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STEM Integrated Ethnoscience-Based Vocational School Science Teaching Materials in Improving Student's HOTs

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Abstract

The research objective was to analyze the feasibility and practicality of Vocational School teaching materials based on STEM integrated ethnoscience. Research and Development of Borg and Gall (2003) with Methods Embedded Experimental were used in this research. The results showed that the STEM integrated ethnoscience-based Vocational School science teaching materials were feasible to be used in research trials based on the assessment of 4 experts judgment which were 2 expert lecturers (material and media), and 2 education practitioners. The teaching material components included Syllabus; Lesson plan; Student Worksheet; HOTs assessment; Material Expert; and Media expert. All components showed very good criteria. Furthermore, the practicality of teaching materials was in a good category based on student responses. Teaching materials were effective in increasing the HOTs of vocational school students based on the Gain score of 0.44 in the moderate category. Teaching materials can improve students' high-order thinking habits through contextual and complex learning resources in ethnoscience studies through STEM literacy.

Keywords: Ethnoscience; HOTs; Science Teaching Materials; STEM

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INTRODUCTION

Empowerment of Vocational High School students is a 21st-century skill that must be cultivated based on the recommendation of the Directorate of Vocational School Development, the reason is to prepare professional and productive prospective graduates (Winarno et al., 2015). The results of the investigation of SMK science learning can provide future life skills through STEM literacy (Science, Technology, Engineering, and Mathematics). The sophisticated digitalization system in the 21st century seems to erode traditions that have been rooted in society, while students' high-order thinking skills (HOTs) are low. The low number of HOTs was triggered by some teachers perceiving HOTs as a process that is only done individually (Pascual et al., 2017; Tendrita et al., 2016). Teachers do not know the right way to increase student HOTs in the learning process in the class (Laius et al., 2015).

Science learning is designed with the HOTs approach to address global problems and is able to understand

science through the discovery process (McFarlane, 2013; Suciati, 2017). HOTs as the ability to generate new and appropriate ideas (Anwar et al., 2012; Diki, 2014; Tendrita et al., 2016), so that the goals of science education are achieved to adapt to different conditions, think flexibly, be creative, think critically, respect society, and be tolerant of ideas (Ogawa, 1986; Okwara & Upu, 2017). The purpose of science education is very relevant to the Regulation of the Minister of Education and Culture of the Republic of Indonesia of 2016 Number 24 concerning basic competencies in Vocational School Natural Science regarding core competencies in the aspect of skills.

The achievement of HOTs based on the results of the vocational School students' school exams in Wonosobo Regency for the 2018/2019 academic year of science subjects shows an average of 43.67 and a standard deviation of 15.20 with a low category which is confirmed by research (Sugiyanto et al., 2018) also shows the average HOTs of Vocational School students in the Regency Klaten is in the low category of 13.71%. Furthermore, by (Suciati et al., 2015) that students' creativity was exacerbated from the 43.56% low category test results.

The next fact is in the results of observations about learning readiness, there are 70% of teachers in making modules on the material that is taught not HOTs oriented, while vocational students are required to have high-level thinking skills in the 21st century. Science learning still relies on how to understand concepts and has not yet become a means. to empower students' HOTs (A. Khoiri, Kusumawati, et al., 2019; A. Khoiri, Sunarno, et al., 2019). The learning approach used to develop HOTs is too difficult for students who have limited knowledge and HOTs, besides that they can also appreciate their own culture through an integrated STEM ethnoscience-based learning approach.

Ethnoscience-based learning improves students' science process skills and appreciation (Atmojo, 2012), learning achievement and the ability to use scientific knowledge (Sudarmin et al., 2014). Ethnoscience-based learning, individuals increasingly master the concept of science in culture, because students learn directly in the environment (K. Becker & Park, 2011; Sumarni et al., 2016, 2017), so that the form of appreciation in the form of curiosity and attention to the traditions and culture of society increases (Okwara & Upu, 2017; Sudarmin, 2014; Sudarmin et al., 2018). Ethnoscience learning has been shown to increase the creative part of students' HOTs through a learning resource environment (A Khoiri & Haryanto, 2018).

The next problem regarding the implementation of education based on local excellence or cultural traditions of the local community from 10 (ten) Vocational School in Wonosobo Regency shows that 70% of schools have not implemented it. This is what encourages vocational students to not know the local potential and cultural traditions of their own region, I think the local potential is one of the efforts to build student character. Although overall teachers already know the local potential in Wonosobo, it is proven that only 42% are able to use it to solve scientific problems.

Ideally, HOTs is the capacity to go beyond the information provided, to take a critical attitude, evaluate, have metacognitive awareness and problem-solving capacity. In fact, ethnoscience has not been accommodated in physics learning, ethnoscience should be a source of environmental learning that can improve students' HOTs with thinking activities in the form of analysis, evaluation, and creating solutions to environmental problems

(Amelia et al., 2021; Sumarni et al., 2020). Based on the existing problems, the importance of analyzing student HOTs through Vocational Science learning based on STEM integrated ethnoscience is to prepare prospective professional graduates who can compete globally without leaving culture as the character of the nation. The characteristics of the teaching materials developed overcoming the problem of low student HOTs who are presented with STEM integrated ethnoscience learning resources to give students the opportunity to think more complexly so that the research objective is to analyze the feasibility of teaching materials developed through expert judgment and to analyze the practicality of teaching materials in foster the HOTs of vocational students.

METHOD

Research and Development (R & D) (Borg, W. R & Gall, 2003) with Methods Embedded Experimental Design, where a set of data functions as support, the role of the second data in the study depends on other types of data, namely: Quantitative data analysis uses quantitative descriptive to test feasibility based on expert judgment consisting of 2 ethnoscience experts, STEM, and 2 education practitioners, while the prerequisite analysis test used the Wilcoxon test, comparative hypothesis testing using the different t test, and further analysis using the Normalized Gain Score to test the increase in student HOTs. Qualitative analysis uses coding, data reduction, data display, and verification of the results of the student response questionnaire to the teaching materials used. Next, conclude the results of the study based on the feasibility and practicality of teaching materials based on STEM integrated ethnoscience which are presented in Figure 1.

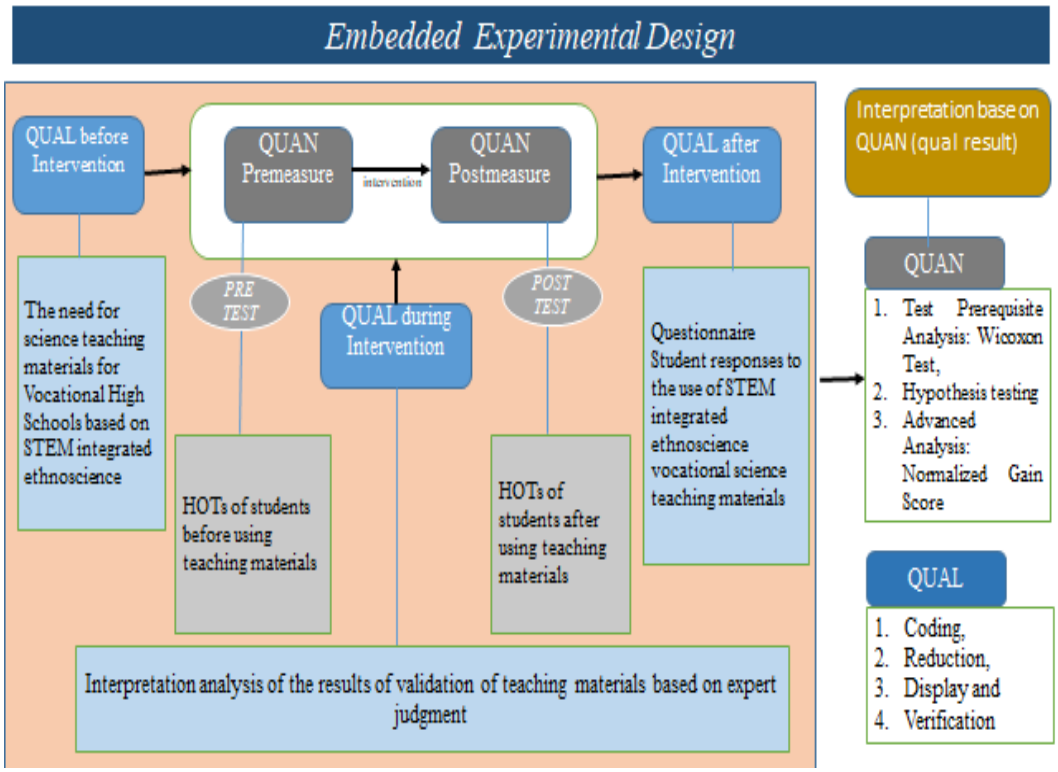


Figure 1 The Development Research with Methods Embedded Experimental Design

Based on Figure 1, qualitative data in the form of the need for science teaching materials for Vocational High School science based on STEM integrated ethnoscience to be developed.

The research population in Pelita Al Qur'an Wonosobo Vocational High School with purposive sampling technique is that there are 25 students of class X accounting. The characteristics of the sample based on the inclusion criteria are: class X students who are active in Pelita Al Qur'an Wonosobo Vocational High School, students who respond to all research data, are physically and mentally healthy, there is no element of coercion from any party, the identity of the data is guaranteed to be confidential. Teaching materials that have been developed to be tested for feasibility by expert judgment, are then used in small-scale research. Comparison of student HOTs before and after using teaching materials to test the practicality of teaching materials.

The validation analysis of the assessment of 4 experts is shown to determine the appropriateness of each component of the teaching material. After the teaching material is declared feasible it can be used in further research to analyze the practicality of the teaching material based on the student response questionnaire answers, observation of the implementation of learning using teaching materials, and the student's HOTs test.

Qualitative analysis is based on student response questionnaires which are described based on respondents' answers and observations of the implementation of learning. The results from the initial product manufacture are validated by the validator. The process of this activity is to find out whether HOTs are in the valid or invalid category. Valid shows that it is suitable for use in the research stage, while invalid shows that the teaching materials developed are not suitable for use at the research stage. Validation is carried out by material experts, media, education practitioners, and peers. After the product is validated by experts, it can be seen its shortcomings and weaknesses, which then the researchers improve and revise the product so that it can be tested on a small and wide scale. The purpose of validation is to obtain information about the feasibility of teaching materials developed through criticism and suggestions by experts.

The validation results are converted using a scale of four which can be seen in Table 1 (Syllabus), Table 2 (Lesson Plan and Student Worksheet), Table 3 (Hots Assessment), Table 4 (Material Expert), and Table 5 (Media Expert):

Table 1 Scale Conversion of Four Syllabus Validations

Range Value	Category	Value
$X \geq 45$	Very good	4
$45 > x \geq 39$	Good	3
$39 > x \geq 32$	Enough	2
$X < 32$	Less	1

Table 2 Scale Conversion of Four Lesson Plan and Student Worksheet Validation

Range Value	Category	Value
$X \geq 39$	Very good	4
$39 > x \geq 33$	Good	3
$33 > x \geq 28$	Enough	2
$X < 28$	Less	1

Table 3 Four scale conversion validation of HOTs assessment

Range Value	Category	Value
$X \geq 36$	Very good	4
$36 > x \geq 31$	Good	3
$31 > x \geq 26$	Enough	2
$X < 26$	Less	1

Table 4 Scale Conversion of four validation of material expert teaching materials.

Range Value	Category	Value
$X \geq 174$	Very good	4
$174 > x \geq 149$	Good	3
$149 > x \geq 125$	Enough	2
$X < 125$	Less	1

Table 5 Scale Conversion of four validation of media expert teaching materials

Range Value	Category	Value
X ≥ 93	Very good	4
93 > x ≥ 80	Good	3
80 > x ≥ 67	Enough	2
X < 67	Less	1

RESULT AND DISCUSSION

The results of the study obtained validation data for all components of teaching materials that were developed based on expert assessment and interpretation results. Furthermore, the practicality test of teaching materials was carried out to identify that teaching materials were practical, easy to use, effective in growing students' HOTs.

Syllabus

The data on the results of syllabus validated using a syllabus validation assessment instrument includes 15 indicators consisting of Feasibility aspects of the content consisting of 8 components, aspects of the presentation of the syllabus consisting of 4 components, and linguistic aspects consisting of 3 components. Based on Table 1, there are four scale conversions consisting of very good, good, adequate and insufficient categories of assessment for each category. The results of the syllabus validation by experts are presented in Table 6.

Based on Table 6, the syllabus arranged has a very good validation category with an average of 52.8 (X ≥ 45) or 3.5 (scale 4). The syllabus is suitable for use in field tests. However, there are some suggestions and comments that need to be improved, among others: 1) learning materials need to be added to sources of waste; 2) the assessment score is fixed on the assessment criteria, and 3) there are still too many learning activities and must consider the allocation of time. 4) Determination of the type of assessment according to the criteria.

Table 6 Results of Syllabus Validation

Aspect	Validator			
	I	II	III	IV
Content Feasibility	29	31	25	29
Presentation	13	14	14	14
Linguistic	9	11	11	11
Sum	51	56	50	54
Syllabus validation average	52.8			

Lesson Plan

The lesson plan which is designed consists of 4 (four) meetings on the material "Waste and Its Handling". The data from the lesson plan validation uses a validation sheet, while the conversion method which is assessed by a total of 13 aspects. The results of the Lesson Plan validation are presented in Table 7.

Table 7 Lesson Plan Validation Results

Aspect	Validator			
	I	II	III	IV
Content Feasibility	18	18	14	18
Presentation	16	17	15	18
Linguistic	10	11	10	12
Sum	44	46	39	48
Lesson plan validation average	44.3			

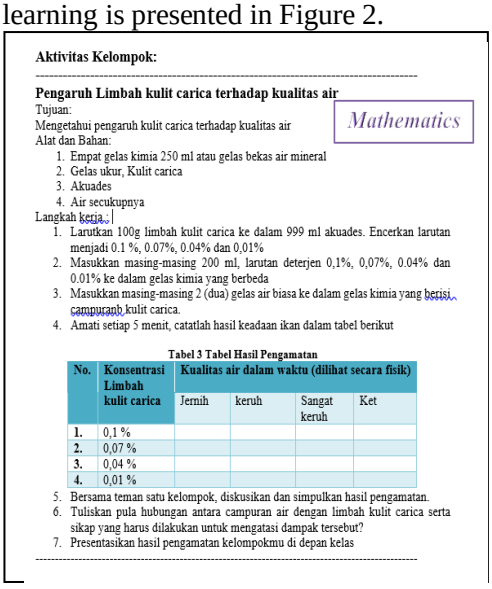
Based on Table 7, the lesson plan validation category is very good with an average of 44.3 (X ≥ 39) or 3.4 (scale 4). Comments and suggestions given on the validation of the Lesson Plan are: 1) HOTs development needs to be highlighted; 2) The objectives are adjusted to the characteristics and abilities of students. 3) A systematic format adapted to the school. 4) The learning objectives use the ABCD principle (Audience, Behavior, Condition, Degree). The results of the validation performed by media experts, material experts, teachers, and peers show that every aspect of the lesson plan

has met the requirements to be used in research with a very good category.

Student Worksheet

Student Activity Sheets are arranged based on the activities in the textbook consisting of 3 (three) activity activities. The validation assessment consists of 3 (three) aspects, namely aspects of the feasibility of content, presentation, and language. These three aspects consist of 13 indicators. The results of the validation assessment were converted using a scale of four which is presented in Table 2.

Student Worksheets are designed to foster the HOTs skills of Vocational School students. One of the Student Activity Sheets which is a physical display of giving attention to students for learning is presented in Figure 2.



Aktivitas Kelompok:

Pengaruh Limbah kulit carica terhadap kualitas air

Tujuan:
Mengetahui pengaruh kulit carica terhadap kualitas air

Mathematics

Alat dan Bahan:
1. Empat gelas kimia 250 ml atau gelas bekas air mineral
2. Gelas ukur, Kulit carica
3. Akuades
4. Air secukupnya

Langkah kerja :
1. Larutkan 100g limbah kulit carica ke dalam 999 ml akuades. Encerkan larutan menjadi 0.1 %, 0.07%, 0.04% dan 0,01%
2. Masukkan masing-masing 200 ml, larutan deterjen 0,1%, 0,07%, 0.04% dan 0.01% ke dalam gelas kimia yang berbeda
3. Masukkan masing-masing 2 (dua) gelas air biasa ke dalam gelas kimia yang berisi campuranb kulit carica.
4. Amati setiap 5 menit, catatlah hasil keadaan ikan dalam tabel berikut

Tabel 3 Tabel Hasil Pengamatan

No.	Konsentrasi Limbah kulit carica	Kualitas air dalam waktu (dilihat secara fisik)			
		Jernih	keruh	Sangat keruh	Ket
1.	0,1 %				
2.	0,07 %				
3.	0,04 %				
4.	0,01 %				

5. Bersama teman satu kelompok, diskusikan dan simpulkan hasil pengamatan.
6. Tuliskan pula hubungan antara campuran air dengan limbah kulit carica serta sikap yang harus dilakukan untuk mengatasi dampak tersebut?
7. Presentasikan hasil pengamatan kelompokmu di depan kelas

Figure 2 Student Worksheet

Based on the data in Table 2 and Figure 2, the results of the Student Worksheet validation which are converted into a scale of four are presented in Table 8.

Table 8 Student Worksheet Validation Results

Aspect	Validator			
	I	II	III	IV
Content Feasibility	18	20	18	23
Presentation	13	13	14	15
Linguistic	9	10	10	12
Sum	40	43	42	50
Worksheet validation average		43.8		

Table 8 shows the results of the validation of the Student Activity Sheet that can be used in very good criteria research with an average of 43.8 ($X \geq 39$) or 3.4 (scale 4), but some suggestions need to be revised towards the presentation aspect, namely: 1) lack of ethnoscience pictures on the activity sheet to better attract students' attention. 2) The instructions for student activities should be clarified again. 3) Essential material with applied science Vocational High School, namely "Waste and Handling".

HOTs assessment

An assessment tool was developed to measure student HOTs. HOTs assessment tools are integrated into learning. HOTs assessment tools include scoring procedures, interpretation guidelines, and scoring. HOTs assessment was carried out using test and questionnaire methods. Assessment with the test method using a test question sheet consisting of 15 questions with details of 10 HOTs questions and 5 LOTs questions in essay form. The assessment has been described in the scoring rubric, namely, each question has a score of 10 with a score of 10 criteria: if the answer is correct, and gives 4 principles, a score of 5: if the answer is correct, and gives an example of less than 3, a score of 0: if the answer is wrong.

The HOTs assessment validation consists of 3 aspects, namely the feasibility aspect of the content consisting of 5 indicators, the presentation aspect consisting of 4 indicators, and the linguistic aspect consisting of 3 indicators. The total number of indicators is 12 indicators. The results of the HOTs assessment validation are presented in Table 9.

Table 9 HOTs Assessment Validation Results

Aspect	Validator			
	I	II	III	IV
Content Feasibility	17	16	18	20
Presentation	14	11	11	14
Linguistic	10	9	9	12
Sum	41	36	38	46
HOTs assessment validation average	40.3			

Based on Table 9, shows that the results of the HOTs assessment validation get an average of 40.3 ($X \geq 36$) or 3.4 (scale 4) very good criteria. In the HOTs assessment instrument, several items need to be improved, namely: 1) the scoring and assessment rubric needs to be explained again to make it more precise and accurate. 2) HOTs and LOTs questions are provided to balance students' thinking abilities. 3) Writing errors in the HOTs question numbers, namely numbers 6 and 9. In full, the validation results of all components can be used, although there are some suggestions and comments that need to be corrected for follow-up.

Material expert teaching materials

The teaching materials developed are systematic teaching materials by arranging materials based on basic competencies. The assessment of textbooks consists of 3 (three) aspects of the validation of teaching materials, namely the feasibility of the content consisting of 21 indicators, the presentation aspect consists of 14 indicators, the linguistic aspect consists of 13 indicators and the assessment aspect is 10 indicators. The total number of indicators in teaching materials for material experts is 58 indicators.

The teaching materials developed are a collection of materials that are systematically arranged by bringing out STEM integrated ethnoscience information as a learning resource, thus helping students to learn independently. The material is presented attractively and provides opportunities for students to think, encouraging students to study hard. The appearance of teaching materials with attractive image packaging is presented in Figure 3.

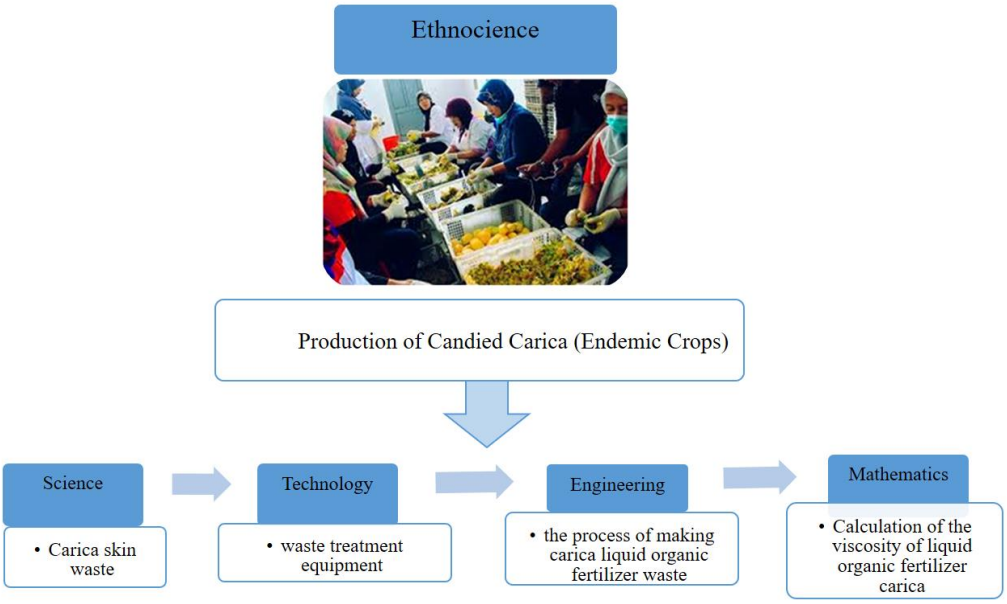


Figure 3 Ethnoscience and STEM Integration

Presentation of the validation assessment of material expert teaching materials can be presented in Table 10.

Table 10 Validation Results of Teaching Materials for material experts

Aspect	Validator			
	I	II	III	IV
Content Feasibility	70	69	75	78
Presentation	55	47	49	48
Legality	45	44	46	49
Assessment	38	40	37	37
Sum	208	200	207	212
Material experts validation average	206.8			

Based on Table 10, the results of the validation of teaching materials for material experts with an average of 206.8 (X ≥ 174) or 3.6 (scale 4) are very good criteria. The validation results show that textbooks compiled by researchers can be used in research, but there are suggestions for improvement, namely the STEM element require affirmation in each student activity.

Media Expert Teaching Materials

The evaluation of teaching materials for media experts consists of 31 assessment indicators which are scored by four validators. The four scale conversions are presented in Table 11.

Table 11 Scale Conversion of four validation of material expert teaching materials

Range Value	Category	Value
X ≥ 93	Very good	4
93 > x ≥ 80	Good	3
80 > x ≥ 67	Enough	2
X < 67	Less	1

Based on Table 11, the assessment of teaching materials for media experts, the validation results of each validator can be presented in Table 12.

Tabel 12 Results of the Validation of Teaching Materials for media experts

Aspek	Validator			
	I	II	III	IV
Sum	116	113	112	116
Media experts validation average	114.3			

Based on Table 12, the results of the assessment of the validation of teaching materials for media experts obtained an average of 114.3 (X ≥ 93) or 3.7 (scale 4) with very good criteria. This result means that the teaching material is suitable for use in research, even though there is input from validators in the form of 1) the presentation of tables and images containing teaching materials must be consistent, and interesting. 2) image contrast must be clear and easy for students to understand so as not to cause ambiguity to students. 3) addition to student answer sheets according to the HOTs questions. Overall, the results of the validation of the syllabus, lesson plans, worksheets, HOTs assessment, teaching materials for material experts, and media are suitable for use with minor revisions.

The results of expert validation recapitulation based on a scale of 4 can be interpreted in Figure 4.

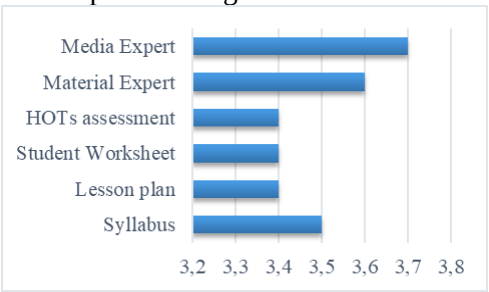


Figure 4 Recapitulation of Expert Validation Results

Lesson plan validation, student worksheets, and HOTs assessment have the lowest results compared to other validation tools (Figure 4), and the validation of teaching materials for media experts has the highest score. These results indicate that student activities in the Student Worksheet are not fully by the characteristics of students. The lesson plan must consider the time allocation and the steps of the STEM model, HOTs assessment must contain LOTs questions to balance students' thinking abilities.

Overall the results of the validation of STEM integrated ethnoscience-based teaching materials in growing HOTs of vocational school students consisting of 7 items, namely syllabus, lesson plans, worksheets, HOTs assessment, material expert teaching materials, and media expert teaching materials are feasible to use with small revisions according to the input from validators that have been fulfilled so that the teaching material product is ready for use in the next research stage, namely the practicality test of the teaching material (Astuti et al., 2018; Rohman & Setyarsih, 2018).

The practicality of Teaching Materials

Based on the results of the pre-test and post-test after using teaching materials, it is presented in Table 13.

Tabel 13 HOTs Pre test and Post test

Criteria	Pre test	Post test
Average	68.7	78.8
Median	56	63
Standard Deviation	2.31	2.85
The highest score	75	95
Lowest score	40	50
The number of students	25	25

Based on Table 13 shows the distribution of pre-test and post-test data using teaching materials, then the N gain score is analyzed, showing the moderate category of 0.44. So that the use of STEM-integrated ethnoscience-based teaching materials effectively increase student HOTs. STEM-based science learning as a form of STEM education is a recommendation for the 21st-century education curriculum. Integrated learning will be meaningful in student life because it is contextual (Syafutri et al., 2020). STEM-based science learning integrates the design of system designs and the use of technology for solving real problems, but the technology literacy used is very little and is still separate between STEM components (Nugroho et al., 2019; Utami et al., 2018). Technological literacy can increase student motivation and positive responses that cause student learning outcomes to increase, but not the realm of (Hasan, 2018).

Ethnoscience-based teaching materials that are packaged with the STEM approach are part of the process of reconstructing original science that develops in the community can be transformed into scientific science. In the case of waste and its handling, it is very close to issues that develop in the community, but it seems that it is still separate from the science learning curriculum, so students find it difficult to develop environmental awareness through HOTs. I think science learning is closely related to natural phenomena (Sudarmin, 2014; Sudarmin & Sumarni, 2018). It is very relevant if the ethnoscience approach is explained through an integrated learning model with technology, engineering, and mathematics, the reason is that scientific science cannot stand alone, it needs further explanations to provide comprehensive and holistic student skills from various learning domains is Source learning (Ahmad Khoiri & Sunarno, 2018; Wulansari & Admoko, 2021).

The HOTs gap between the need for and availability of Indonesian human resources expertise, amounting to 88 million, is still dominated by less-skilled workers, and it is predicted that in 2020 there will be a 50% shortage of labor. Without efforts to develop students' high-level thinking skills and prerequisite values for entering the STEM profession, it is very difficult to expect a young generation who is reliable and able to compete globally. Therefore, STEM education needs to be a frame of reference for the education process in Indonesia in the future (K. H. Becker & Park, 2011).

Science teaching materials for Vocational Schools based on STEM integrated ethnoscience are effective for

increasing student HOTs through the Gain test (Table 13), The importance of ethnoscience learning for special exploration in empowering students' knowledge that has been embedded in students to develop genuine knowledge in a community and is studied towards Science is formal as a study of learning in schools (Parmin & Fibriana, 2019) with integrated packaging of teaching materials, namely the use of the STEM approach with ethnoscience as a source of contextual learning.

The STEM approach in teaching materials takes a long time to prepare, teachers and students together must be ready for its implementation (Knezek et al., 2015). The participation of science teachers contributes to the development of STEM-based science teaching materials and teaching materials whose effectiveness has been tested based on classroom-based scientific research (Lawanto et al., 2013).

Teaching materials are developed to contribute to students' higher-order thinking skills through their habit of exploring ethnoscience information sources. Ethnoscience studies contained in teaching materials equip students to analyze, evaluate and be creative. Students are required to be able to analyze (C4) the surrounding environment on the issue of waste, then evaluate (C5) the causes and ways of handling it, and provide solutions in creating (C6) learning products through experiments in activities (Figure 1). Student activities in testing the effect of water quality on mixing waste with the treatment of water concentration, so that students can understand the concept and be able to solve waste problems through analyzing activities (C4). Learning phases are needed to investigate ethnoscience studies to foster student HOTs which are strengthened that Vocational School graduates must be ready to work with all the skills they have (DeLuca & Lari, 2013). The implementation of STEM integrated ethnoscience-based science teaching materials requires a shift in teacher-centered science learning towards student-centered learning through student worksheets that can independently foster thinking skills (Susilawati et al., 2019).

The implementation of STEM learning is integrated with complex learning resources to facilitate students in higher-order thinking activities (Figure 4). Idea development activities, connecting different ideas and formulating ideas to solve certain problems. Students' thinking skills will develop well if done deliberately. Students who have creative thinking skills will easily understand the concept of learning (Diki, 2014). The HOTs empowerment in STEM learning that is offered can maximize creative thinking process skills through a process of inquiry which ultimately can realize maximum creativity. STEM aims to product learning by integrating. So that the research recommendations on the use of STEM literacy are very important in growing HOTs, but the form of STEM integration used is not yet effective, so innovation is needed in the learning model by examining student HOTs indicators.

The research recommendation has the potential to use science teaching materials Vocational School with STEM integrated ethnoscience approach in empowering the HOTs indicator which emphasizes the ability to think through complex learning resources. The characteristics of Vocational School Applied Science learning are that students are invited to be brave to look for other learning resources that are available and spread widely around them which are listed in the STEM learning phase, learning outcomes, learning activities, material or subject matter, learning strategy methods, and assessment techniques (Suswanto,

Abdidin, 2018). Furthermore, STEM which is integrated with the ethnoscience approach in the developed teaching materials can increase student HOTs through contextual learning resources and students' thinking habits to interact with the environment and offer solutions to environmental problems.

CONCLUSION

Natural science teaching materials based on STEM integrated ethnoscience is suitable for use in research trials based on the assessment of 4 experts judgment is 2 expert lecturers (material and media) and 2 education practitioners. The teaching material components include Syllabus 3.5; Lesson plan 3.4; Student Worksheet 3.4; HOTs assessment 3.4; Material Expert 3.6; and Media expert 3.7. All components show very good criteria. Furthermore, the practicality of teaching materials is a good category based on student responses. Teaching materials are effective in increasing the HOTs of vocational school students based on the Gain score of 0.44 in the moderate category. Teaching materials can accommodate students' high-order thinking habits through contextual and complex learning resources in ethnoscience studies through STEM literacy. Research recommendations are in the form of the importance of developing ethnoscience-based teaching materials for other science materials, so that learning is more contextual that is directly related to the community environment and equips students in growing the character of respect for their traditions and culture.

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