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Development of Project Based Ethno-STEM Online Learning Module to Increase Interpersonal Literacy And Learning Out-come

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Article Info	Abstract
	Interpersonal skills are ability to understand sociocultural phenomena which include aspects of communication, appreciation, tolerance, caring, empathy, and being able to work with others and be able to adapt well in the surrounding environment. This is a very important provision that must be owned by every student. Purpose of this research is to develop learning media for brave science that examines local wisdom content to study the topic of food ingredients. This research was conducted at An-Nur Ungaran Middle School and several traditional food industry places around the student's residences. The research method used is R&D with the ADDIE model. This media was validated and declared appropriate by media experts and material experts, then applied in science learning. The data obtained from the readability test, and the N-Gain test from students. The results of the study show that 1) Ethno-STEM learning module can be developed using the ADDIE model and is declared feasible to be applied in learning; 2) Ethno-STEM learning module can be developed to have good readability results, namely at a score of 61.4%; 3) Using of this Ethno-STEM module can improve interpersonal literacy and learning outcomes with N-gain values of 0.31 and 0.33, respectively.

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INTRODUCTION

The 21st century is the first milestone in the era of the industrial revolution 4.0 which is marked by changes in various fields of life due to the rapid development of digital technology. Education is an important key in preparing students who are qualified and able to adapt to the multicultural conditions of Indonesia (language, ethnicity, and customs) (Khairiah, 2020). Literacy needs to be mastered by students so that they have an awareness of reading and understanding socio-cultural and multicultural phenomena to form a personality that reflects the value of respecting and caring for others, tolerant and empathetic amidst the many differences that exist. However, based on the 2018 PISA results, students' mastery of literacy skills in Indonesia is still low when compared to other countries. There are still frequent violations of regulations committed by students such as dirty talking, bullying, smoking, and dishonest acts. In addition, academic achievement is still relatively low, especially in exact learning. This can occur due to the lack of massive emphasis on character education in the learning carried out (Winanto, 2017) and the learning process is not optimal.

The preparation of teaching materials is one of the important factors in determining the success of the learning process. Good teaching materials are developed by taking into account the characteristics of students, the type of material, and the resources in the surrounding environment. Teaching materials based on local wisdom are an alternative in the preparation of learning media that can make students more interested in participating in learning because they make use of things that come from the environment around students. The integration of science, technology, engineering, and mathematic (STEM) components in teaching materials is something that is done so that students can build more integrated and comprehensive knowledge based on the 2013 curriculum development (Nuryani, Y., 2016). In addition, STEM-based learning is also aligned with the demands of today's science learning which is expected to develop 21st-century abilities such as higher-order thinking skills, literacy, and problem-solving skills (Barkatsas Tasos & Bertram Adam, 2016).

STEM learning based on local wisdom shows some positive results in improving the quality of the learning process and achieving learning goals. Research conducted by Atmojo shows that learning science by utilizing local wisdom can increase students' appreciation of the tempe-making profession in the high category (Atmojo, 2012). Research conducted by Sudarmin, et al., shows that learning science by utilizing local wisdom and integrating with STEM can develop students' creative, innovative, and diligent thinking ((Sudarmin, Sumarni & Yulianti, 2019). (W. Sumarni, 2020) also carry out ethno-STEM-based learning and can significantly improve critical thinking and creative thinking skills (W. Sumarni, 2020). Meanwhile, research conducted (Izatul Azalia & Wisnuadi, 2020) has succeeded in developing ethno-STEM-based learning ebooks and can improve learning outcomes ((Izatul Azalia & Wisnuadi, 2020). Based on these results it is hoped that the ethno-STEM approach will also be able to increase interpersonal literacy which consists of the ability to respect and respect others, appreciate, care for others, cooperate, tolerate, empathize, and increase the achievement of results learning.

METHODS

This research develops an ethno-STEM-based science module for the junior high school level on the topic of foodstuffs. The goal is to produce a product and test the effectiveness of the product for online learning. The development model uses the ADDIE method which consists of 5 stages, namely analysis, design, development, implementation, and evaluation. The analysis phase is carried out to analyze competence, student characteristics, and content/material. The design stage is used to design modules and the final form of the product to be implemented by students. The development stage is carried out by considering the analysis that has been carried out so that it is in line with what is expected of students and is easy to implement in the field. Module implementation is carried out for 2 months starting from February-March 2022 or to be precise at the beginning of the even semester of the 2021/2022 school year. The evaluation stage is the last step taken to assess the extent to which the module can achieve the objectives to be achieved in the research, analyzing the strengths and weaknesses of the product that has been implemented.

The research was conducted at An Nur Ungaran Middle School involving 48 students, 1 media expert, 2 material experts, and 3 education practitioners. The data collection techniques used in the research and development of ethno-STEM-based science modules are questionnaires and tests. Picks were taken from teachers and students to find out the response to media use. The validity test was carried out by involving experts to determine the validity of the content, language, and presentation. The readability test was carried out using the gap test to determine the readability level of the learning module. The effectiveness of the module in improving learning outcomes and interpersonal literacy is carried out by the N-gain test.

RESULTS AND DISCUSSION

Findings from research on the development of project-based ethno-STEM online learning modules to improve interpersonal literacy and learning outcomes on the topic of food ingredients include the characteristics and display design of teaching modules. The initial design stage of the teaching module is carried out by setting the material, competency standards and basic competencies of the module to be developed. This is important because not all science material can be taught using the STEM approach. After that, an analysis of student characteristics and the potential for local wisdom in the student environment, especially those that could be learned during the Covid-19 pandemic. Based on the results of student analysis, data were obtained in the form of the majority of students wanting science learning to be carried out online/online facilitated in groups. In addition, many students also expect that the learning modules used contain lots of video and image content.

The learning module material map is made by connecting several sub-materials in the module so that it makes it easier for students to find out the relationship between the sub-chapters. The material in the online learning module is developed by integrating science into the core material of food ingredients, technology as additional information to strengthen existing scientific concepts, engineering to know and be able to implement the knowledge gained, and mathematics to integrate mathematical abilities into scientific knowledge. This is done so that students not only learn about scientific facts but also apply science to the lives around students. The presentation of the material is carried out using simple language and is equipped with illustrated pictures and several videos that have been linked with a QR code. The selection of templates or formats for teaching modules also takes into account the beauty and comfort factors when this module is accessed by students so that a display format is chosen that can attract students' attention. The science concepts displayed in the module are under the basic competencies of science class 7 in the 2013 curriculum. The use of letters and colors also meets the standard rules for writing teaching materials.

Additional content material about technology in the learning module is not only done to strengthen the material concept but also to facilitate students to be ability to access additional references from the internet. An example of technology integration is adding information about a bomb calorimeter, a tool that can be used to determine the energy content of a food. Besides that, the glucometer tool was also introduced to students so that students know about tools that can be used to find out someone has a high blood sugar content. Not only written material and pictures, but there are also additional video links so that students know more about this technology.

The integration of the engineering component in the online learning module is shown in the observation rubric and the final assignment of the project which was carried out to study some of the manufacture of traditional food in the environment around students. With this section, students will work directly as a group to learn how to make traditional food and also learn about the ingredients of food used to produce this food. However, in its implementation, the project's final assignment was not as expected because many groups had not had time to work on and complete the assignment due to the outbreak of a new variant of the Covid-19 disease, making it impossible to hold face-to-face meetings between groups.

The next STEM component is mathematics which in this learning module is shown in the rubric for calculating students' daily energy needs. In this rubric, students are directed to identify energy needs and energy intake which is obtained equipped with cases for certain students so that they can train students' critical thinking skills in the realm of context analysis. However, there are still many students who experience problems in completing this rubric because they are not used to working on

problem-based and data-based questions, but with guidance from the teacher, some students can solve these problems.

The teaching modules that have been developed contain some local wisdom content in the observation aspect and some additional information in the "Did you know?" rubric. This is intended so that students can explore and study objects in the environment around students specifically in the traditional food industry. Some of the traditional food industries that were studied were tofu and meatball production centers, tohu tofu manufacturing industries, places to manufacture various indro cassava and banana chips, places to make jenang, and places to make dumplings. When making observations students communicate directly with the community so that they not only learn about science content which is the core of learning but also learn to socialize properly, try to speak polite words, and overcome problems when unwanted things occur in the field. Through this step, students internalize the values that exist in society so that they can increase interpersonal literacy which includes the ability to respect and respect others, appreciate, care for others, cooperate, tolerate, and empathize.

The online learning module also provides explanations and examples of the components of aspects of interpersonal literacy so that students not only learn the science material but are also able to develop aspects of respecting and respecting others, appreciating, and caring for others, cooperation, tolerance, and empathy. This section is a step to introduce and internalize interpersonal literacy competencies. Apart from that, this module is also made with 3 independent exercises that can be used to train and hone students' thinking skills.

Module Validity

The teaching modules that have been developed are limited to one science learning topic,

namely food ingredients. The use of this module can be accessed in network/online or off-network/offline mode. The delivery of learning is carried out by utilizing the WhatsApp class group because students prefer and easily understand instructions through the group. According to a study conducted by Assidiqi & Sumarni, (2020) explained that the digital platform most often used to carry out online learning is WhatsApp group. This is because this platform is simpler and easier to use. Teachers can provide various kinds of materials, explanations, and evaluation questions through messages, sounds, to videos. Whatsapp groups are also able to facilitate two-way learning through video call services. Through this service students and teachers can meet face-to-face in the process of delivering material and delivering assignments even with a limited number of students. The presentation of this module uses a flipbook model and can be opened using a smart device, laptop, or computer. Flipbook is a digital form of a book but has a more attractive appearance with the flipbook effect, or like reading a real book. Teachers are also very easy to carry anywhere even in large quantities, so teachers have various and easily accessible sources of material.

The developed teaching module can be used for learning if it fulfills several conditions so that it can be used properly. This is because if learning is carried out using inappropriate media it will affect learning outcomes. Based on the regulation of the Minister of Education, culture, research, and technology of the Republic of Indonesia number 22 of 2022 concerning book quality standards, the modules made must have good material, presentation, design, and graphic standards (Permendikbudristek, 2022). Therefore, the teaching modules developed were tested for validity using the expert judgment method. The results of the validity of the ethno-STEM-based teaching modules are shown in Table 1

Table 1. Result of the Validity from ethno-STEM-based Teaching Module

Feasibility Aspect	Media Expert	Material Expert	Average Score	Criteria
Content	94.64	95.53	95.09	Very Eligible
Linguistic	91.67	86.54	89.11	Very Eligible
Presentation	96.43	92.86	94.65	Very Eligible
Average Score	94.25	91.64	92.95	Very Eligible

Based on Table 1, it can be seen that the teaching modules developed fall into very decent criteria with a percentage score of 92.95%. Therefore it can be said that the modules that have been developed can be used in the learning process. This module has met quality standards including the feasibility of content, presentation, graphics, and illustrations of the contents included in the teaching materials. The presentation of the teaching modules has met the consistency of the presentation systematics, the sequence of the material, the references to several supporting books, and involves student participation in using this teaching module. The content of teaching materials also meets several criteria such as the material contained according to core competence (KI) and basic competence (KD), accuracy of images and terms, accuracy of appropriate examples and images, and can increase students' interpersonal knowledge and literacy. Some of the eligibility criteria for these teaching modules are by the quality standards set by the National Education Standards Agency so these teaching modules are included in the very feasible criteria.

Science in this digital teaching module is also given context in the form of explanations, pictures, videos, and information about the application of technology and the phenomenon of surrounding activities which are supporting materials for students' interpersonal literacy. When learning science, students are involved a lot to explore knowledge and phenomena that exist in the environment around students so that they can train students and develop and use interpersonal literacy skills consisting of aspects of communication, appreciation, tolerance, caring, empathy, and being able to work with others. Research conducted by Inayah et al. (2022) has succeeded in developing an ethno-STEM module in physics material to improve students' communication skills. In addition, STEM-based project learning can improve teamwork skills. This is because there are many activities carried out by students that require joint coordination and collaboration (Shofiyah et al., 2022).

Readability of Module

The readability results of the ethno-STEM learning module were obtained from the gap test carried out by students. The readability test results

of the compiled modules show a score of 61.4. Details can be seen in Table 2.

Table 2. Results of the Readability Test Values

No	Category	Range	Total	Percentage (%)
1	Frustration	≤ 40	9	19
2	Instructional	41-60	16	33
3	Independent	> 60	23	48
Final Grade				61.4

According to Rankin and Culhane in 1969 cited by Inawati (2019) determining the interpretation of the results of the gap test based on the following criteria.

1. Category above 60% (> 60%) : independent or free level
2. Category between 41% - 60% :   instructional level
3. Category below 40%   :   level   of frustration or failure

This can be interpreted that the ethno-STEM based learning modules are relatively easy to read. This is corroborated by the responses of students who get points of 2.85 (scale 4) or a score of 71 (scale 100) on the aspect of clarity of writing. But there are still some problems from students who say the letters used are too small. This can happen because students have different facilities for accessing modules, namely using gadgets, laptops, and some using computers. If the device used has a small screen, the module needs to be enlarged several times to make it easier to read.

The teaching modules that have been made have a good readability level and are easy to understand. This is because the teaching materials are prepared using the correct Indonesian Spelling and use communicative language. The delivery of science material also takes into account the development of students at the junior high school level to minimize the use of language that is difficult to understand. Based on the questionnaire that was filled in by students on the easy-to-understand module aspect, a score of 2.77 or 69 was obtained. This means that instructional explanations still need to be improved. The use of straightforward and communicative language is an important key so that users of learning modules, namely teachers and

students can understand well (Anista et al., 2022). The use of good language is Indonesian, the use of which is by the communication situation, while the correct Indonesian is Indonesian, the use of which is by the rules of the Indonesian language. The rules of the Indonesian language include sound system, word order, sentence structure, and writing system (Sriyanto, 2015).

Efectivity of Module

The development of project-based ethno-STEM online learning modules has been tested for validity and readability. Based on the validity and readability analysis that has been carried out, it can be said that the teaching modules compiled are valid and can be implemented in An Nur Ungaran Middle School students as grade 7 learning media on food ingredients. The effectiveness test of the ebook is analyzed based on the results of the initial test (pretest) and the final test (posttest). Questions in the form of multiple choice questions 25 are given at the beginning of learning and after the implementation of the teaching modules to determine their ability to develop interpersonal literacy and improve learning outcomes.

N-gain Test of Learning Outcomes

An increase in learning outcomes was obtained from the N-gain test based on the results of the pretest and posttest that were carried out by students when using the ethno-STEM online learning module. This test is carried out by making comparisons of student scores before using the learning module and after using the learning module. Pretest and posttest are carried out by not allowing students to access additional information so that they are closed books. The results of the comparison of students' pretest and posttest scores

using the ethno-STEM module can be seen in Table 3 and Graph 1.

Table 3. Comparison of Pretest and Posttest Scores of Student Learning Outcomes

Criteria	Pretest	Postest
Lowest Score	15	40
Highest Score	75	90
Average Score	48.02	65.42
N-gain Average	0.33	

Based on Figure 1 we can see that the students' posttest scores were higher than the results of the pretest scores. From these results, it means that the implementation of local wisdom-based ethno-STEM modules in online learning can improve student learning outcomes. This is because students can maximize the knowledge gained while exploring teaching modules. During online learning using teaching modules, students are not only limited to accessing the information in the module but can also access some of the links in it. So that students gain extensive knowledge and can simultaneously practice the questions in the module or on the links provided. Sumarni & Kadarwati (2020) explained that ethno-STEM-based project learning can improve students' critical and creative thinking skills. This can happen because STEM learning shows comprehensive characteristics, namely problem-solving, critical analysis, and facilitating students to train their thinking skills. This is corroborated by the results of research by Martawijaya, *et al.*, (2023) which explains that learning STEM projects by utilizing local wisdom can improve higher-order thinking skills (HOTS) and reduce student misconceptions.
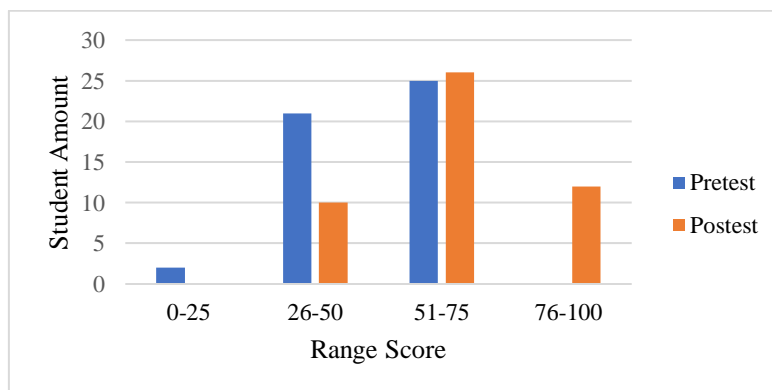

Figure 1. Comparison of Students' Pretest and Posttest Scores

Based on the data that has been obtained, the analysis of the N-gain test to improve student learning outcomes obtains a score of 0.33. This means that it is included in the medium category. As for the details of the number of students who have a high N-gain category, there are 6%, there are 40% in the medium category, and there are 54% in the low category. The average value of N-gain can be included in the moderate category because the average student gets a very low pretest score, namely at an average of 48.02, while the average posttest result only reaches 65.42. These data indicate that student learning outcomes also increased. So that it can be said that learning with ethno-STEM modules in online learning can improve student learning outcomes. These results are in line with research by Suryawati et al. (2021) which states that learning by utilizing problem-based local wisdom can improve students' thinking skills and strengthen environmental literacy.

Assessment of aspects of interpersonal literacy is carried out by conducting a pretest and posttest using questions. Based on the analysis of the pretest and posttest results, it was found that the average score of students increased from 57.08 to 73.75. The results of the pretest and post-test comparisons can be seen in Table 4 below.

Table 4. Pretest and Posttest Values for Interpersonal Literacy Aspects

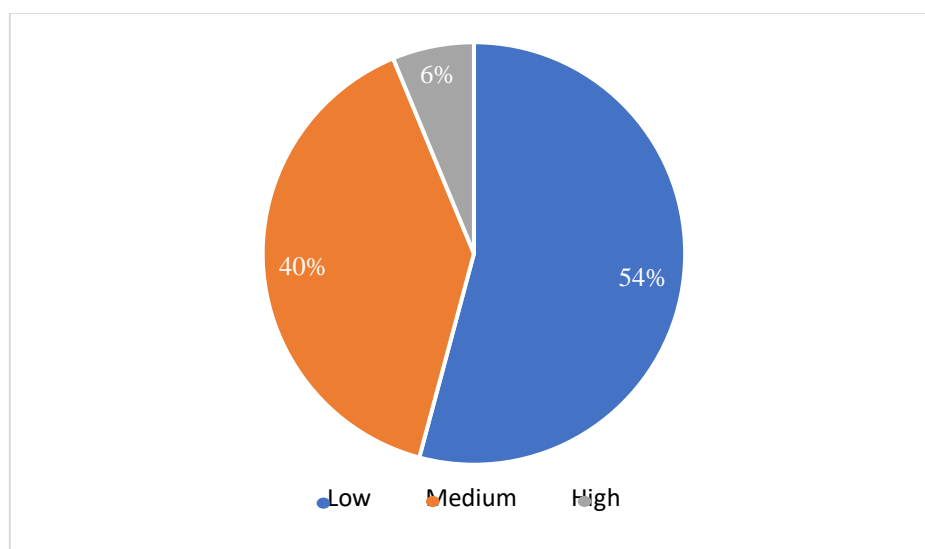| Aspect	Pretest	Postest
Cooperation	0.46	0.73
Caring Attitude	0.44	0.67
Tolerance	0.65	0.79
Communication	0.73	0.81
Apreciation	0.58	0.69
Average	57.08	73.75
N-gain	0.31	

Figure 2. N-gain Test Results for Students' Pretest and Posttest Scores

Based on these data, the N-gain test results were obtained at 0.3 which is in the moderate category. In detail, the number of students in the high N-gain category is 5%, the medium category is 43%, and the low category is 52%. This shows that there are differences in aspects of students' interpersonal literacy mastery before learning using teaching modules and after learning using teaching modules. Learning by involving students in a social environment will foster positive attitudes such as caring, tolerance, and the ability to appreciate. One

of the rubrics in the module, there is one that requires students to make observations in the field so that students make simple observations about making traditional food around the student's environment. According to Rosala (2016), learning based on local wisdom is by educational goals, namely that students can develop knowledge, understanding, and skills to solve social problems that occur in students' lives, through their learning abilities. Character education not only teaches what is right and wrong but also instills habits

(habituation) about good things so that students become aware (cognitive) about what is right and wrong, can feel (affective) good values , and are used to doing them (psychomotor). Herman (2022) explains that an attitude of social sensitivity (empathy, caring, and harmony) can be formed for students by exploring the local wisdom of the local community, in this case, namely the a'mauduu culture that has existed for generations in Takalar Regency.

CONCLUSION

Based on the results of the research and data analysis that has been carried out, it is concluded that the ethno-STEM module material for food ingredients has been successfully developed through the stages of analysis, design, development, implementation, and evaluation and has the characteristics of elements of science, technology, engineering, and mathematics that combine in studying traditional food industry topics. The validity of the ethno-STEM module on the topic of the traditional food industry has a score of 94.25% according to media experts and 91.64% according to material experts which fall into a very good category, thus teaching modules are appropriate for use in the online learning process. The ethno-STEM module on the topic of the traditional food industry is effective in increasing learning outcomes and interpersonal literacy with an N-gain value of 0.33 and 0.31 which is in the moderate category.

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