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Article

## Development of Ethnoscience-Based Digital Teaching Materials in Authentic Jember Patrol Music in Sound Sub Materials for Students in Junior High School

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### ABSTRACT

Culture is the wealth of the Indonesian nation while education is an intermediary for forming the character of the nation's successor. Learning in schools is an interaction that helps students understand learning materials, especially conceptual and factual learning. One of them is in learning Natural Sciences (IPA), in the field of Physics. Noise material is a conceptual material with a discussion of sound waves produced by vibrating objects (sound sources). Based on the needs analysis obtained, the development of appropriate teaching materials to explain the material is a digital book. The purpose of this study is to describe the level of validation of teaching materials and describe student responses to ethnoscience-based digital teaching materials in Authentic Jember Patrol music on sound sub-materials in class VIII SMP/MTs students. The type of research used is the development of a 4-D model. The subject of validity in this study involved material experts and media experts and science teachers, with the results of material validation being 91.03%, media experts 89, 41%, and user experts (teachers) 88, 23% very valid categories. While the student response test in this study was divided into 2, namely, small-scale test and large-scale test with an average percentage result of 80.76% with a valid category, and large-scale trials obtained an average percentage of 87.28% with a category very, without any revisions to the developed teaching material products.

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### INTRODUCTION

Indonesia is a country that is rich in ethnic and national diversity, according to historical records of the social life of the Indonesian people who come from the tribes and cultures of each region (Bagus Brata, 2016). Entering the era of globalization, cultural values in Indonesia are slowly shifting, so that the culture that should be preserved begins to fade and be forgotten (Suketi, 2019). Seeing this condition, education can participate in maintaining and preserving the existing culture through learning in schools. As in UURI number 20 of the year concerning the National Education System Chapter II article 3, it is stated that national education has a function as a developer of student abilities and forms the dignified character of the nation's civilization in educating the nation's life, and developing

the potential of students. Education seeks to make people who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens (Wahyudin, 2020). In line with this goal, an important component in developing the potential of the nation's successors can be done through the interaction of educators with students (Irfanda, 2018), in more detail, namely learning, we can know in the teaching and learning process (KBM) can not be separated from learning tools that can effectively and efficiently help teachers and students in understanding a material.

The results of the first observations the researchers got information, the science subject teacher class VIII MTsN 2 Jember the KBM process held focused on learning resources recommended by the government, namely the 2017 revised Kemendikbud Science book and UKPM (Independent Learning Activity Unit) and during online learning the two books were distributed separately. digital. The impact is that students only understand concepts without knowing the application of existing material, thus teachers need additional teaching materials to deliver learning materials.

In fact, learning tools are information facilities, tools that are arranged in sequence according to the competence of the subject and are used in the learning process (Putri, 2019). Thus the use of teaching materials in delivering material can help students be more creative, independent and master concepts that have not been understood. Along with the development of technology and information in conveying messages, it is not always in the form of print media, one of which is digital books that can help students or teachers understand material, both conceptual and factual material with unlimited time and place.

According to (Agung, 2020) Natural Sciences (IPA) is a branch of natural science that studies all aspects of natural events and their changes from the branches of chemistry, physics, and biology. One of the branches of science subjects whose learning material is a source of knowledge, concepts and principles can grow scientific skills and help in solving everyday problems. In accordance with educational policy that physics learning material is a source of human activities, so that physics is one of the areas of the ethnoscience approach in science that studies natural phenomena and human interactions within the scope of the surrounding culture (Jeane, 2020).

One of the Indonesian cultures that contains elements of science in the realm of physics is the Jember patrol music art culture. This patrol music art was born from the acculturation of the Madurese and Javanese cultures who settled in Jember district and became the Padhalungan culture. As one of the arts that was born from cultural acculturation, Jember's patrol music still exists today. Thus, ethnoscience can be used in the field of education, especially SMP/MTs in Jember Regency. So that it can create interactive, innovative learning and can be a factor in students' understanding of the material and local culture. Considering that patrol music is currently a trending topic as an Intangible Cultural Heritage (WBTB) in Jember Regency (Jemberkab, 2021)

The form of the use of ethnoscience is found in the physics branch of the sound material for class VIII even semesters, considering that the material is conceptual material and is closely related to life so that in its presentation it requires an intermediate medium (Diana,2020). However, the facts in the field of sound sub-materials are only concepts and implementations with examples of modern musical instruments and the difficulty that students understand is how to apply formula with surrounding life. This right is undeniable from the KBM process that is held, where teachers do not associate learning materials with the culture around them. In fact, the sound wave material is directly proportional to the art of musil patrol with ethnoscience dressing, where ethnoscience collaborates Jember patrol music with sound wave material which will make it easier for students to understand the

concept of sound. Thus the function of teaching materials in clarifying and facilitating sound wave material in local culture.

Based on a needs analysis questionnaire for class VIII MTs Negeri 2 Jember, as many as 18 students who are representatives of class VIII E and VIII H on the Jember patrol music culture. From the questionnaire, a vulnerable score of 16.7% was obtained from 18 students who did not know the art of patrol music. And 38.9% of 18 students do not know if there is an element of physics in patrol music and the average score range is obtained in the importance of supporting books or supplements. Students answer "very important" is

## METHODS

The type of research used is Research and Development (R and D) which is a research method in developing and testing the feasibility of a product. The development and research model this time was developed by Thiagarajan, which is 4-D with stages



(Sugiyono, 2019). In this study, the research used a 4-D model which was modified into 3-D; Define, Design, and Development because of the time the author faced.

The Feasibility Test of Ethnoscience-based teaching materials consists of the feasibility of the material, the media and the feasibility of the presentation. The validity of the teaching material product or not is determined by the lecturers, science teachers and students. Following are the stages in this research:

### 1. Define

Researchers define and determine product development to be made. This stage consists of:

- a. Front-end Analysis: stage of problem analysis needed in product development
- b. Learner Analysis: researchers conduct a needs analysis to determine research subjects that can be used in developing products.
- c. Task Analysis: The researcher determines the task analysis that is in accordance with the existing problems
- d. Concept Analysis: The researcher prepares the concept of the material that will be presented in the teaching materials and in accordance with the Core Competencies (KI) and Core Competencies (KI)
- e. Specifying Instructional Objectives: researchers develop teaching materials to be made, it is necessary to formulate learning objectives.

### 2. Design

At this stage the researcher determines the format of product development to be made. Here are the steps in the design stage

- a. Material Preparation: the material used in this study is a branch of physics in the sound sub-material.
- b. Product Selection: according to the needs analysis, the researcher developed a digital book based on Ethnoscience on Jember's parol music
- c. Preliminary Design: The first thing the researcher did was to design the product before testing in the field, either in the form of selecting the format of the teaching materials and the instruments used.
  - 1) Format selection: the digital book format developed is, 1) cover (logo, title, image, and identity), 2) introduction, 3) table of contents, 4) list of pictures, 5) introduction (description of digital book, KI , KD, indicators and learning objectives, and concept maps), 6) content (sound material and

independent/group assignments), and 7) closing (answer key, glossary, bibliography, and author's biodata).

## 2) Instrument Selection

The design of the instrument aims to determine the validity of the product both before and after being tested. In this study, the researcher used an instrument that was in accordance with the product being developed.

## 3. Development

At this stage the researcher made product improvements by revising the product which was judged to be valid or not by a team of lecturer material experts, media experts from lecturers, and user experts (teachers). Products that have been validated by a team of experts are ready to be tested, product trials are tested on class VIII F and VIII H students at MTs Negeri 2 Jember. With small-scale and large-scale trial subjects. The small-scale trial was carried out by 6 students consisting of 3 students of class VIII F and 3 students of class VIII H. Meanwhile, for the large-scale test, there were 30 students consisting of 15 students from class VIII f and 15 students from class VIII H.

## 4. Dessiminate

At this stage the researcher did not develop a method due to the limited time. Moreover, the research conducted was not to determine the level of effectiveness of learning activities, but to determine the validity and student responses to ethnoscience-based digital books in authentic Jember patrol music.

The types of data in this study are quantitative and qualitative data obtained from a team of experts (science lecturers and teachers) and test student responses in the field. Meanwhile, the research instrument used in the form of a questionnaire to test the validation of the product that has been made. The questionnaire used is in the form of a checklist with a score range using a Likert scale, where each item has a gradation from positive to negative. (Sugiono, 2019). The following is the rating scale used by researchers:

**Table 1.** Scala Criteria

No	Criteria	Score
1	Very Good	5
2	Good	4
3	Enough	3
4	Not Enough	2
5	Very Less	1

(Sezy, 2021)

In collecting data, whether the product is valid or not valid, the researcher uses the following technical data analysis techniques:

$$v_{ah} = \frac{T_{se}}{T_{sh}} \times 100\%$$

Information:

$V_{ah}$  : Percentage Value

$T_{se}$  : Total score Empirical (Maximum expected score)

$T_{sh}$  : Total expected score

With the criteria for the validity of the product presented by the researcher as follows:

**Table 2.** Validation Criteria

Validity Criteria	Validity Level
85,01%-100%	Very valid or can be used without revision
70,01%-85,00%	Valid or can be used but need a small revision
50,01%-70,00%	Not valid, it is recommended not to use it because it needs a major revision
01,00%-50,00%	Invalid, or should not be used

While the results of the analysis of the student response test, the level of product attractiveness will be seen as follows:

$$v_{ah} = \frac{T_{se}}{T_{sh}} \times 100\%$$

Information :  
 V-ah : Percentage Value  
 T<sub>se</sub> : Total Empirical score obtained from student responses  
 T<sub>sh</sub> : Total expected score

With the product attractiveness criteria presented by the researcher as follows:

**Table 3.** Responnse Criteria

No	Presentase (%)	Criteria
1	81%-100%	Very Interesting
2	61%-80%	Interesting
3	41%-60%	Quite Interesting
4	20%-40%	Not Attractive
5	0%-20%	Very Unattractive

(Sahlan, 2016)

## RESULTS AND DISCUSSION

The results of research and development were in the form of data description, data analysis, and data interpretation using relevant theories. The purpose of developing this product will be to increase knowledge and help the student learning process. The model that the researcher uses adopts the 4-D model (Define, Design, Develop, and Desseminate) developed by Thiagarajan. However, this time the researchers only arrived at the Develop stage due to cost and time constraints, and only limited to the limits made for Ethnoscience-based digital teaching materials and student responses to the product. The following are the stages in the preparation and manufacture of ethnoscience-based digital teaching material products:

### 1. Define Stage

At this stage the researcher obtains the results of the needs analysis related to the product to be developed as follows:

- Products developed must be in accordance with the K2013 curriculum and in accordance with KI and KD
- The material that is in accordance with the research product is a branch of physics in the sub-material of sound
- The purpose of the developed product can help students understand the formulas and concepts of the material
- Students can get to know traditional music culture through learning
- Intermediary media that can be used are in the form of electronic book applications, more precisely flipbooks

### 2. Design

At this stage the researcher determines the format and design of the product development with the following steps:

- Preparation of learning materials  
The product must be in accordance with the curriculum, Core Competencies, Basic Competencies, Objectives and Indicators.
- Media Selection  
In making media, researchers used software, namely Microsoft Word 2010, Canva, CorelDraw and Flipbook.

Microsoft word can be used in the form of data processing (Setyawan, 2018). However, researchers used Microsoft Word 2010 to compile material or content on learning products and the size of the previous digital book was adjusted to support books in learning, which was 21 x 29.7 cm (Prastowo, 2016). The format for writing and product design is written using Arial and Times New Roman font size 12 pt. Meanwhile, on the cover the researcher uses CorelDraw and on the additional design of the book content using Canva media. FlipBook itself is used in the final stages of all products that have been designed by researchers.


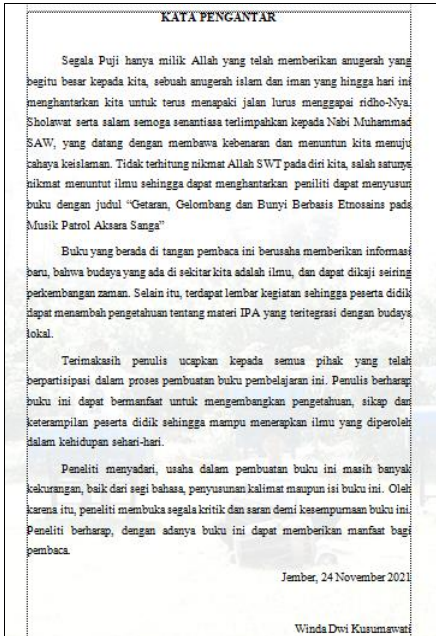
### c. Media Drafting

At this stage the researcher conducts product design starting from compiling;

1. Cover which contains; Logo, Title, Image and Identity of the researcher
2. Foreword
3. Table of Contents
4. List of Figures
5. List of Tables
6. Introduction which contains; Book description, Core Competence and Basic Competence, Indicators and Learning Objectives, User manual, Ethnoscience description and Concept maps
7. Split page
8. Content which includes; Theory, Materials and ethnoscience, independent task, and Competence test
9. Final which content; Answer key, Glossary, Bibliography, Biography and cover

The following initial design for the development of Ethnoscience-based digital teaching materials can be seen in the table below:

**Table 4.** Product Design

Cover	Foreword
	



Tabel Contents	List of figures
<p><b>DAFTAR ISI</b></p> <p>Cover Buku.....</p> <p>Kata Pengantar..... i</p> <p>Daftar Isi..... iii</p> <p>Daftar Gambar..... iii</p> <p>Daftar Tabel..... iv</p> <p>Buku Suplemen..... v</p> <p>KI, KD, Indikator dan Tujuan..... vi</p> <p>Petunjuk Penggunaan Buku..... viii</p> <p>Mengenal Etnosains..... x</p> <p>Peta Konsep..... xi</p> <p>Bunyi..... xii</p> <p>A. Pengertian Bunyi..... xii</p> <p>B. Frekuensi..... xiii</p> <p>C. Cepat Rambat Bunyi..... xiii</p> <p>D. Karakteristik Bunyi..... xiv</p> <p>E. Pemantulan Bunyi..... xiv</p> <p>F. Efek Doppler..... xv</p> <p>Uji Kompetensi..... xv</p> <p>Kunci Jawaban..... xv</p> <p>Glosarium..... xv</p> <p>Daftar Pustaka..... xv</p> <p>Biografi Penulis..... xv</p> <p>Cover Penutup..... xv</p>	<p><b>DAFTAR GAMBAR</b></p> <p>1.1 Gambar pertunjukan Musik Patrol</p> <p>1.2 Tokoh Alexander Graham Bell</p> <p>1.3 Gambar alat musik patrol terbuat dari kayu nangka</p> <p>1.4 Tuts Piano</p> <p>1.5 Tokoh Heinrich Rudolf Hertz</p> <p>1.6 Gambar alat musik patrol jenis bass</p> <p>1.7 Gambar alat musik patrol jenis selingan</p> <p>1.8 Gambar alat musik patrol jenis tingtung</p> <p>1.9 Gambar musik patrol jenis Remo</p> <p>1.10 Gambar musik patrol jenis kleter</p> <p>1.11 Contoh gama</p> <p>1.12 Pemanfaatan gaung</p> <p>1.13 Perbedaan gaung dan gama</p> <p>1.14 Ilustrasi efek doppler</p> <p>1.15 Tokoh Andreas Doppler</p>

List of tables	Book description
<p><b>DAFTAR TABEL</b></p> <p>1.1 Tabel Cepat Rambat Bunyi Dalam Medium</p> <p>1.2 Bunyi Hukum Merenne</p>	<p><b>BUKU SUPLEMEN</b></p> <p>Buku suplemen atau penunjang secara bahasa berarti buku yang memiliki kegunaan sebagai bahan pengayaan bagi siswa, seputar pelengkap pembelajaran ataupun tidak sama sekali. Sedangkan secara istilah buku suplemen berarti sebagai penunjang pembelajaran yang dapat digunakan sebagai pelengkap dalam pembelajaran. Maka dari itu, buku ini hadir sebagai pelengkap pembelajaran siswa melalui pendekatan budaya sekitar tempat tinggal siswa dengan materi yang ada di sekolah. Terlebih pada pembelajaran IPA yang kaitannya erat dengan alam sekitar.</p> <p>Sesuai dengan realita yang ada, salah satu cabang ilmu yang ada dalam pembelajaran IPA dan mengandung unsur budaya yaitu materi fisika. Materi fisika sendiri memiliki konsep dan fakta yang kental, sehingga membutuhkan perantara dalam penyampaiannya. Buku ini memuat mata pelajaran fisika pada materi getaran, gelombang dan bunyi yang dikaitkan dengan budaya khas Jember yaitu kesenian musik patrol.</p> <p>Dalam musik patrol Jember, terdapat unsur materi fisika yang erat kaitannya dengan materi getaran, gelombang dan bunyi. Dapat kita ketahui, pada frekuensi, nada, warna, tinggi rendah nada, dan bahkan kuat lemah nada terdapat dala musik patrol.</p> <p>Musik patrol khas Jember merupakan kesenian yang lahir dari akulturasi budaya. Alat musik patrol sendiri terbuat dari kayu nangka dengan ukuran yang bervariasi sehingga suara yang dihasilkan memiliki ciri khas masing-masing, serta kunci utama dalam permainan musik patrol adalah seruling bambu dan termasuk kedalam pemahatan materi bunyi (rupa organa).</p> <p>Maka dari itu buku ini hadir dengan tujuan siswa dapat memahami materi getaran, gelombang dan bunyi dalam balutan kesenian musik patrol khas Jember.</p>

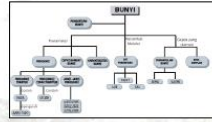
KI and KD	Indicators And Learning Objectives
<p><b>KI&amp;KD</b></p> <p><b>KI</b></p> <p>KI 1 : Menghargai dan menghayati agama yang diamtu                      KI 2 : Menghargai dan menghayati perilaku jujur, disiplin, tanggung jawab, peduli (toleransi, gotong royong), santun, percaya diri, dalam berinteraksi secara efektif dengan lingkungan sosial dan alam dalam jangkauan pergaulan dan keberadaanya                      KI 3 : Memahami dan menerapkan pengetahuan (faktual, konseptual, dan prosedural) berdasarkan rasa ingin tahunya tentang ilmu pengetahuan, teknologi, seni, budaya terkait fenomena dan kejadian tampak mata                      KI 4 : Mengelola, menyaji, dan menalar dalam ranah konkret (menggunakan, mengurai, merangkai, memodifikasi, dan membuat) dan ranah abstrak (menulis, membaca, menghitung, menggambar, dan mengarang) sesuai dengan yang dipelajari di sekolah dan sumber lain.</p> <p><b>KD</b></p> <p>3.11 Menganalisis konsep getaran, gelombang dan bunyi dalam kehidupan sehari-hari termasuk sistem pendengaran manusia dan sistem sonar pada hewan                      4.11 Menyajikan hasil percobaan tentang getaran, gelombang dan bunyi</p>	<p><b>Indikator</b></p> <p>A. Menjelaskan karakteristik bunyi                      B. Menghitung cepat rambat gelombang bunyi                      C. Menghitung jarak sumber bunyi ke pendengar                      D. Menganalisis hubungan antara frekuensi bunyi dengan tegangan dawai                      E. Menganalisis hubungan antara panjang pendeknya senar dengan frekuensi bunyi</p> <p><b>Tujuan</b></p> <p>1 Siswa dapat menjelaskan karakteristik bunyi                      2 Siswa dapat menghitung cepat rambat gelombang bunyi                      3 Siswa dapat menghitung jarak sumber bunyi ke pendengar                      4 Siswa dapat menganalisis hubungan antara frekuensi bunyi dengan tegangan dawai                      5 Siswa dapat menganalisis hubungan antara panjang pendeknya senar dengan frekuensi bunyi</p>

User manual

Ethnoscience Description

PETUNJUK PENGGUNAAN BUKU

Sebelum menggunakan buku ini, kamu perlu memahami petunjuk penggunaannya. Buku petunjuk atau suplemen ini dilengkapi dengan informasi-informasi, foto-foto berwarna, diagram-diagram dan ilustrasi untuk membantu siswa dalam mempelajari sains dan budaya lebih mendalam. Berikut ini akan dijelaskan petunjuk penggunaan buku ini beserta penjelasannya.



Pada fitur ini menjelaskan alur pemikiran yang akan dipelajari setiap sub bab dalam materi gelombang bunyi

Pada fitur ini membahas fakta yang ada dan berkaitan dengan materi yang telah ada

**Informasi..!**  
Latar belakang budaya yang dimiliki setiap siswa

- Alat dan bahan yang kalian perlukan**
- Kentongan bambu atau botol kaca
  - Pemukul kayu atau pemukul besi (jika medianya dari bahan kaca)
- Jika tidak ada kentongan bisa menggunakan botol kaca galon dan wadah yang berongga*

Bagian ini mengajak siswa menyelidiki dan menyimpulkan apa yang telah dilakukan.

**Dapat Bermanfaat**

Bunyi diantar saja dengan gelombang mekanik yang berwujud yang benar-benar merambat melalui partikel-partikel dan memiliki arah rambat yang tetap. Pada pergerakannya, partikel-partikel tidak akan bergeser tempatnya, tetapi hanya bergetar. Pada pergerakannya, partikel-partikel tidak akan bergeser tempatnya, tetapi hanya bergetar. Media rambat bunyi dapat berwujud padat, cair, gas, dan bunyi juga dapat merambat dan bergetar dalam vakum.

Pada bagian merupakan sarana informasi dan ilmu pengetahuan Islam modern



Etnosains

Apa itu Etnosains?



Etnosains secara etimologi berasal dari kata "ethnos" dari bahasa Yunani yang berarti "bangsa" dan "scientia" dari bahasa Latin yang berarti "pengetahuan". Secara umum Etnosains berarti pengetahuan yang dimiliki oleh suatu bangsa atau lebih tepatnya suku bangsa atau kelompok tertentu. Secara garis besar etnosains berarti ilmu pengetahuan yang berasal dari pengalaman dalam mengamati budaya yang berkembang, kemudian terintegrasi kedalam materi pembelajaran.

**Pernahkah kalian berfikir, mengapa etnosains perlu kita pelajari?**

Karena tanpa kita sadari ilmu yang kita peroleh berasal dari lingkungan sekitar kita, baik kegiatan sosial, pendidikan dan kebudayaan. Membahas tentang budaya pastinya tidak lepas dari tempat tinggal kita, baik berupa adat istiadat, kearifan lokal hingga kepercayaan masyarakat yang berkembang secara turun temurun. Dari kegiatan masyarakat tersebut lahirnya sebuah kebudayaan yang berkembang hingga sekarang, baik berupa kegiatan keagamaan, kegiatan sosial dan kesenian.

**Informasi..!**  
Latar belakang budaya yang dimiliki setiap siswa mempengaruhi proses pembelajaran siswa

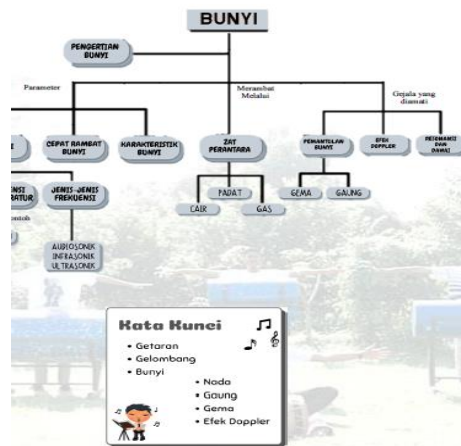
Salah satu kesenian yang dapat kita pelajari kali ini adalah kesenian musik patrol khas Jember. Kesenian Musik patrol sendiri merupakan kesenian yang masih eksis sampai detik ini, baik dari kegiatan sehari-hari hingga ajang perlombaan. Terbukti dengan adanya lomba tahunan yang diselenggarakan UKM Universitas Jember di bulan Ramadhan, dan kegiatan BBI (Bulan Berkunjung Ke Jember) yang menampilkan kekayaan budaya khas Jember.

Membahas patrol tidak luput dengan komunitasnya. Salah satu komunitas grup patrol yang eksis dan bergerak di dunia teknologi industri yaitu komunitas Patrol Jember Authentik. Dari sini kita bisa lebih mengenal ilmu sains

Concept Maps

Split Page

PETA KONSEP



Gelombang Bunyi Dalam Musik Patrol Jember Authentik



Theory

Materials And Ethnoscience

Bunyi

A Pengertian Bunyi

Dalam kehidupan sehari-hari kita sering melihat benda bergerak dan menghasilkan bunyi. Misalnya drum yang dipukul akan bergerak dan menghasilkan bunyi, jika permukaan kulit drum kita senam. Maka getaran pada permukaan tersebut akan berhenti dan bunyi yang dihasilkan memudar. Mengapa hal tersebut dapat terjadi? mari kita amati percobaan berikut!

- Alat dan bahan yang kalian perlukan**
- Kentongan bambu atau botol kaca
  - Pemukul kayu atau pemukul besi (jika medianya dari bahan kaca)
- Jika tidak ada kentongan bisa menggunakan botol kaca galon dan wadah yang berongga*

Langkah-langkah kegiatan

- Pukulah kentongan atau media lain yang kalian miliki hingga menghasilkan suara!
- Semah permukaan kentongan secara perlahan dengan jarum, kemudian rasakan apa yang terjadi!
- Pegang permukaan kentongan sampai tidak bersuara, kemudian sentuhlah dengan jari. Apa yang kamu rasakan?
- Selanjutnya buatlah kesimpulan berdasarkan percobaan yang telah kamu lakukan

Dari percobaan di atas dapat disimpulkan bahwa bunyi berasal dari getaran, dan benda yang bergerak disebut sebagai sumber bunyi. Bunyi merupakan gelombang longitudinal yang merambatkan energi gelombang pada medium rambatan hingga terdengar oleh reseptor pendengar.

Getaran yang berasal dari sumber bunyi tidak selamanya menghasilkan bunyi, sebab hal itu bergantung pada kuat lemah bunyi, tinggi rendah bunyi dan kepekaan alat pendengaran kita. Contohnya pada getaran bunyi pada benda

**Informasi..!**  
Molekula di udara hanya mengalami rapatan dan renggangan saja. Dan bunyi sampai ke telinga kita karena merambat dalam bentuk gelombang.

Gelombang Bunyi Berbasis Etnosains Pada Musik Patrol Jember Authentik

Etnosains dalam musik patrol



Gambar 1.1: Pertunjukan Musik Patrol (Sumber: Observasi Lapangan)

Dapat kita ketahui dalam petunjuk musik patrol Jember Authentik tidak lepas dari materi bunyi loh, mengapa bisa begitu?

*"Karena saat musik patrol mendapat pukulan maka terjadi rapatan dan renggangan pada permukaan alat musik, sehingga menghasilkan bunyi. Bunyi tersebut merambat melalui medium udara dan sampai ke telinga kita."*



## Independent Task

percobaan berikut!

**Ayo, Kita Lakukan**

**Alat dan bahan yang kalian perlukan**

- Kentongan bambu atau botol kaca
- Pemukul kayu atau pemukul besi (jika medianya dari bahan kaca)

Jika tidak ada kentongan bisa menggunakan botol kaca galon dan wadah yang berongga

**Langkah-langkah kegiatan**

- Pukulah kentongan atau media lain yang kalian miliki hingga mengeluarkan suara!
- Sentuh permukaan kentongan secara perlahan dengan jarimu, kemudian rasakan apa yang terjadi!
- Pegang permukaan kentongan sampai tidak bersuara, kemudian sentuhlah dengan jari. Apa yang kamu rasakan?
- Selanjutnya buatlah kesimpulan berdasarkan percobaan yang telah kamu lakukan

## Competence Test

## Uji Kompetensi

## A. Pilihlah satu jawaban yang paling tepat

- Gelombang yang memerlukan zat perantara untuk merambat dinamakan gelombang....
  - Gelombang mekanik
  - Gelombang elektromagnetik
  - Gelombang longitudinal
  - Gelombang transversal
- Gelombang yang merambat akan memindahkan....
  - Frekuensi
  - Amplitudo
  - Periode
  - Energi
- Sebuah bel listrik dibunyikan di dalam silinder kaca tertutup. Selanjutnya, udara dari dalam silinder dipompa keluar sedikit demi sedikit hingga habis. Bunyi bel terdengar makin lemah dan akhirnya tidak terdengar. Peristiwa ini terjadi karena....
  - Bunyi merambat memerlukan medium
  - Bunyi diredam oleh bahan kaca
  - Bunyi terbawa keluar bersama kaca
  - Frekuensi bunyi bel di bawah 20 Hz
- Kuat lemah bunyi bergantung pada
  - Frekuensi
  - Kawat

## Answer Key

## Kunci Jawaban

## A. Jawaban pilihan ganda

- |      |       |
|------|-------|
| 1. C | 6. A  |
| 2. D | 7. B  |
| 3. B | 8. B  |
| 4. B | 9. B  |
| 5. C | 10. A |

## B. Jawaban esai

- Gelombang bunyi merupakan gelombang longitudinal yang membutuhkan medium perantara dalam menghantar energi ke pendengar.
- Diketahui :  $v = 340 \text{ m/s}$  Ditanya:  $\lambda$ ?  
 $f = 50 \text{ Hz}$   
Jawab:  $\lambda = v/f = 340/50 = 6.8 \text{ m}$
- Perambatan gelombang bunyi dipengaruhi oleh suhu, ketika malam hari bunyi dipantulkan ke arah suhu yang lebih hangat (permukaan bumi) dibandingkan di atasnya dan bunyi terdengar jelas. Berbeda pada siang hari, gelombang bunyi dipantulkan ke suhu yang tinggi (atas) sedangkan permukaan bumi dingin dan bunyi tidak jelas di dengar.
- Pada saat kejadian tersebut gelombang bunyi pada sirine mengalami perpindahan dan semakin rapat mendekati pendengar, sehingga bunyi yang terdengar semakin jelas. Begitu sebaliknya ketika sirine menjauhi sumber bunyi, gelombang bunyi mengalami renggangan sehingga semakin jauh sirine dari pendengar maka renggangan makin lebar dan suara makin memudar.
- Pemantulan jika benda dilempar ke lantai
  - Pemantulan dapat terjadi karena benda yang bergerak memiliki energi. Ketika benda bergerak dan ada yang menghalangi, maka tersebut akan berbalik arah (memantul) dengan energi yang masih dimiliki.
  - Sifat bunyi yang dipantulkan dapat dimanfaatkan untuk mengukur kedalaman air, mengukur lorong gua dan bermanfaat untuk nelayan dalam mencari ikan

## Glossary

## Glosarium

<b>Amplitudo</b>	: Simpangan terjauh yang dicapai benda yang bergetar
<b>Bunyi</b>	: Getaran yang merambat melalui medium perantara
<b>Desah</b>	: Bunyi yang memiliki frekuensi tidak teratur
<b>Efek Doppler</b>	: Fenomena sumber bunyi mendekat dan sumber bunyi menjauhi pendengar
<b>Frekuensi</b>	: Jumlah getaran dalam satuan waktu (detik)
<b>Frekuensi audiosonik</b>	: Bunyi dengan rentan frekuensi 20-20.000 Hz
<b>Frekuensi infrasonik</b>	: Bunyi dengan frekuensi di bawah 20Hz
<b>Frekuensi ultrasonik</b>	: Bunyi dengan rentan frekuensi di atas 20.000Hz
<b>Gaung</b>	: Bunyi pantul yang terdengar bersamaan dengan bunyi asli
<b>Gelombang</b>	: Getaran atau energi yang merambat
<b>Gema</b>	: Bunyi pantul yang terdengar setelah bunyi asli diucapkan
<b>Getaran</b>	: Peristiwa bolak balik benda terhadap suatu titik kesetimbangan
<b>Nada</b>	: Bunyi dengan frekuensi teratur
<b>Resonansi</b>	: Peristiwa ikut bergetarnya suatu benda karena benda lain yang ada didekatnya.
<b>Patrol</b>	: Alat musik khas kebudayaan pandhalangan kota Jember
<b>Warna Bunyi</b>	: Perbedaan suara pada bunyi (khususnya alat musik)

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## Biography

*Hello, My Name is*  
**Winda Dwi Kusumawati**  
*"Sabir acidir meyvesi tattidir"*



Winda Dwi Kusumawati merupakan anak kedua dari dua bersaudara, dari pasangan suami Kusnadi dan Istri Juharia Aditia. Ia lahir di Jember 24 November 1998 tepatnya di Kelurahan Gebang, Kecamatan Patarang, Kabupaten Jember, Provinsi Jawa Timur. Riwayat pendidikan diawali dari jenjang Taman Kanak-kanak Al-Qodiri 1 Jember (2004-2005), kemudian melanjutkan di Madrasah Ibtidaiyah Laboratorium MAN 2 Jember (2005-2011). Pendidikan selanjutnya di Madrasah Tsanawiyah Negeri 2 Jember (2011-2014). Pendidikan selanjutnya di Madrasah Aliyah Negeri 2 Jember (2014-2017). Kemudian ia melanjutkan ke perguruan tinggi di Universitas Islam Negeri (UIN KHAS) Jember (2017-sekarang dan pendidikan non formal di Ma'had Al-Jamia'ah Syaifuddin Zuhri IAIN Jember (2017). Dari sejak sekolah menengah pertama sampai mengengah atas ia aktif di berbagai organisasi seperti Osis MTs Negeri 2 Jember (2011-2013), Pramuka (Dewan Galang MTsN 2 Jember), Osis MAN 2 Jember (Ketua bidang 4), Pramuka MAN 2 Jember, dan Teater Adibrata. Di perguruan tinggi ia aktif di Himpunan Mahasiswa Prodi (HMPS Vektor Tadris IPA IAIN Jember), Pramuka IAIN Jember, dan pernah aktif dihimpunan mahasiswa Jember. Saat ini ia sedang menyelesaikan tugas akhir perkuliahan.



3. The development stage here contains the refinement of teaching material products that have gone through the revision stage. Furthermore, the product is validated by meteorologists, media experts and user experts (teachers).

a. Expert validation

- Material expert validation is carried out to test the validity in terms of the material or content contained in the teaching materials made. There are three aspects of assessment in the questionnaire including; appropriateness of content, presentation and language used. The percentage results in the material validation test obtained a range of values of 91, 03% with details;

**Table 5.** Validation Material

No	Scoring Aspects	Score
1	Content Eligibility	54
2	presentation	38
3	Language	40
<b>Quantity</b>		<b>132</b>
<b>Percentage (%)</b>		<b>91,03%</b>

- Media expert validation is carried out by testing the validity of teaching materials made from graphics, with two aspects of assessment including; the feasibility of the software engineering used and the feasibility of displaying media and audio. at this stage the researcher obtained the results of the validation test of the range of values of 89, 41% with details;

**Table 6.** Validation Material

No	Scoring Aspects	Score
1	Software engineering	57
2	Visual and audio display	19
<b>Quantity</b>		<b>76</b>
<b>Percentage (%)</b>		<b>89,41 %</b>

b. User Validation(Teacher)

Furthermore, the product that has been validated by a team of experts is re-validated by the user (teacher) before the product is tested and responds to students. Aspects assessed by user validation include product feasibility, material suitability, and aspects of the language used. At this stage the researcher obtained the results of the validation test of the range of values of 88, 23% with details;

**Table 7.** Validation User (Teacher)

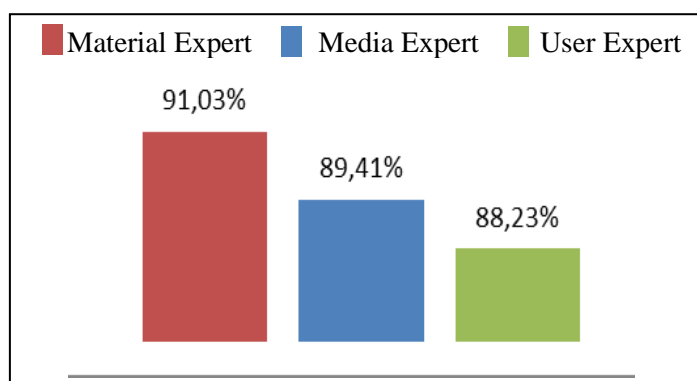
No	Scoring Aspects	Score
1	Theory	39
2	Language	8
3	Graphics	28
<b>Quantity</b>		<b>75</b>
<b>Percentage (%)</b>		<b>88, 23%</b>

Based on the validation results of the three experts, the Ethnoscience-based digital teaching material product that was developed obtained the following results:

**Table 8.** Validation of Experts

No	Assessment Aspect	Score
1	Material Expert	91,03%
2	Media Expert	89,41 %
3	User expert (Teacher)	88, 23%
<b>Percentage (%)</b>		<b>89,55 %</b>

From the results of these percentages, the total average given is 89.55% and shows that the development of ethnoscience-based digital teaching materials in Jember Authentic patrol music in the sound sub-material is included in the "very valid" category, here is a graph of the results of the comparison of the expert team:

**Figure 1.** Expert Validation Diagram

After knowing the results of the validation of ethnoscience-based digital teaching materials, the next step was to test the product to class VIII SMP students at MTs Negeri 2 Jember. Product trials were conducted to determine student responses to the attractiveness of ethnoscience-based digital teaching materials. Response test data retrieval was carried out in two stages, namely small-scale trials with the aim of knowing the results of student analysis of the quality of the materials developed with a total of 6 students consisting of 3 students of class VIIIH and 3 students of class VIIIE, the six students selected were students with Criteria; students who have never used flipbook applications and students who use internet networks in their learning methods. The results of a small trial obtained a percentage range of 80.76% or the product developed was "interesting". While large-scale trials were carried out to determine the quality and quantity of the product with the number of similar students 30 students each representing class VIIIH and VIIIE, with student criteria such as small-scale tests, but there were differences in students who had previously taken small-scale tests. The response test on a large scale obtained a result of 87.28%, or the product developed was "very interesting". The following is the validation of student response test validations from both small and large scales:

**Table 9.** Student Response Test

No	Student Response Test	Percentage %
1	Small scale test	80, 76
2	Large-scale test	87, 28

## DATA ANALYSIS

Ethnoscience based on sound sub material in class VIII SMP/MTs. This study uses a research and development research model or the so-called 4-D model developed by Thiagarajan. This development model has 4 stages, namely, (define, design, develop, Disseminate), but researchers only use 3 stages, namely (define, design, and develop). The researcher chose to use the 4-D model because the 4-D module presents systematic steps from preliminary analysis to producing a product, making it possible to produce ethnoscience-based digital teaching materials that suit the characteristics of schools and students.

Based on the results of interview observations in February 2021, researchers received information that students' problems in understanding concepts and facts in science learning are in the physics branch. Students assume that physics is a difficult material because many formulas and concepts are difficult to understand and the books used in learning are only BSE and UKBM books, there are no supporting books that help students understand the concept of sound material. From this problem, the researcher wants to develop a teaching material in the form of a digital supplement book based on ethnoscience.

Researchers chose Ethnoscience-based supplement books because during learning the teacher never used flip books and monotonous learning used modern musical instruments so that students did not recognize traditional music that was still awake.

The material developed in this teaching material is sound material with an ethnoscience approach or community culture that is still awake. The following are aspects of the relationship between science and culture which are associated with the art culture of Jember patrol music with sound material. Aspects of science, sound comes from vibrations, and objects that vibrate. Sound is a longitudinal wave whose energy propagation requires a medium of introduction to be heard by the receptor. In patrol music, the punches performed by patrol music players result in tightness and estrangement on the surface of the musical instrument and the air column cavities on the musical instrument, resulting in the sound and sound of the instrument propagating through the medium of matter and air until it reaches the listener. The use of flipbooks helps convey information and material that is abstract and clarified with audio and pictures so that students can easily understand the concepts and formulas in the sound sub-material.

Ethnoscience-based digital teaching materials on sub-sound materials developed by research will then be validated by material expert validators, media experts, and user experts (Science teachers) to determine the feasibility of Ethnoscience-based digital teaching materials before testing them on students. The material expert validator is Mr. Dinar Maftukh Fajar, S.Pd., M.PFis. The results of the validation carried out by material expert validators on the development of Ethnoscience-based digital teaching materials in the sound sub material were obtained at 91.03% so that they were included in the very valid category with suggestions for correcting errors in letters, symbols, punctuation marks and also the effectiveness of the sentences used, while in the comments it is enough to show elements of ethnoscience. The content of the material in the ethnoscience-based digital supplement book is included in the very valid category, namely 91.03%, this is because the material has linked science elements with culture that is still maintained.

This is in accordance with the one on the speed of sound material, where sound propagating requires an intermediary medium. The medium that has the largest propagation is solid objects, the same as the basic material for making patrol musical instruments in the form of jackfruit wood so that the sound that comes from the patrol musical instrument the direction of the wave propagation is faster (Abdul, 2016).

Assessment of teaching materials for media expert validators is Mrs. Lailly Yunita Puspita S. Pd, M. Si. The results of the validation carried out by the material expert validator



on the development of Ethnoscience-based digital teaching materials on the sound sub material were obtained at 89.41% so that it was included in the very valid category with suggestions for correcting errors on the cover, bibliography, writing source images, and a list of tables. While the comments are enough and the attractive appearance of the design that is presented is in harmony with the concept and theme. These results are in accordance with the use of supplement books as complementary learning books, and the advantages of the flipbook application as a medium that presents supporting features in the form of audio, video, and so on (Suci, 2020). Meanwhile, in the assessment of teaching materials for expert user validators (science teachers), Mr. Fatu Rosi M. Pd. For the results of the validation carried out by expert user validators on the development of Ethnoscience-based teaching materials in the sound sub-material, data validation was obtained by 88.23% so that it was valid with suggestions for improving the content of devotion to God Almighty, considering the school background is Madrasah Tsanawiyah. As for suggestions and comments that supplement books are interesting media, because they link a culture that is still maintained with learning materials, especially there is explanatory content regarding audio music related to the material.

The product that has been validated by several validators will be tested on class VIIIH and VIIIE students. This trial aims to determine student responses to products that have been developed by researchers. The trial was carried out in two stages, namely small scale and large scale. The small-scale test requires 6 students from each class representative, while the large-scale test requires 30 students from class representatives as well. After conducting a small-scale trial, it was obtained that a percentage of 80.76% was included in the valid category by making minor revisions. These results were obtained due to incompatibility and constraints in accessing the network on the media. Furthermore, the product is used in large-scale trials. For the large-scale test, the percentage result is 87.28% which is included in the very attractive category. It is proven by the enthusiasm of students both from suggestions and comments regarding ethnoscience-based digital supplement book products, especially they can get to know the culture that still exists around students. Based on the percentage of small-scale and large-scale trial results obtained with a percentage of 80.76% and 87.28%, it can be said that digital teaching materials (supplementary books) based on ethnoscience in patrol music in the sound sub-material are in the very interesting category with product development criteria in accordance with BNSP.

## CONCLUSION

This research is a type of Research and Development research using a 4-D model by Thiagarajan. The model has four stages, namely, Define, Design, Development and Dissiminate. However, the researcher modified 4-D to 3-D or reached the Develop stage due to time constraints, the time the research took place at the end of the year and odd semester exams were held. The objectives of this study are, (1) to describe the level of validation of ethnoscience-based digital teaching materials in the Jember Authentic patrol music in the sound sub-material; (2) describe student responses to ethnoscience-based digital teaching materials in Authentic Jember patrol music on sound sub-materials for class VIII SMP/MTs students. With the subject of the variable assessment in the study, namely, material experts and media experts consisting of lecturers and science teachers. The student response test in this study was divided into 2, namely 6 students in the small-scale test and 30 students in the large-scale test.

The results of this study stated that the development of ethnoscience-based digital teaching materials obtained an average percentage of material expert validation tests of 91.03%, media experts 89.41%, and user experts (teachers) obtained results of 88.23% with meet the very valid category and the product is very attractive. The results of the small-scale

trial response obtained an average percentage of 80.76% in the "interesting" category, while in the large-scale trial an average percentage of 87.28% was obtained in the "very interesting" category so that this ethnoscience-based digital teaching material can be used in supporting student learning without any revision.

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