that the four science teachers in Nagekeo Regency have begun to include ethnoscience material in their lesson plans and also utilize technology to convey it to students. Typically, science teachers, when designing culture-based learning, provide opportunities for students to learn science through their own culture (Hikmawati *et al.*, 2021). Science material linked to culture (contextual) engages students because they learn about and practice that culture. Students will also engage in critical thinking about cultural activities that conflict with scientific concepts. According to Risdianto *et al.*, (2020), ethnoscience-based learning models can improve students' critical thinking skills. In the context of technology use, teachers are very enthusiastic about designing lessons with this new tool in their classes, such as using laptops to download instructional media and YouTube applications (Adu-Marfo *et al.*, 2026).

A general analysis to determine students' learning interests was conducted based on student questionnaire responses regarding their teachers' teaching processes and use of technology, as well as their understanding of science material within a cultural context. The average student learning interest

results for the four schools are shown in Figure 2.

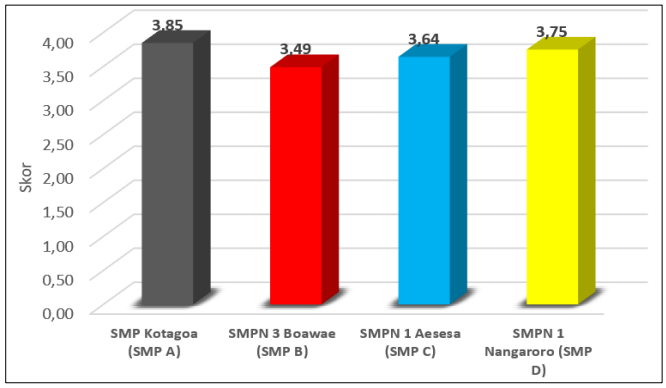

Figure 2. Student Learning Interest Score

Based on Figure 2, student learning interest across the four schools ranged from 3.49 to 3.85, thus categorizing it as very good. These results indicate that students' learning interest is evident when their teachers implement ethnoscience-technology-based learning. Research shows that students' positive responses to ethnoscience-technology-based learning within the context of tea culture, global local wisdom, and Ethno-STEM IBPjLM are highly engaging (Sudarmin *et al.*, 2024).

Furthermore, an analysis was conducted to examine the relationship between the implementation of ethnoscience-technology-based instructional designs in the classroom and students' learning interests. The analysis was conducted using instructional design data from 4 teachers to their students in 4 schools. Based on the results of the Pearson correlation test on this limited sample, the value of $r = 0.981$ was obtained with $p = 0.019 < 0.05$. This indicated that there is a very strong and significant positive relationship between the quality of ethnoscience-technology-based science teacher lesson plans and junior high school students' learning interests. The coefficient of determination, $R^2 = 0.962$, indicated that 96.2% of the variation in students' learning interests is explained by the quality of the teacher's lesson plan. These results indicate that students' learning interest stems from receiving meaningful instruction from their teachers. These findings align with research by Sudarmin *et al.* (2026), which found that teachers' use of Ethno-techno media (VR) successfully increased student interest, with students responding positively to the media, finding it engaging, innovative, and effective in improving their science and technology literacy.

Amid technological advances and the abundance of local material resources, teachers are required to design ethnoscience-technology-based learning that can foster student interest. This approach will make learning materials more relevant, contextual, and engaging, and bridge academic science concepts with local culture, transforming abstract material into familiar learning experiences supported by interactive digital tools. The research recommends that science teachers connect academic knowledge to students' cultural realities, ground abstract concepts in everyday life, and use digital platforms as a bridge for visualization, thereby transforming learning from passive memorization to meaningful exploration.

CONCLUSION

This study analyzes the ethnoscience-technology-based instructional design developed by teachers and its influence on students' interest in learning. With meaningful learning, it can have a positive impact on students' learning interest, which will be related to their learning achievement. The conclusion of this study is that science teachers in Nagekeo district have designed ethnoscience-technology-based science instruction. The material on the classification of living things (the extinction of biodiversity) is linked to the traditional ritual of *Toa lako/ndai*/hunting, the material on the human digestive system with the cultural ritual of *ngo'a ngi'i* or tooth filing, the material on Newton's laws with the traditional game of *koti*/spinning tops, and the concept of sound with the traditional musical instrument of Nagekeo *Go Genga*. All materials are designed to be taught using technology, such as creating videos for uploading to YouTube, showing videos using LCDs and laptops, and using PowerPoint presentations. Furthermore, it

can be concluded that there is a high correlation between ethnoscience-technology-based learning designs and student learning interests in Nagekeo Regency. Researchers recommend using an ethnoscience-technology approach in learning and call for future research with broader samples, science materials from different cultural contexts, and mixed research designs.

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