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Development Of Ethno-Stem-Based Teaching Modules On Proximate Analysis Materials To Improve Communication Skills Of Vocational School Students

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Abstract

This research aims to develop an Ethno-Stem-based teaching module on proximal analysis material and test the validity, practicality, and effectiveness in improving the communication skills of Vocational High School (SMK) students. The research uses the ADDIE development model which has several stages, namely analysis, design, development, implementation, and evaluation. The subject of the researcher was grade XI students in the competence of Laboratory Testing Analysis expertise. The instruments used to support this research were expert validation sheets, teacher and student response questionnaires, and communication skills tests.

The results of the study show that the teaching modules developed have a very high level of validity seen from the results of the content, presentation, language, and graphic aspects; The practicality of the module is in the practical category based on user response; also the effectiveness of the modules is demonstrated through a significant improvement in students' communication skills. These results state that the integration of the Ethno-Stem approach in the teaching module is able to create contextual learning; as well as improving the quality of students' scientific interaction in the learning process.

Keywords: Ethno-Stem; proxy analysis; teaching modules; scientific communication; SMK.

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INTRODUCTION

Vocational education has an important role in preparing graduates who not only master concepts but also have applicative skills that are very relevant to the world of work. As for what is written by (Musa et al., 2025) which Internships are widely adopted as a mechanism to enhance graduate employability, yet their role in shaping student readiness, soft skill development, and digital literacy remains underexamined in Indonesia. Meanwhile, from saying that the integration of employability skills into vocational education and training (VET) affects students' perceived skills. Perceived or self-evaluated skills are often inaccurate perceptions of the real skills' possession, but nevertheless they play a profound role in graduates' career decisions. (Romanova, 2022)

In the Laboratory Test Analysis expertise program, students will be required to be able to conduct chemical analysis systematically; and be able to communicate the results scientifically. However, learning practices in the field still show a number of problems, especially related to low student involvement and lack of optimal scientific communication skills in students. (Abualrob , 2022) has written about student involvement in science classes in 5th and 9th graders in Palestine. The sample was 1,132 students, and the results showed that 5th graders were more engaged than 9th graders; Teachers and learning contexts also affect engagement.

Proximate analysis material is one of the important competencies in the field of analytical chemistry. This material has the determination of the composition of nutrients in food; such as moisture content, ash, protein, fat, and carbohydrates. In his projects, learning this material is often delivered theoretically without being linked to a real context that is close to the students' daily lives. As a result, students have difficulty understanding concepts; and less able to communicate the results of the analysis effectively. (Hasnunidah et al., 2023)

Scientific communication skills are essential competencies in 21st century learning. Students are not only required to understand concepts; but also able to convey ideas, discuss, and present results systematically. Therefore, learning innovations that are able to integrate mastery of concepts and also the development of communication skills are urgently needed.

One of the approaches that can be used is Ethno-Stem which is a learning approach that integrates elements of local culture with science, technology, engineering, and mathematics. This approach provides students with the opportunity to learn through contexts relevant to their lives; So that learning will become more meaningful. For example, local foodstuffs such as ilabulo, sabongi, and binte biluhuta can be used as objects of study in proxy analysis materials.

Previous research has shown that Ethno-Stem-based teaching modules have the potential

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to improve the quality of learning both in terms of understanding concepts and student involvement in communicating. Modules that are designed contextually and systematically prove to be easier for students to understand; and able to encourage active learning activities. The use of communicative language in the module also contributes to improving the communication skills of vocational school students.

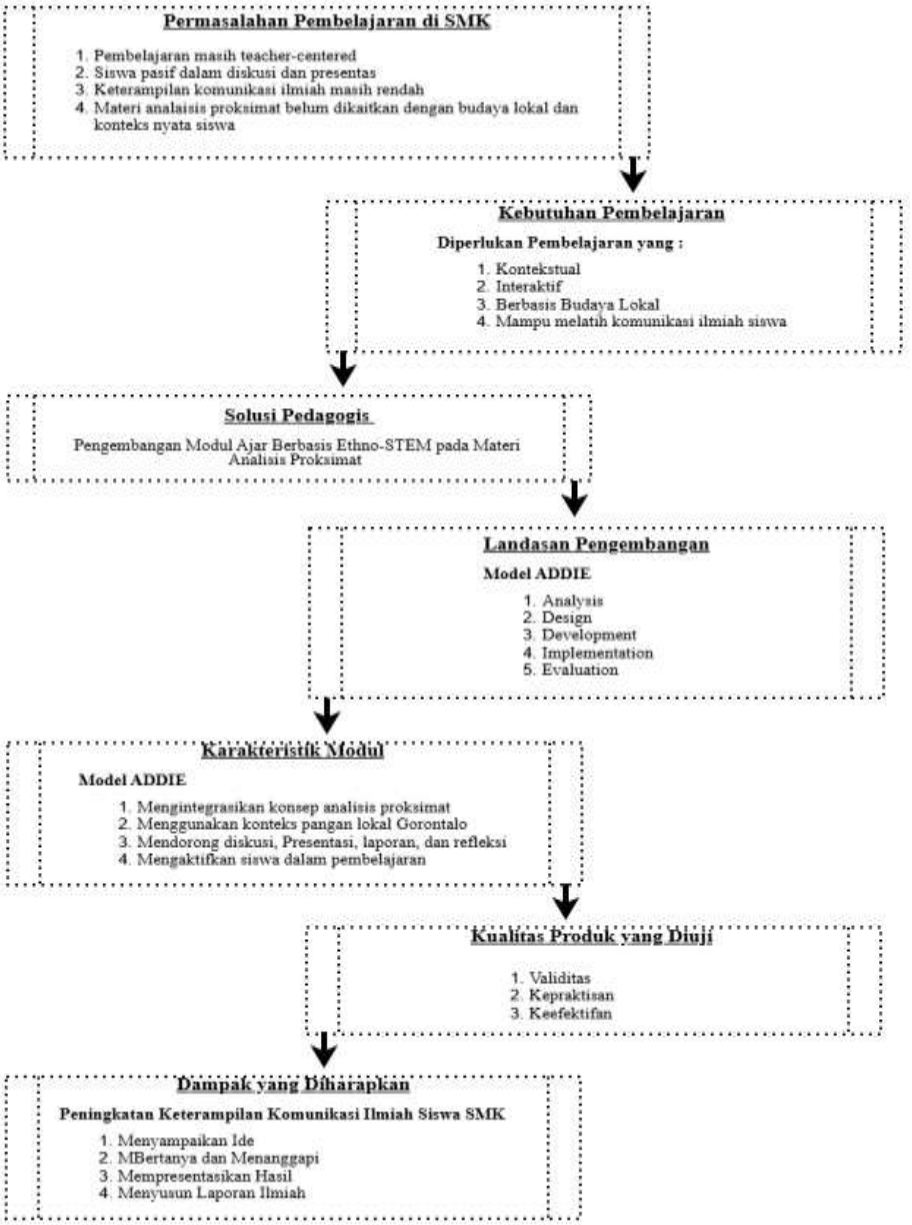
Based on the description above, this study aims to: (1) develop an Ethno-Stem-based teaching module on proxy analysis material; (2) to determine the level of validity and practicality of the module; and (3) testing the effectiveness of teaching modules in improving the communication skills of vocational school students.

METHODS

This research is research and development using the ADDIE model. This model was chosen because it has a systematic structure and allows for the development of educational products in a gradual and tested manner.

1. Analysis stage : needs analysis, curriculum analysis, and student characteristics analysis. The results of the analysis show that students need contextual teaching modules; and able to help them understand the material more easily.
2. Design stage : designing the module structure, preparing learning objectives, and integrating Ethno-Stem elements in the material. The module is designed with attention to the interconnectedness between the concept of chemistry and local culture or Ethno-Stem.
3. Development stage : carry out the complete process of preparing modules. The module will then be validated by three validators consisting of material experts, education experts, and practitioners (teachers). Validation is carried out to assess the feasibility of the module from various aspects.
4. Implementation stage : Through a trial limited to grade XI students. Where the module is used in learning to see user responses and their effectiveness.
5. Evaluation stage : Aims to assess the quality of the module based on the data obtained. The data was analyzed using quantitative descriptive techniques by calculating the percentage of scores to determine the eligibility category.

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The research instruments include:

1. Module Validation Sheet: The validation sheet is used to assess the feasibility level of the Ethno-Stem-based teaching modules that have been developed. Validation is carried out by three validators consisting of material experts, education experts, and practitioners (teachers).

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The aspects assessed in the validation sheet are:

1) Content eligibility: in the form of suitability of the material with the curriculum, the truth of the concept, and relevance to the Ethno-Stem context;
2) Feasibility of presentation: in the form of systematics of preparation, order of material, and clarity of learning steps;
3) Language Eligibility Clarity: in the form of readability, as well as suitability with the level of student development;
4) Graphic feasibility: in the form of appearance, design, use of images, and consistency of format.

Each indicator will be assessed using a Likert scale of 1–5. The validation data was analyzed by calculating the percentage of scores to determine the eligibility category, which was very unfeasible, unfeasible, moderately feasible, feasible, and very feasible according to the rules.

2. Teacher and Student Response Questionnaire

A response questionnaire that will be used to measure the level of practicality of the teaching module is developed. Questionnaires are given to teachers and students after the learning process using modules.

Aspects assessed:

1) Ease of use of the module in the form of clarity of instructions and ease of following activities;
2) The attractiveness of the module is in the form of visual displays, illustrations, and presentation of materials;
3) Understanding of the material is in the form of ease of students in understanding the content of the module;
4) Compatibility with learning is in the form of the connection of the module with learning activities in the classroom.

The questionnaire instrument uses a Likert scale of 1–5 ranging from strongly disagree to strongly agree. The results of the questionnaire will be analyzed by calculating the average percentage of respondents' scores and then categorized into practicality, namely impractical, less practical, quite practical, practical, and very practical.

3. Communication Skills Test

A communication skills test that will be used to measure the effectiveness of the module in improving students' scientific communication skills. Tests are given in the form of pretest

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and posttest so that they are carried out before and after learning using modules.

Indicators of measured communication skills include:

1) Ability to convey ideas orally or in writing;
2) Ability to ask questions;
3) Ability to discuss and provide feedback;
4) Ability to present the results of the analysis systematically.

The test instruments are arranged in the form of description questions and presentation assignments. The assessment will be carried out using an assessment rubric that has been prepared on a certain scale for each indicator.

The test result data is analyzed by calculating the average pretest and posttest scores; and improving learning outcomes using the N-Gain formula. The results of the analysis will be used to determine the level of effectiveness of the module in improving students' communication skills.

RESULTS AND DISCUSSION

1. Validity of the Module

Table 1. Results of Validation of Ethno-Stem-Based Teaching Modules

Yes	Assessment Aspects	Percentage (%)	Categories
1	Content Eligibility	96,00	Highly Worth It
2	Presentation	97,77	Highly Worth It
3	Language	92,67	Highly Worth It
4	Graphic	95,50	Highly Worth It
	Average	**95,48**	**Highly Worth It**

The validation results have shown that the Ethno-Stem-based teaching module has a very high level of feasibility. Where the assessment is carried out on four main aspects, namely the feasibility of content, presentation, language, and graphics.

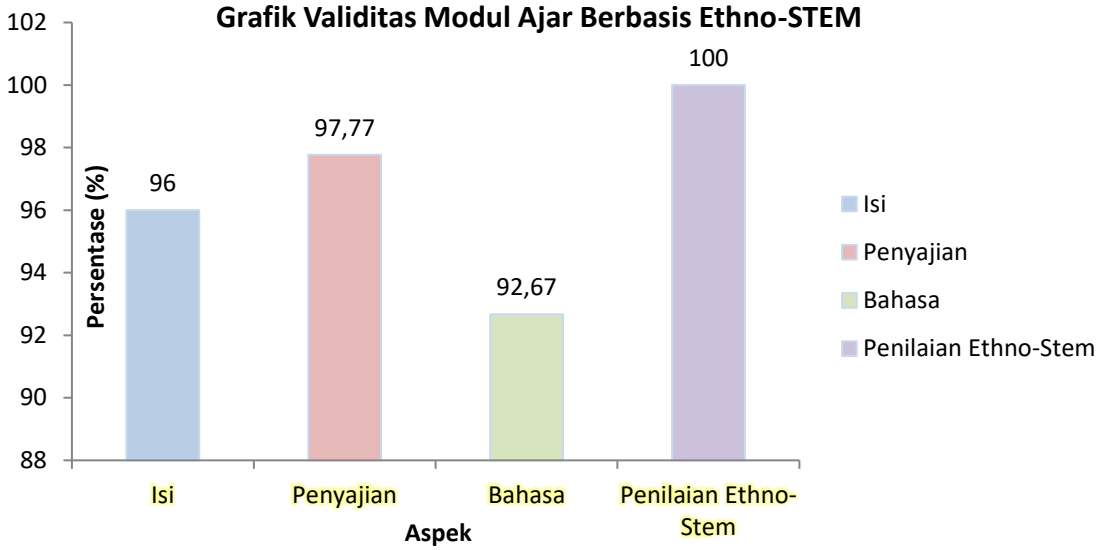
The content aspect has obtained a very decent category; which shows that the material is in accordance with the curriculum and has good concept truth. The presentation aspect also shows very high results with a score of 97.77%; this shows that the modules are arranged systematically and sequentially.

The language aspect which obtained a score of 92.67% is included in the very feasible category. This also shows that the use of language in the module is communicative; and in

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accordance with the level of student understanding. Meanwhile, the graphic aspect also obtained a very feasible category which shows that the appearance of the module is interesting and supports the learning process.

This high validity value has shown that the module has met the quality standards of the teaching module both in terms of substance and presentation.



2. Practicality of Modules

Table 2. Results of Teacher and Student Responses to the Practicality of the Module

Respondents	Percentage (%)	Categories
Teacher	94,00	Practical
Students	91,50	Practical
Average	**92,75**	**Practical**

The practicality of the module was measured by looking at teacher response data and student response data after use in learning. The results showed that the use of the module was in the practical category with indicators of ease of use, clarity of instruction, and suitability with learning time.

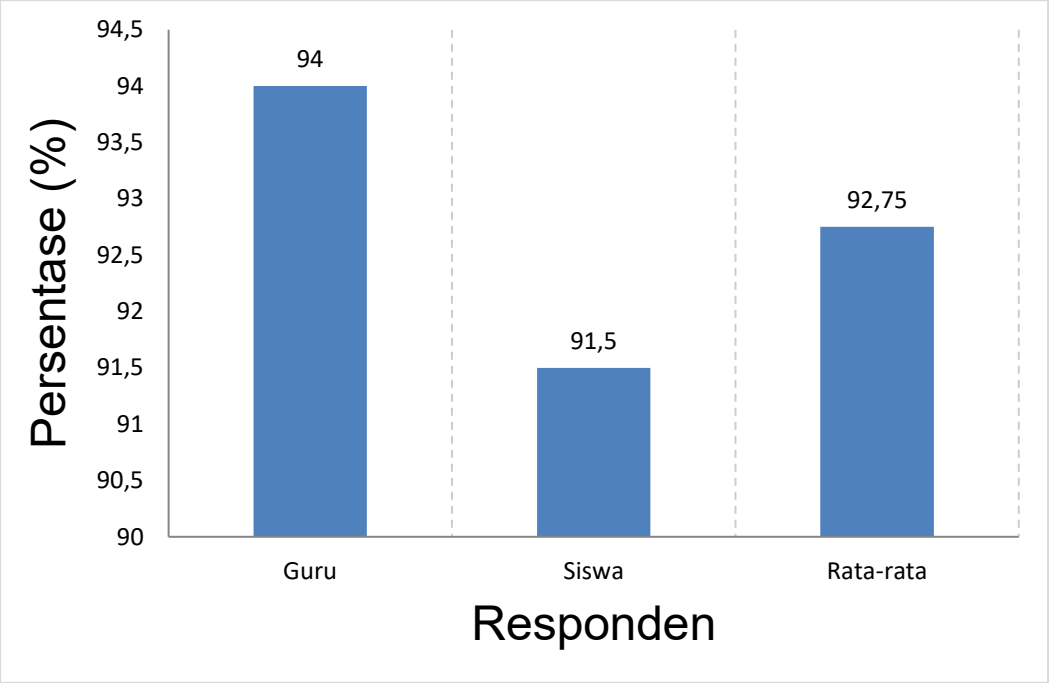
Students stated that the modules helped them understand the material more easily and also provided a more interesting learning experience. The teacher also gave a positive response, especially on the aspect of integration between the material and activities during learning.

This shows that the modules are not only theoretically feasible but can also be used

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effectively in learning practice.

Tables and Graphs of Research Respondents



3. Effectiveness of the Module

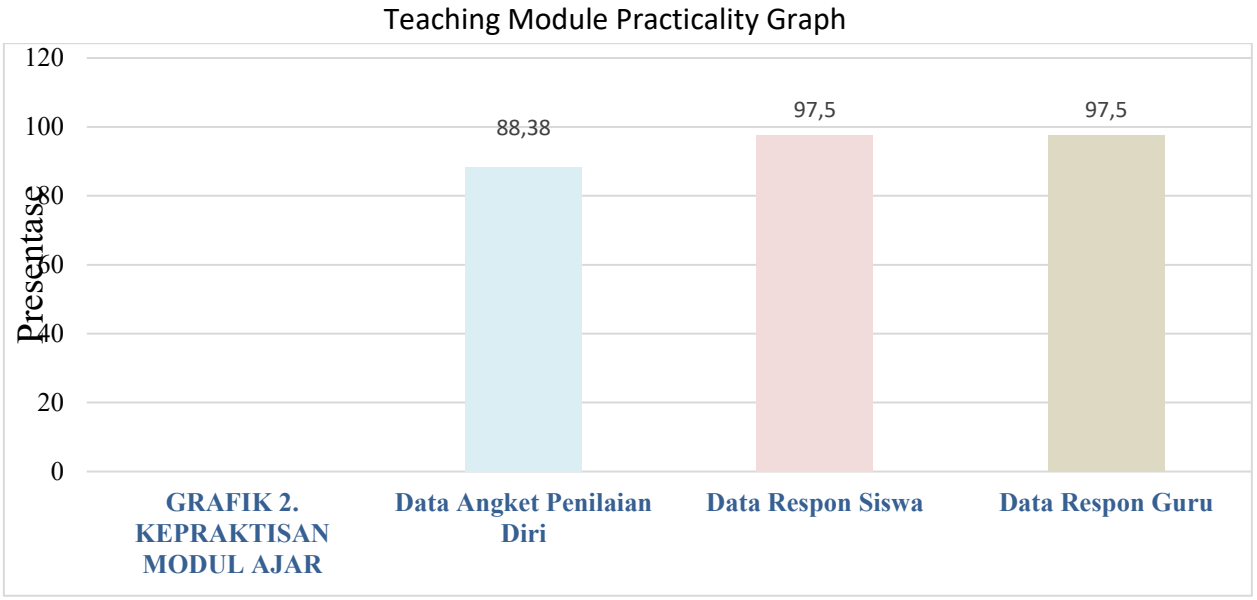
Table 3. Results of Student Communication Skills Improvement

Categories	Average Score
Pretest	22, 79
Posttest	92,72
N-Gain	68,97
Categories	Medium

The effectiveness of the module was reviewed from the improvement of students' communication skills. The results showed a significant increase between the pretest and posttest scores which showed that the module was able to improve students' scientific communication skills.

Students also become more active in discussing; able to convey ideas more clearly; and more confident in presenting the results of the analysis. This shows that the Ethno-Stem approach is able to create interactive learning and encourage active student participation.

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GRAFIK 2. KEPRAKTISAN MODUL AJAR

DISCUSSION

The results of this study are in line with previous research which showed that Ethno-Stem-based modules have a high level of feasibility and are able to improve the quality of learning. The integration of local culture in learning has been proven to be effective in increasing student involvement in learning.

In addition, the use of communicative language in modules also contributes to improving students' communication skills. Modules that are systematically arranged provide a clear structure that makes it easier for students to understand the material.

Thus, Ethno-Stem-based teaching modules can be an innovative solution in analytical chemistry learning, especially to improve the communication skills of vocational school students.

CONCLUSION

Based on the results of research and development that has been carried out, the Ethno-Stem-based teaching module on proximal analysis material is declared feasible to use based on the results of expert validation with a very valid category. The developed module also shows a high level of practicality based on student responses. In addition, the use of Ethno-Stem-based teaching modules has proven to be effective in improving the communication skills of vocational school students, which is shown by the increase in pretest scores to posttest scores with N-Gain values in the medium/high category. Thus, the developed teaching modules can be used as an

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alternative to teaching modules to improve students' communication skills.

Suggestions

It is recommended for teachers to use this module as an alternative to innovative teaching modules. Further research is expected to develop more modules on other materials as well as examine other 21st century skills such as critical thinking and creativity.

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