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# Ethnoscience and Web-based Learning Media to Maintain Cultural Awareness in Science Classroom: An Exploratory Sequential Study

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## ABSTRACT

This research aimed to measure prospective teachers' cultural awareness in learning using web and ethnoscience-based media. To confirm the media's feasibility, we conducted teaching material verification tests and media verification tests utilizing Borg & Gall theory. A mixed method study was used in data collection techniques, including observations, documentation, and interview. Following the qualitative, quantitative verification test was conducted by two verifiers, with the first verifier, media professionals, rated highly effective with an average of 96.6%. In contrast, the average percentage of material expert verifiers was 98%. The results showed that the student's cultural knowledge increased statistically significant with 5% alpha after learning science using the media. The average n-gains for the three grades were high, with no differences among them, and over 93% of students responded positively to the media. Prospective teachers can benefit from incorporating these media into their teaching practices to enhance students' understanding and respect for diverse cultural perspectives. The findings suggest that integrating ethnoscience and web-based media in science education can help bridge the gap between traditional knowledge systems and scientific content. Overall, the practical implications of this study highlight the importance of leveraging innovative teaching methods to promote cultural understanding and inclusivity in science classrooms.



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## 1. INTRODUCTION

In the current era of globalization, students are more familiar with foreign cultures and less understand the country's culture and local wisdom, so students' sense of nationalism argued. For culture and local wisdom to remain strong, students, as the nation's next generation, must instill a sense of love for culture and local wisdom by integrating cultural knowledge into the learning process (Fasasi, 2017; Koirala, 2022). Because regional culture, local wisdom, and the surrounding environment can make a particular contribution to the learning experience of students in the form of mindset (cognitive), attitude patterns (affective), and behavior patterns (psychomotor). Therefore, an educational breakthrough is needed that combines culture with science or commonly called ethnoscience (Dewi et al., 2021). Despite the cultural-awareness issues, based on the observation, there are problems faced by students when learning science, particularly: the lecturer reprimands students who are less successful than praises successful students; the use of media is not appropriate, and the learning material provided by the lecturer is usually packed with a tiresome powerpoint presentation. We then explore the preliminary study using qualitative analysis to get a more profound description of this situation.

In today's interconnected world, education plays a key role in promoting cultural awareness and inclusion. In the field of science education, it is important to recognize the different cultural backgrounds and bodies of knowledge of students and their contributions to scientific understanding. Recognizing and integrating cultural perspectives into science education not only promotes inclusion but also enhances the learning experience for all students. states that ethnoscience, or original knowledge in the form of language, customs, and morals, is currently the recommended scientific approach for education in Indonesia (Solheri et al., 2022). An approach to planning and developing a learning environment incorporating culture into science learning is known as the ethnoscience approach (Sulistri et al., 2020). The lecturer's ability to combine original and scientific knowledge is crucial for applying an ethno-scientific approach to teaching science. The application of ethnoscience is not only in line with the era and principles adopted by Indonesian society today but also to regional culture and regional cultural potential. Why scientific knowledge? Regarding the capacity to apply scientific knowledge to real-world situations and achieve higher levels of scientific literacy, there are critical assumptions that are often not questioned. The following is an example of assuming someone would apply what they know to real-world situations if they had sufficient knowledge. In other words, it is assumed that personal behaviours and decisions are directly influenced by scientific knowledge. These assumptions provide little or no recognition of domains, including interests, attitudes, beliefs, and values that influence personal decisions (Pahrudin et al., 2019).

Information and communication technology is also the most critical part of the educational process for the development of students. This is because information and communication technology can provide solutions to overcome educational problems in Indonesia (Widianto, 2021). As technology users, humans must be able to take advantage of current technology to find alternative media to replace conventional learning media (Yu et

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al., 2022). Technology is always related to education and technology as an alternative to increasing the ability of students to be able to think regularly, critically, creatively, and innovatively in the context of technology so that they can, directly and indirectly, improve the quality of "technology literacy" and superior human resources, which is very necessary for this era of globalization (Makinde, 2020). The existence of technology has undoubtedly dominated various circles of society, especially in the era of the digital industry as it is today (Yin et al., 2021). There have been many community activities that have utilized technology as the most accessible basis in their lives. One of them is the use of technology in education. It can foster a sense of independence and activeness in learning citizens through student activities that enjoy the learning process based on independent business (Purnama et al., 2021). The independent business in question is students' activeness in finding and analyzing their knowledge based on their specifications and students' sensitivity in critically processing all the information they get. Making students who were previously passive become active students, in other words, trying to produce and share knowledge and skills rather than absorb the knowledge conveyed by educators; so, in this case, educators are only trying to direct and not necessarily activate themselves to teach or fully control students (Sulistri et al., 2020; Widianto, 2021).

Previous research (Mukti & Anggraeni, 2020) on electrical learning material using web-based media found that this media is designed to help students learn independently. Waluyo (2021) states that web-based media is essential for online learning participants, and the content can be personalized to the learning process's needs, helping convey learning content to students. Dewi (2020) points out that vocational students' learning achievement improves when using web-based media. Besides that, high school students learning outcomes improved using web-based media (Arifiani et al., 2022). Furthermore, the advantages of using this web-based learning media for lecture methods are: 1) An online system that can be used outside class hours without relying on lecturers; 2) Accessible anytime, anywhere, by anyone, as long as there is an internet connection; 3) being interactive, it is very interesting to use as an independent learning medium; 4) It can also be accessed from any internet-connected device (Hidayat, 2018; Setiyowati, 2021).

This study investigated the students' cultural awareness before and after using ethnoscience and web-based media in science classrooms. The moderating effects of university location was also examined.

## 2. METHODS

This research is a mixed exploratory sequential study that begins with the collection of qualitative data, then progresses to the collection of quantitative data. Qualitative data in this study is used in a preliminary study to measure the cultural awareness and learning activities of university students in an elementary teacher education program consisting of 120 students in the science classroom. Then, explain and describe the results obtained (Schoonenboom & Johnson, 2017).

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### 2.1. Qualitative Study

Data were collected through observation and extensive questioning of five key informants. The information collected relates to students' cultural perceptions and learning activities. The research was conducted in Surabaya, East Java, Indonesia. Researchers used tools such as field notes, voice recorders, cameras, and indicator readings to facilitate data collection and analysis. These tools collect data in the form of information expected to complement the required information according to the research focus. Data analysis by (Miles & Huberman, 1994) consists of data acquisition, reduction, display, and conclusion/verification. According to the National Education Association (NEA), cultural awareness or competence consists of 1) understanding one's culture and that of others, and 2) understanding the role of culture in education (Baker, 2012; Tomalin & Stempleski, 2013).

### 2.2 Quantitative Study

Research and analysis instruments of the ethnoscience and web-based learning media is as follows:

#### 2.2.1. Expert Validation Sheet

The expert validation sheet consists of two assessments: 1) material expert; 2) media expert validation. Furthermore, the validator is asked to assess the validity of studying and evaluating aspects of the media and material in learning media development. While media validation can be seen in general standards, software technical aspects, visual communication, and media design, material expert validation includes research relevance, content, and language eligibility criteria. The validation instrument uses a Likert scale with 5 rating scales **(see table 1)** (Emerson, 2017).

**Table 1.** Guidelines for the Rating Scale of the Validation Sheet

| **RATING SCALE FALIDATION** | |
|---|---|
| **Score** | **Category** |
| 5 | Highly credible |
| 4 | Credible |
| 3 | Credible enough |
| 2 | Less credible |
| 1 | Not credible |

The next step after getting the results of this validation score is classifying it into the score on the Likert scale. The formula used to calculate the percentage of validation results is as follows (Cohen et al., 2017).

$$P = \frac{\Sigma \square x}{N} \times 100\%$$

Summing up the percentage calculation results matched with the average validity according to (Drost, 2011) **see table 2**:

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**Table 2.** Media Eligibility Criteria

| MEDIA ELIGIBILITY CRITERIA | | |
|---|---|---|
| **No** | **Percentage** | **Criteria** |
| 1 | 81% – 100% | Highly credible |
| 2 | 61% – 80% | Credible |
| 3 | 45% – 60% | Credible enough |
| 4 | 45% – 60% | Less credible |
| 5 | <20% | Not credible |

Ethnoscience-based Google sites learning media for science subjects are feasible as the validity percentage of the validation results of experts reaches more than 61%.

### 2.2.2. Questionnaire

A questionnaire is a tool used to collect data by giving written questions to respondents. This questionnaire is used to determine the response of students and class lecturers to the media products that have been developed. The data in the questionnaire or written statements to the respondents for this were filled out by students and lecturers at the end of the trial (see **table 3**) (Pakaya et al., 2023).

**Table 3.** Guidelines for Student and Lecturer Response Questionnaire Rating Scales

| QUESTIONNAIRE RATING SCALE | |
|---|---|
| **Score** | **Category** |
| 5 | Extremely agree |
| 4 | Agree |
| 3 | Quite Agree |
| 2 | Disagree |
| 1 | Extremely Disagree |

Calculations to see the weight of each response by calculating the average score use the following formula (Pakaya et al., 2023):

$$P = \frac{\sum x}{N}$$

The practicality percentage calculation uses the (2) formula. Summarize the calculation results using the following criteria, see **table 4**:

**Table 4.** Percentage of Student and Lecturer Responses

| **No** | **Percentage** | **Criteria** |
|---|---|---|
| **1** | P > 81% | Very good |
| **2** | 61% < P ≤ 80% | Good |
| **3** | 45% < P ≤ 60% | Enough |
| **4** | 21%<P≤ 44% | Deficient |
| **5** | P<20% | Very deficient |

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### 2.2.3. Effectiveness

Analysis of effectiveness can be seen from the results of students' cultural awareness in science classroom after using the media. The data obtained is then analyzed to determine the effectiveness of the media. The completeness aspect of student learning outcomes emerges from the learning process carried out using Google sites media through assessment questions and is considered valid if $\alpha > 0.05$ (significant level) (Creswell & Clark, 2011).

## 3. RESULTS AND DISCUSSION

The initial stage of this research, the analysis phase, includes qualitative data collection from an observation of learning activities, and interview the keynote source person. The result from observations indicates that cultural awareness of students still needs to be improved. This is shown by several interview questions asked to informants, which lead to indicators of cultural awareness. Almost all questions were not answered perfectly. This observation result underlies us to implement web-based ethnoscience media for students in science classes. Several causes allow us to explore, including the university's location in a big city. Big cities tend to be advanced and have a very diaspora population. So, there is less cultural consistency in everyday life. After that, material analysis and learning media creation were carried out using web-based sites in the form of products from the Google Sites application. The development of this product is an innovation in the use of learning media, which can be seen at the following link or address: https://sites.google.com/view/klas4ipas-bab4/home.

We compile materials and media that will become learning media based on the Google Sites web. At this stage, it begins with designing and determining the concept for the background and storyboards to facilitate the creation of concepts on media, layout concepts, material content, and additional supporting images.

This stage of the development program that has been designed and then processed into the Google Sites media, see **Figure 1 and Figure 2**. Here are the results for the following web-based media products from Google Sites.

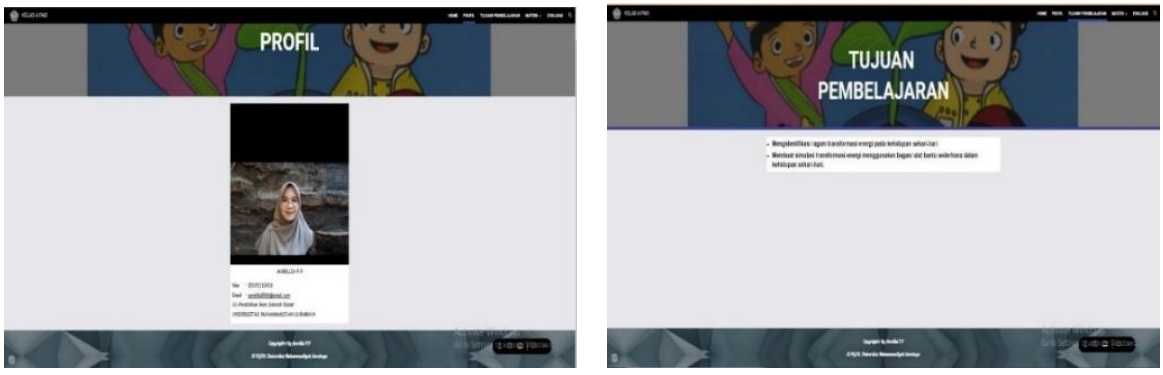


**Figure 1.** View of the main page, menus, and display of the profile page.

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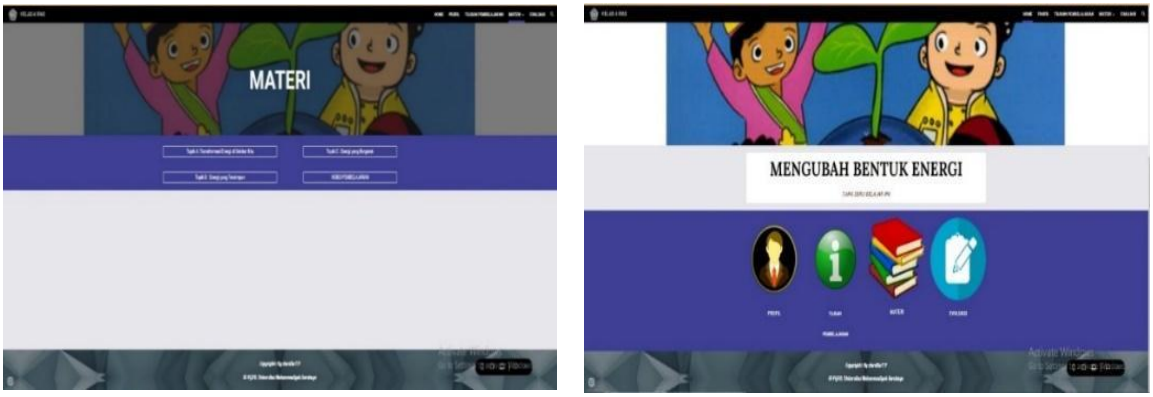


**Figure 2.** Display of learning objectives pages and material pages.

Based on the results at elementary school, and in line with the research by (Pertiwi & Purnawarman, 2023). Google Sites media is the right choice for learning activities because this media is fun for students and easy for lecturers to use. Expert validity tests have carried out the implementation of this research's validity test, and the validity level must be determined through the validation of media experts, material experts, and student and lecturer questionnaires to test web-based teaching material products. Experts generally consider that the product validation survey tool reflects all the topics discussed in this study and has measurable content, language components, display, and graphics components so that the media created is feasible.

The validity of products is determined by analyzing data from expert validation tests; the results of the expert validation test of learning materials obtained a percentage of 98%, so web-based teaching material products meet the categories so that they can be said to be very valid (see **table 5**).

**Table 5.** Validation Test Results by Material Experts

| No | Aspects | Validator | | Awarage |
|---|---|---|---|---|
| | | 1 | 2 | |
| 1 | Materials | 33 | 34 | 33,5 |
| 2 | Display | 15 | 15 | 15 |
| 3 | Media effect | 15 | 15 | 15 |
| 4 | Construct and Language Validity | 10 | 10 | 10 |
| | Sum | | 73,5 | |
| | Percentage | | 98,0% | |
| | Category | | Highly credible | |

Based on the aspects presented, the elaboration of teaching materials includes mind mapping, material for changes in energy forms and assessment sheets, indicators, and learning objectives according to basic skills (Febrina et al., 2020). The results of the validation test by media experts showed a percentage of 96.6%, which means that the web-based teaching aid product meets the very feasible category (see **table 6**).

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**Table 6.** Validation Test Results by Learning Media Experts

| No | Aspects | Validator | | Awarage |
|---|---|---|---|---|
| | | 1 | 2 | |
| 1 | Materials | 37 | 40 | 38,5 |
| 2 | Display | 9 | 9 | 9 |
| 3 | Media effect | 15 | 15 | 15 |
| 4 | Construct and Language Validity | 10 | 10 | 10 |
| | Sum | | 72,5 | |
| | Percentage | | 96,6% | |
| | Category | | Very feasible | |

Product trials were carried out for students. In this phase, questionnaires were distributed to students and lecturers, where they received information about the product and quality of online media developed by Google Sites. The results of the evaluation of the lecturer's and students' answers were as follows: the test results on students consisted of 120 university students in science class, and a percentage of 93% was obtained. Hence, the product of web-based teaching materials fulfilled the category so that it could be excellent.

Based on the results of a Google Sites learning media lecturer survey, the percentage is 94%, so the product meets very good requirements (see **table 7**).

**Table 7**. Results of the Lecturer Response Assessment Questionnaire

| No | Name | Score | Feasibility | Percentage | Category |
|---|---|---|---|---|---|
| 1 | Respondent 1 | 105 | 4,5 | 95% | Very good |
| 2 | Respondent 2 | 102 | 5 | 92% | Very good |
| | Sum | 207 | 9,5 | 94% | Very good |
| | Average | 103,5 | 4,75 | | |

Improvements are made to avoid problems when using google sites media in the teaching process. At a later date, the evaluation determines the feasibility of product development for the media being developed.

The effectiveness of the product is obtained from the results of student's cultural knowledge tests; student learning outcomes after using Google Sites learning media have an overall average n-gain 0,53 which means that the average learning outcomes of all students who take the test are complete (see **table 8**).

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**Table 8.** Recapitulation of Test Results

| Class | Pretest | Postest | N-Gain | Level |
|---|---|---|---|---|
| **A** | 52,3 | 81,3 | 0,50 | Medium |
| **B** | 54,6 | 87,2 | 0,51 | Medium |
| **C** | 57,2 | 81,9 | 0,57 | Medium |
| **Average** | **54,7** | **83,5** | **0,53** | **Medium** |

Levene's test with significance levels of 5% and 0.05 were used for homogeneity tests for the first (pre-test) and final (post-test) tests, respectively. Priyatno (2016) this means that if the number of signatures results in more than 0.05, the distribution of the data is said to be homogen. The homogeneity test results are shown in **table 9**.

**Table 9.** Homogeneity Test Results

| Variable | Significancy | Standard | Data Variance |
|---|---|---|---|
| Pretest | 0,074 | 0,05 | Homogen |
| Posttest | 0,065 | 0,05 | Homogen |

As seen in Table 10, the pretest and posttest homogeneity tests are significantly better than 0.05 (5%). This indicates that classes A, B, and C have homogeneous data variants. The normality test used in this study is the Kolmogorov-Smirnov test because a lot of the data used in the study is more than or equal to 50. The data distribution is expected if the significant result is more than 0.05 (Sundayana, 2014). The outcomes of the normality test are revealed in the following **table 10**.

**Table 10.** Normality Test Results

| Variable | Kolmogorov-Smirnov | Standard | Data Variance |
|---|---|---|---|
| **A Class** | 0,121 | 0,05 | Normal |
| **B Class** | 0,137 | 0,05 | Normal |
| **C Class** | 0,153 | 0,05 | Normal |

The students in class A achieved a score of 0.121 > 0.05 for their cultural knowledge; class B scored 0.137 > 0.05; and class C scored > 0.153 based on the normality test scores of the pre- and post-test results. The results of the test were normally distributed. The data are regularly distributed if the Kolmogorov-Smirnov score is > 0.05 (5% significance level). The results of the two tests for data homogeneity and normality showed that the gathered data were consistent and distributed normally. The relevance of the learning media examined using a paired t-test. **Table 11** show the calculation's outcomes:

**Table 11.** Paired T-Test Results

| t count | Sig. (p) | Description |
|---|---|---|
| 5,870 | 0,002 | The difference pretest and posttest is sizable. |

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The paired t-test calculation using Table 11 produced a t-count of 5,870 and a significance value of 0.002 for the test. This leads us to the conclusion that (0.002) 0.05 is the significant value. As a result, it can be concluded that, using the learning media, there is a significant change in the students' cultural knowledge. Therefore, it can be said that learning with ethnoscience and web-based media can improve students' cultural awareness.

Ethnoscience is meaningful learning that allows students to "learning by doing" (Fasasi, 2017). Learning by doing allows students to connect the learning material studied with the context of everyday life. Implementing ethnoscience-based learning will make learning activities more meaningful and by the objectives of implementing learning according to the Permendikbud number 58 of 2014, that each student can apply science wisely to maintain sustainability.

Education and technology are interrelated and inseparable in the 4.0 era. The role of technology in the development of education is significant, and education also plays an essential role in developing information technology (Ploj Virtič, 2022). As we know, the curriculum plays a significant role in education (Aikens & McKenzie, 2021). The curriculum is a "soul" in Indonesian education. It has been determined, but its implementation must be evaluated dynamically and periodically according to the times and technological advances (Vhalery et al., 2022). It must also pay attention to the competencies needed by the community. The independent curriculum develops so rapidly in the fields of technology and information that it significantly impacts all activities that humans carry out in their lives (Naila et al., 2022). The Ministry of Education and Culture has developed a unique curriculum to enable innovative learning and meet students' needs called Kurikulum Merdeka (Rahmadayanti & Hartoyo, 2022).

This "Kurikulum Merdeka" is closely related to the 21st-century skill i.e. critical thinking and problem-solving, creativity and innovations, communication, and collaboration (Naila, 2020). In learning, sometimes lecturers only rely on tools such as blackboards, conventional learning media, methods, and materials in achieving learning goals (Wen & Walters, 2022). However, students must also develop their life skills (4c and others) and understand the material. With that need, lecturers not only have to master the learning materials but also software applications and relevant media that allow students to find out how well they interpret their level of understanding and develop their life skills (Dewi et al., 2019). Many applications and online platforms can be used as learning media, including Phet simulator, Google Sites, Quizizz, Mentimeter, Powtoon, and others. Lecturers can also reuse posts, create questions, create assignments, and create topic features when creating learning materials. Therefore, we use one of the appropriate media types in making teaching materials, namely the Google Sites application, which is easy for elementary students to use (Pertiwi & Purnawarman, 2023).

An effective learning process is a planned learning process whose results meet predetermined standards (Yuliana et al., 2021). The effect of learning can be seen in students' mastery of concepts and their level of learning motivation (Naila, 2023). This can be obtained by appreciating student work, responses, greetings, and tasks. Students have worked on that.

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The learning environment is essentially a component of the learning system because some media must be integral parts, so it must be in harmony with the learning process (Barry et al., 2018).

Research conducted by (Barak & Ziv, 2013) web-based learning media can provide a new atmosphere during the learning process and help students avoid boring learning situations. In this case, Google Sites media can make learning easier for students because it is again easily accessible so that students can review previous material as an assessment of what they have been studying (Pertiwi & Purnawarman, 2023). The development of ethnoscience-based google sites learning media has gone through product verification and trial stages; from the verification and product trial activities, some data is obtained, then analyzed to determine whether the learning media is of good quality, namely by effective, practical, and influential standards.

Web and ethnoscience-based learning media using Google Sites has now been developed for students in elementary teacher education program so that every student can access learning anytime, anywhere. This allows students to receive information from various sources and can encourage students to learn more actively and independently (Yu et al., 2022). In addition, lecturers can easily add or update materials and publish it. This web and ethnoscience-based learning media using Google Sites provides benefits for students and lecturers (Arumingtyas, 2021; Mukti & Anggraeni, 2020). Therefore, Google Sites is the right choice for lecturers to embed learning.

## 4. CONCLUSION

Based on the results of the research described earlier, it can be concluded as follows: 1) The results of material validation obtained from material experts are 98% and can be categorized as "very feasible". The media validation results from media experts were 96.6% which can be categorized in the "very feasible" criteria. The very feasible criteria means that the ethnoscience and web-based media is very valid and feasible to use; 2) Practical results based on the assessment of 120 students is 93% with the "excellent" criterion. While the results of practitioners based on the lecturer's assessment were 94% with the "outstanding" criterion. The excellent criterion means that the media is efficient in learning; 3) The results showed that the student's cultural knowledge increased statistically significantly with 5% alpha after learning science using the media. The average n-gains for the three grades were high, with no differences among the three grades, and over 93% of students responded positively to the media Ethnoscience and web-based learning media meets the media eligibility criteria: valid, practical, and effective to improve students' cultural awareness in science classroom.

## 5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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