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Ethnopedagogy: Traditional games in senior high school physics enrichment module

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ABSTRACT

This research aims to determine expert opinions on the feasibility of high school physics enrichment modules with 21st-century skills based on ethnopedagogy and determine the product's attractiveness. This research employed R&D research in conjunction with ADDIE development models. The research subjects were senior high school students from MAN 1 Bandar Lampung, SMA Negeri 12 Bandar Lampung, and SMA Negeri 5 Bandar Lampung. The data collection techniques were questionnaires for expert validation: material expert, media expert, and cultural expert. Then the researchers also distributed student questionnaires. The findings of this study are as follows: 1) the final product met the excellent criteria, 2) the product's attractiveness met the excellent criteria, and 3) the teachers' responses indicated that the product belonged to the excellent criteria. As a physics learning product, the high school physics enrichment modules with 21st-century skills based on ethnopedagogy were appropriate and attractive to use. It is suggested that further researchers develop learning material other than local Lampung culture and traditional Lampung games so that the physics concepts will differ.

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INTRODUCTION

Ethnopedagogy includes local knowledge or wisdom as a source of skills and innovations that can be empowered for the benefit of the people (Susila et al., 2019). Ethnopedagogy is a message related to the term character culture as seen from the ethnic and educational aspects of the pedagogical aspect (Oktavianti & Ratnasari, 2018), which can also play a role in cultural value-based education (Koswara et al., 2016) as well as character education practices for children (Suminar et al., 2020). Ethnopedagogy-based learning, defined as the creation of a learning environment that integrates local wisdom, can be used to improve educational quality (Rakhmawati, 2016; Tanu, 2016) (Ningsih & Cysby, 2019; Syasmita, 2019).

Local wisdom can be defined as a cultural order in the form of knowledge, norms, regulations, and local ideas that are wise, full of wisdom, and value that are embedded and followed by community members in an area to meet the needs of living together that have been passed down through generations (Putra, 2017) (Hiryanto, 2017). Local wisdom is one type of social capital that the community can develop to bring order and balance to the community's socio-cultural life while also preserving natural resources (Hidayati, 2016).

According to the findings of researchers at the Lampung Museum and the Keratuan Lampung Cultural Arts College, several aspects of Lampung culture can be related to one of the sciences, namely physics, a science that is very closely related to daily human life (Diani et al., 2016), Hooke's law material, Uniformly Changed Straight Motion (GLBB) material,

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impact material, pressure material, transfer material, acceleration and speed, equilibrium material, and other physical materials.

Enrichment is an essential process in learning physics because it allows students to understand the material more deeply and increases students' learning motivation (Agustin, 2015; Izzati, 2015; Riyan et al., 2021; Rofiah et al., 2015). Similarly, using the enrichment module can boost students' learning motivation and conceptual understanding.

Several problems were discovered due to pre-research conducted in several high schools. The teachers rarely used media or teaching materials during the enrichment process in physics lessons because enrichment was applied to complex subjects or materials. Also, the teachers focus more on the remedial than the enrichment process. The teachers have never linked the concept of physics to local culture, even during the physics learning process. They also lacked teaching materials suitable to the learning materials (Setiyadi, 2017; Sukiminiandari et al., 2015). Previous research has shown that ethnopedagogy is a more effective learning approach when implemented through learning activities that present local wisdom-based media (Oktavianti & Ratnasari, 2018).

One solution for preserving local wisdom is to implement local culture-based learning. Several studies have combined learning with local cultural wisdom, including work by Shufa (2018), Prihatini (2015), Tusriyanto (2020), Hasriyanti (2021), Rosadi et al. (2019), and Bakhtiar (2016). However, there has been no learning that elevates the culture of traditional Lampung games packaged in the form of modules among the many studies that integrate learning based on local cultural wisdom. As a result, a high school enrichment module based on traditional Lampung games and containing 21st-century skills integrated into physics subjects is required.

METHOD

This research employed the instructional design method with the ADDIE development model. The ADDIE model is organized into stages: analysis, design, development, implementation, and evaluation (Dick & Carrey, 1996). Figure 1 depicts the flow of research and development using the ADDIE model.

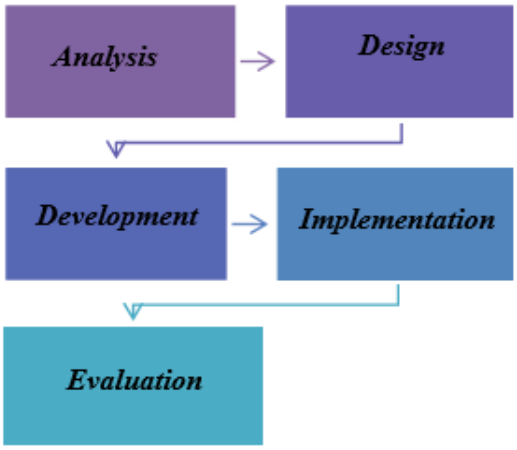


Figure 1. ADDIE Development Stages

The developed enrichment module is intended for senior high school students. Questionnaires for media experts, material experts, and cultural experts were used to collect data. Furthermore, the researchers distributed questionnaires for teachers and students in the small-scale trial (10 students in each school) and the field trial (30 students in each school). The qualitative data obtained from the research results were then analyzed in the form of numerical data with a Likert scale. The Likert scale assesses a person's or group's attitudes, opinions, and perceptions of social phenomena (Agustian et al., 2013).

This research was conducted in three Bandar Lampung senior high schools, namely SMAN 1 Tanjung Bintang, SMAN 14 Bandar Lampung, and SMAN 15 Bandar Lampung, with class XII students as research subjects. In this study, the criteria for the range of validation values in table 1 were determined using a Likert scale with a score range of 1-5 for the highest value.

Table 1. The Criteria of Scale Interpretation (Diani et al., 2018)

Criteria	Interval
Highly invalid	0 < X ≤ 20%
Invalid	20 < X ≤ 40%
Moderately valid	40 < X ≤ 60%
Valid	60 < X ≤ 80%
Highly valid	80 < X≤ 100%

The percentage of validity scores was obtained by the following formula (Wati et al., 2016):

$$V = \frac{T}{U} \times 100\%$$

Description:
V = Validity
T = The obtained validity score
U = Maximum validity score

Furthermore, the percentage of the total assessment score can be calculated using the following formula:

$$P = \frac{\Sigma X}{\Sigma Xi} \times 100\%$$

Description:
P : Percentage
ΣX : The total of respondents' answers on one item
Σxi : Item's ideal score

RESULTS

To determine product feasibility, the high school physics enrichment module as enrichment material was interpreted in the form of words. Data analysis was performed to determine the validity of physics learning products after revision. The questionnaire as an instrument was the research's potential. A high school physics enrichment module can help students learn more about topics such as Hooke's Law, GLBB, Collision, Pressure, Displacement, Velocity, Acceleration, and Equilibrium. In traditional Lampung games, parabolic motion is associated with everyday life examples of applying the environment around local wisdom. There are archery games, ula games, gun locok games, enggrang games, and catfish patel games. Because the module contains material for traditional Lampung games in applying physics concepts, the use of learning modules can be viewed as an effort to preserve Lampung culture.

The high school physics enrichment module, includes 21st-century skills, such as life and career skills, learning and innovation skills, and information technology and media skills, in addition to traditional Lampung games on applying physics concepts. The following step is to gather information as a solution from research and development conducted by researchers. The data were used to forecast educator needs for the developed physics enrichment module. The first step was to gather issues from MAN 1 Bandar Lampung, SMA N 12 Bandar Lampung, and SMA N 5 Bandar Lampung. The following step was to gather references, such as articles from journals and books on the development of physics enrichment modules, 21st-century learning skills, ethnopedagogy, and traditional Lampung games. Then, the researchers collected information from various journal articles, books, and the Internet. The next step was to develop a high school physics enrichment module containing 21st-century skills based on ethnopedagogy. Figure 2 shows the front cover image of the product.

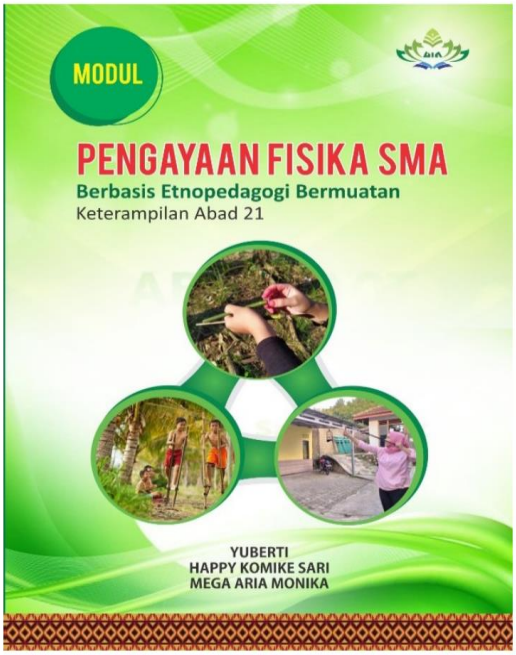
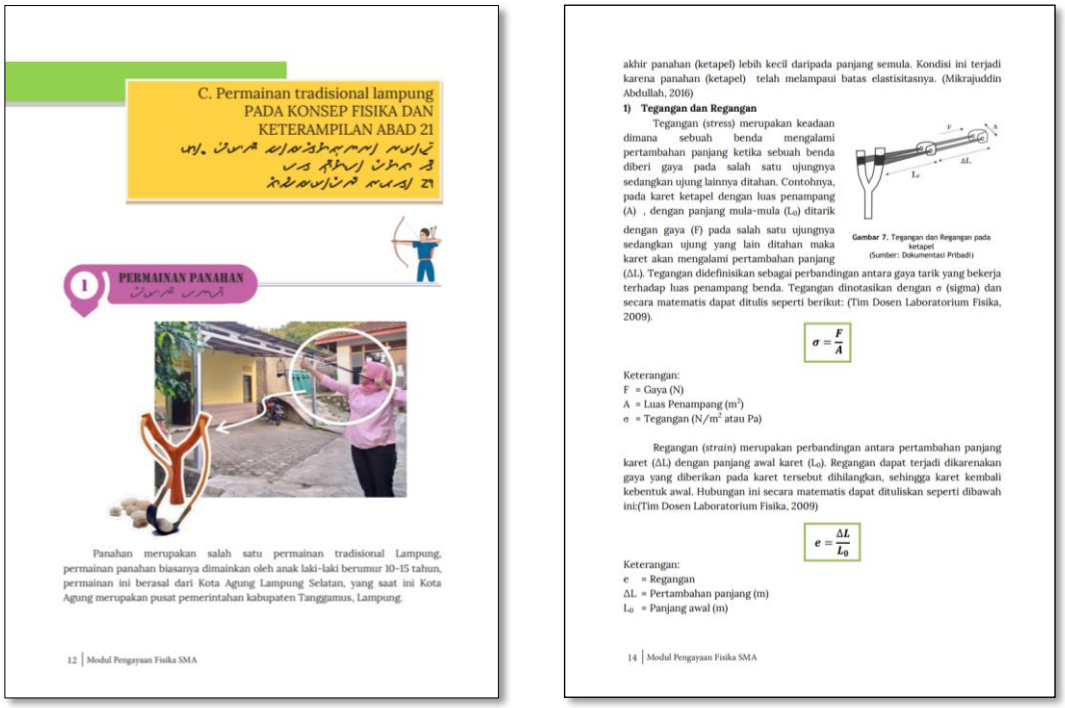


Figure 2. Cover Design



(a) (b)

Figure 3. (a) The Design of Traditional Games; (b) The Design of Learning Materials

The development stage began after the product had been successfully developed. A team of validators who were experts in their respective fields tested the product for validity. The validator teams consisted of three validators from the material, media, and cultural experts.

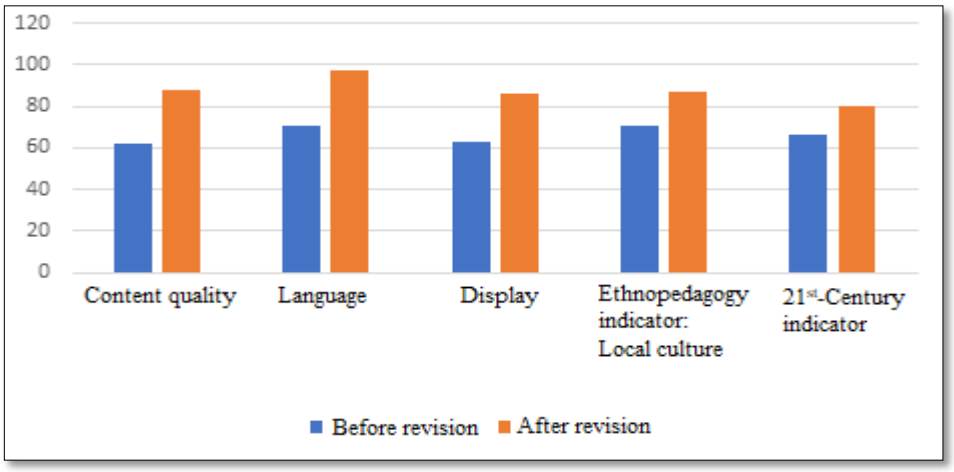


Figure 4. The Percentage of Expert Validation

According to Figure 4 of the assessment performed by material experts, the feasibility criteria obtained was 62% in content quality. The language aspect achieved a percentage of 71% in the feasible criteria. The material display received a percentage of 63% in the feasible criteria. The aspects of ethnopedagogical indicators or local culture received 71% in the feasible criteria. The 21st-Century indicators received a percentage score of 66% in the feasible criteria. The average assessment obtained from the material expert validator

team at stage 1 was 66% in the feasible criteria.

Furthermore, the material experts' assessment after the content quality revision obtained a percentage of 88% in the highly feasible criteria. The language aspect reached 97% in the highly feasible criteria. Regarding the material display, the percentage was 86% in the highly feasible criteria. The ethnopedagogical indicators (local culture) obtained 87% in the highly feasible criteria. The 21st-Century Indicators got a score percentage of 80% in the highly feasible criteria. The average assessment score obtained from the material expert validator team in stage 2 after revision reached 88% in the highly feasible criteria.

The percentage of assessment increased following the revision; some suggestions and comments from the validators for the material in the module, so the validation assessment from the validator team increased following the revision. Figure 5 depicts the percentage of media expert assessments.

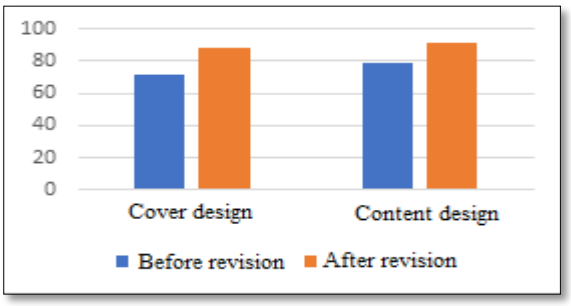


Figure 5. The Assessment Percentage by the Media Expert

According to Figure 5 of the media experts' assessments, the module cover design received the feasible criteria with a percentage of 72 %. Meanwhile, the module received a 79% in the feasible criteria in the content design aspect. The average assessment of the feasibility of the media by the media expert validator team in stage 1 before the revision was 75% in the feasible criteria. Furthermore, after the revision, the module cover obtained a percentage of 88% in the highly feasible criteria, and the content design obtained a 91% in the highly feasible criteria. The average percentage obtained was 90% in the highly feasible criteria.

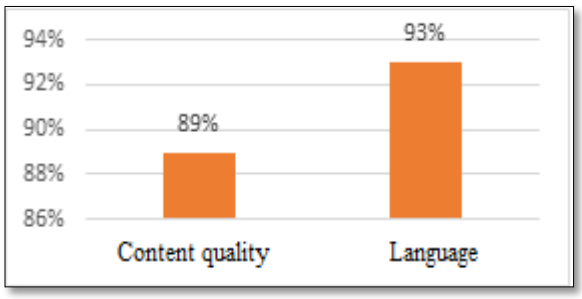


Figure 6. The Assessment Score by the Cultural Experts

According to Figure 6 of the validation performed by cultural expert validators, the percentage of feasibility in the content quality aspect was 89%, and the percentage in the language aspect was 93%. The average assessment score from the cultural expert validator team was 91% in the highly feasible criteria.

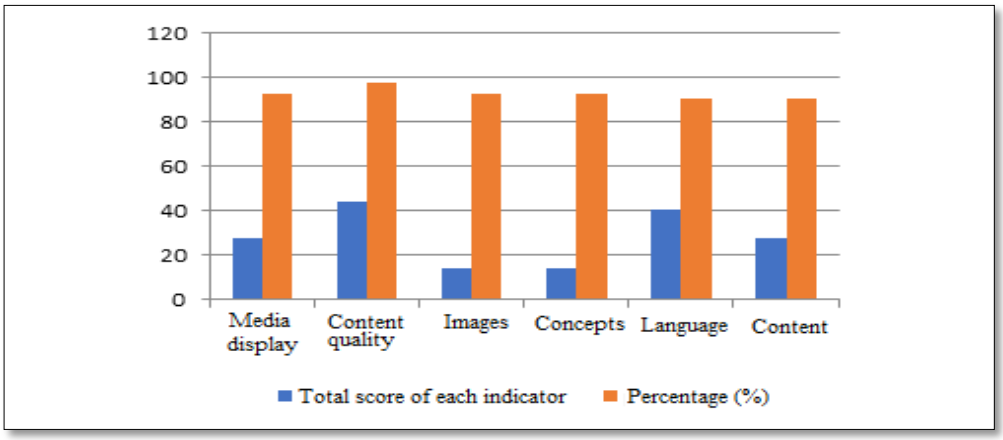


Figure 7. The Recapitulation of Teachers' Response

Figure 7 shows three physics teachers' trial in three schools. The teacher trial results on aspect one regarding media display received 93 %. A percentage of 97.8 % was obtained in aspect two regarding the quality of the content. The percentage of images and concepts was 93%. Meanwhile, the language and content aspects received 91% and 93%, respectively. The average percentage obtained was 94% in the highly feasible criteria.

Based on a recapitulation of the results of a small group trial administered to 30 students from three different schools, the aspect of media display obtained an average score of 4.3 with a 86% percentage gain. The average score for content quality was 4.1, with a percentage gain of 81.6 percent. The average score in the image aspect was 4.1, with a percentage gain of 82.3%. The average score is 4.2, with a percentage gain of 81.3 percent in terms of concept. The average language score was 4.1, with a percentage gain of 81.7%. The average content score is 4.0, with a percentage gain of 79.7%.

Meanwhile, the average benefit score was 4.0, with a percentage gain of 79.3%. The average score for attractiveness was 4.2, with a percentage gain of 83.3%. The average result of the small group trial was 4.1, with a percentage gain of 81.9% in the very interesting criteria.

Table 2. The Results of Field Trial at SMAN 5 Bandar Lampung

No	Indicator	Score	Average Score	Score Percentage	Average Percentage	Interpretation
1	Media display	259	4,3	86,3%	83%	Very Interesting
2	Content quality	372	4,1	82,7%		
3	Images	245	4,1	82%		
4	Concepts	128	4,3	85,3%		
5	Language	243	4,1	81%		
6	Content	248	4,1	83%		
7	Benefit	122	4,1	81%		
8	Attractiveness	128	4,3	85%		

Table 3. The Results of Field Trial at MAN 1 Bandar Lampung

No	Indicator	Score	Average Score	Score Percentage	Average Percentage	Interpretation
1	Media display	251	4,2	84%	79,80%	Interesting
2	Content quality	369	4,1	82%		
3	Images	248	4,1	82,7%		
4	Concepts	113	3,8	75%		
5	Language	229	3,8	76%		
6	Content	228	3,8	76%		
7	Benefit	122	4,1	81,3%		
8	Attractiveness	122	4,1	81%		

Table 4. The Results of Field Trial at SMAN 12 Bandar Lampung

No	Indicator	Score	Average Score	Score Percentage	Average Percentage	Interpretation
1	Media display	260	4,3	86,7%	84%	Interesting
2	Content quality	371	4,1	82,4%		
3	Images	246	4,1	82%		
4	Concepts	127	4,2	84,7%		
5	Language	245	4,1	81,7%		
6	Content	244	4,1	81%		
7	Benefit	123	4,1	82%		
8	Attractiveness	132	4,4	88%		

Based on the results of the field trial conducted on 90 students in physics subjects from three schools (table 2-4), the media display aspect had an average score of 4.3 with an 85.6% percentage gain. The average score for content quality was 4.1, with a percentage gain of 82.4 %. The average image score was 4.1, with an 82% percentage gain. Regarding the concept, the average score was 4.1, with a percentage gain of 81.8%. The average language score was 4.0, with a percentage gain of 79.7%. In terms of content, the average score was 4.0, with a percentage gain of 80%.

Meanwhile, in terms of benefits, the average score was 4.1, with an 82% percentage gain. The average score in the attractiveness aspect was 4.2, with a percentage gain of 85%. The average result of the field trial was 4.1, with a percentage gain of 82.2% in the very interesting criteria.

DISCUSSION

The researchers developed the product using the ADDIE model (Dick & Carey, 1996). The first stage of this research was conducting preliminary research in three schools. The second stage involved researchers developing interesting media or learning products based on pre-research findings. Next, the researchers chose the material presented in the enrichment module. The developed learning product was expected to aid and facilitate enrichment and increase students' knowledge. This finding is also consistent with the findings of Setiayadi et al.'s research, which stated that students' knowledge is used to develop teaching modules (Hamzah, 2016; Setiyadi, 2017)

The successfully developed physics enrichment module was then validated with the validator before being tested in the field. Material experts, media experts, and cultural experts were the experts in their respective fields who performed the validation.

The Results of Material Experts' Validation

Three material expert validators validated the developed module. It was declared very feasible with several inputs, such as adding image illustrations to the content, providing formula descriptions, providing real illustrations or personal documentation, combining traditional game chapters with the second chapter with the same material content, and making several sub-chapters after being made into one chapter. The product had been revised in response to the validator's suggestions and inputs. The revised product assessment from material experts received an average percentage of 88% in the highly feasible criteria because it was relevant to the physics material, 21st-century skills material, and local wisdom material. Therefore, the module is suitable for the learning materials and can be used in the learning process.

The Results of Media Experts'Validation

Three media expert validators validated the module. It was declared highly feasible with several inputs, such as adding Qur'an verses and 21st-century skills concepts, changing front and back covers, writing, and blending the color and the background.

Three validators performed the validation and produced suggestions and input as the revision basis. The revised product had a 90% validity percentage in the highly feasible criteria because it met the following criteria: the cover was appealing, the font was appropriate, and the images were suitable. Thus, the module was appealing and suitable for the enrichment process.

The Result of Cultural Experts' Validation

Three validators validated the module and provided suggestions and inputs. The module obtained a percentage of 91% and was categorized as highly feasible. The

module contained traditional Lampung games, *Had* or Lampung script, 21st-century skills, and physics concepts in applying traditional Lampung games. Therefore, the developed product was ready for students to use.

The Results of Trial for the Teachers

Physics teachers from SMAN 5 Bandar Lampung, MAN 1 Bandar Lampung, and SMAN 12 Bandar Lampung participated in the trial. This trial began by asking teachers to evaluate and respond to the learning products.

The module was found to be interesting and suitable for use at the SMA/MA level based on trials and analysis. This trial achieved an average of 94% in the highly feasible criteria and can be used in the enrichment process.

Product Trials

The product trials covered the small-roup and field trials. The small-group trial was conducted on 30 students from three different schools. The students were asked to fill out questionnaires. The result of the small-group trial was 81.9% in the highly feasible criteria.

The field trial was conducted on 90 students from three different schools. This trial covered eight aspects: media display, content quality, images, concepts, language, content, usefulness, and attractiveness. The average percentage obtained was 82.2% in the very interesting category. According to the trials, the students were enthusiastic about the physics learning module developed by the researchers. The researchers' module can be useful for increasing students' knowledge of physics materials related to traditional Lampung games and adding teaching materials for teachers, particularly in physics learning.

Many module developments have been carried out in previous studies, such as the artificial shrimp ponds ecosystem module with the theme of ethnoscience (Kusumah et al., 2022). However, this study's ethnoscience content section designated as the module's hallmark has not been explained in detail. Two other modules have been developed: the Pontianak local wisdom module with carbide cannon game (Matsun et al., 2019) and Gunung Kelud-based module (Setiawan et al., 2017). However, those modules were not focused on enrichment. Furthermore, previous research did not go through the trial phase, so how students as module users responded is unknown. Based on the findings of the validated physics enrichment module development, the following benefits are known: this module provides knowledge about local culture as well as traditional Lampung culture games that are closely related to physics learning materials (such as archery games for Hooke material; Ula games for GLBB material and collision; Bedli Lock game on pressure material; Enggran game on displacement and acceleration and equilibrium material.

Furthermore, this module can train students in aspects of 21st-century skills (life and career skills; learning and innovation skills; and information technology and media skills). The limitation of this enrichment module is that it does not include all traditional Lampung games. With the development of a high school physics enrichment module based on ethnopedagogy, students and teachers can contribute to preserving local culture, particularly Lampung culture, and increasing knowledge.

CONCLUSION

A high school physics enrichment module containing 21st-century skills based on ethnopedagogy has been developed using the ADDIE model. Based on the validations by the material experts, media experts, and cultural experts, the products developed are categorized as highly feasible. The attractiveness test in small groups and field trials resulted in a very interesting category. Therefore, the developed module is feasible and

interesting for teachers and students to use as teaching and learning materials.

It is suggested that further researchers enrich the physics material by looking for more traditional Lampung games closely related to physics learning materials. Also, further researchers can develop modules using local wisdom from different cultures.

LIMITATION

The developed ethnopedagogical approach-based enrichment module for senior high school students incorporating traditional Lampung games and 21st-century skills has several limitations: 1) Because researchers have limited time and resources, the local wisdom that is inserted is only for traditional Lampung games; 2) The insertion of local wisdom in physics lessons is limited to only a few materials, such as Hooke's Law, Collision, Pressure, Displacement, Velocity, Acceleration, and Equilibrium. Those materials are related to the local wisdom of Lampung province. Not all of the physics material in this subject can be linked to traditional Lampung games.

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AUTHORS CONTRIBUTION

YY contributed to the ideas in research and research design. HK and INO were in charge of collecting data, analyzing the data, and arranging discussions. AA was in charge of product development and article writing.

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