



Development of a Geography Module Based on Group Investigation Integrated with High Order Thinking Skills on Exogenous Material to Improve Critical Thinking Skills of High School Students

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Received: January 15, 2025

Revised: February 20, 2025

Accepted: March 25, 2025

Published: March 31, 2025

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DOI: [10.29303/jppipa.v11i3.10395](https://doi.org/10.29303/jppipa.v11i3.10395)

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Abstract: Critical thinking skills can be facilitated through learning with a group investigation (GI) model. Therefore, a teaching module integrated with high order thinking skills is needed to support the learning process. The purpose of this study was to determine the analysis of teacher and student needs for geography module based on group investigation integrated with high order thinking skills, module validity, level of practicality, and effectiveness of the module in improving students' critical thinking skills. This study is a development research. Data were analyzed using qualitative and quantitative methods. Qualitative descriptive analysis was used to analyze data on needs, validity, and practicality of the module, while quantitative analysis was used to test the effectiveness of the module. The results of the needs analysis showed that teachers needed for geography module based on group investigation integrated with high order thinking skills, and students needed interesting and easy-to-understand learning media. Expert validation showed that the module had a validity index of 93.5% with a very valid category. The practicality level of the module reached 81% with a practical category. Effectiveness testing using the independent sample t-test produced a sig value. (2-tailed) of 0.000 (<0.05), which shows that the module is effective in improving students' critical thinking skills. The conclusion of this study is that the geography module based on group investigation integrated with high order thinking skills is valid, practical, and effective in improving students' critical thinking skills in exogenous material.

Keywords: Critical thinking; Exogenous; Group investigation (GI); Modules

Introduction

Increasing the standards and quality of education is one of the strategies implemented by government as a response to the era globalization currently being faced (Peters-Burton & Stehle, 2019). Effort to improve educational standards aims to create human resources excellence that can be identified through mastery of 21st century skills by every individual (Van Laar et al., 2020). Significance of skills the 21st century has made it a focus

major in current educational research (Geisinger, 2016). This is caused by the importance of 21st century skills as preparation of students in facing various future challenges (Larson & Miller, 2011) and had a substantial impact on students' lives after them complete their formal education (Kaufman, 2013). The implementation 21st century skills are considered to be a must in every process learning (Dicerbo, 2014; Fry & Seely, 2011; Griffin, 2017; Jang, 2016; Lambert & Gong, 2010; Sibille et al., 2010).

How to Cite:

Supriyanto, A., & Nursa'ban, M. Development of a Geography Module Based on Group Investigation Integrated with High Order Thinking Skills on Exogenous Material to Improve Critical Thinking Skills of High School Students. *Jurnal Penelitian Pendidikan IPA*, 11(3), 440-447. <https://doi.org/10.29303/jppipa.v11i3.10395>

In connection with the demand to improve the quality of human resources, the quality of education needs to be improved in all subjects including Geography subjects. Geography is a science that is able to support the needs of students in improving their understanding of spatial phenomena, especially in the geosphere layer. Geography learning is considered by students as boring and requires a lot of memorization, as a result many students are less interested in studying Geography subjects (Susilawati & Sochiba, 2024; Wijayanti et al., 2022).

21st century education has focused on improving creative competence, critical thinking, cooperation and communication (González-Pérez & Ramírez-Montoya, 2022). This will be a challenge for schools and teachers to find ways to ensure that 21st century competencies can be possessed by students (Azizah et al., 2021).

The implementation of comprehensive learning in Indonesia still has problems. This problem is proven by the results of the 2018 Program for International Student Assessment (PISA) survey which shows that Indonesia is far behind other countries, namely ranking 71st out of 79 participating countries (Hewi et al., 2020).

Learning outcomes are largely determined by the quality of learning implementation. The better the activities in learning, of course the learning outcomes achieved by students will be maximized. One of the factors causing the implementation of learning to not be optimal is the use of learning models that are still less varied (Muliani & Wibawa, 2019). Therefore, teacher skills are needed in implementing learning with various learning models that suit the characteristics of the learning material and the results to be achieved (Susilawati et al., 2022). One of the skills that can improve student learning outcomes is critical thinking.

Critical thinking skills are the ability to analyze and evaluate information used to draw valid conclusions (Adilah & Rosyida, 2024). Critical thinking is an active and systematic cognitive process that aims to evaluate arguments, truth, and richness, as well as provide evidence for the relationship between two or more topics and to accept or reject ideas (Handayani et al., 2023). Critical thinking skills focus more on the learning process rather than just the acquisition of knowledge (Cahyani et al., 2023).

Academics and educational practitioners have made various efforts to improve students' critical thinking skills. Among the efforts made is implementing learning using various innovative learning models such as Group Investigation (GI) model. Group Investigation is a learning model that requires students to use their thinking skills to create an active learning environment in the classroom. In Group Investigation (GI) learning, students will be invited to work together with a diverse

small group scope to solve a problem through direct field research. Classes with active conditions in investigation activities will be more interested in investigating and deepening their way of thinking, reviewing data, and learning to accommodate input from others or their environment (Cahyani et al., 2023).

The advantage of the Group Investigation learning model lies in the learning stage where students are actively involved (student centered) through direct investigation activities to find and discover causes and effects, analyze findings, and draw conclusions so that students will independently hone their knowledge and analytical and critical thinking skills. In this context, critical thinking capacity refers to the mental activity of considering questions and considering options that emphasize choosing the most appropriate response. This is equivalent to Ennis' statement regarding critical thinking which is reasonable and speculative decision making whose center point is on what is believed or done (Raudhah et al., 2019). Another advantage of the Group Investigation model is that students are given the opportunity to choose groups according to their interests or interests in the existing topics to be investigated, so that students are no longer told but find out through observation and investigation.

The stages in the Group Investigation model help students independently hone and use their critical thinking skills to provide alternative solutions to problems being investigated in groups in addition to its purpose of being able to increase students' critical thinking skills (Kartikawati & Pratama, 2017). The Group Investigation learning model motivates students to think critically at each stage, so educators often use this model to improve students' critical thinking skills, including in geography subject. One of the materials in geography lessons is exogenous. Based on observations, it is known that students need geography learning media on exogenous energy material that is able to present material in an interesting way with a visual format. This is because students feel that exogenous energy material has many things to memorize. So it needs to develop geography learning materials in visual format through modules that contain material presented in the form of visual picture.

Modules are a form of innovation carried out to support learning activities. Modules are packaged electronically by not removing the elements and components on the module and can be accessed using electronic devices (Yanarti et al., 2022). Modules have the advantage of being able to stand alone so they can improve the quality of learning (Marnah et al., 2022). So this study aims to develop a geography module based on group investigation integrated with high order thinking skills on exogenous material which valid,

practical and effective to improve critical thinking skills of high school students.

Method

This type of research is Research and Development research. Research and Development (R&D) research is a research process designed to produce or develop a new product, system, or method, or to improve an existing one. The product to be researched and developed in this study is a module based on group investigation integrated with high order thinking skills on exogenous material, which consists of RPP, Teaching Materials, LKPD (Student Worksheets) and Assessment Instruments.

The model used in this study is the Brog & Gall (1998) research and development model. According to Borg & Gall (1998), development research has nine main development steps which include: (1) investigation and information collection, including literature studies, field observations, and report preparation, (2) planning, (3) development of initial product forms, (4) initial field trials, (5) main product revision, (6) main field trials, (7) field operational trials, (8) final product revision. These nine steps can be summarized into 10 stages, namely: (1) Identification of Potential and Problems, (2) Data Collection, (3) Product Design, (4) Design Validation, (5) Design Revision, (6) Product Trials, (7) Product Revisions, (8) Usage Trials, (9) Product Revisions, and (10) Mass Product Implementation.

The research instruments used were tests and non-tests. The test was conducted by giving a pretest and posttest in learning in the form of essay questions totaling 5 questions. This test aims to determine whether there is an increase in students' critical thinking. Critical thinking are measured using indicators, namely

analytical skills, synthesizing arguments, evaluating information, drawing conclusions using deductive and inductive reasoning, and solving problems (Lai, 2011). Non-tests are in the form of student response questionnaires and observation sheets used to directly observe the learning process using geography modules. Data analysis techniques in the study include: for validity and practicality tests, the Percentage Index formula is used:

$$I \% = \frac{\text{Total Assessment Score}}{\text{Maximum Score}} \times 100\% \quad (1)$$

Then, to test the effectiveness, the independent sample t-test was used with the help of the SPSS program.

Result and Discussion

Teaching Module Validation Results

Validity value given by validator to the design of geography module based on group investigation integrated with high order thinking skills on exogenous material. The presentation component obtained the largest Percentage Index, which is 81%. While the smallest Percentage Index was given to the graphic component, which is 80%. Details of the complete learning device validation data can be seen in table 1.

The validator provides recommendations for learning devices that are suitable for use with revisions according to suggestions. The suggestions are as follows: In general, this learning module is considered suitable for use with several revisions to the aspects of learning objectives, learning activities, and assessment formats. The proposed revisions aim to improve the clarity, relevance, and effectiveness of the module in supporting an optimal learning process.

Table 1. Percentage Index of Validation of Learning Experts' Assessment Results of Validators

Components of Learning Devices that are Assessed	Percentage index (%)	Learning Devices Percentage Index (%)
Presentation		
a. Technique	80	
b. Material	81	81
c. Presentation	82	
Graphics		
a. Module Size/Format	79	
b. Cover section design	81	80
c. Content section design	79	
d. Paper Quality	81	
Validity		Valid

Media Validation Results for Linguists

Validity value given by validator to the design of geography module based on group investigation integrated with high order thinking skills on exogenous material. The readability component obtained the

largest Percentage Index, which is 83%. While the smallest Percentage Index was given to the other two components, which is 79%. Details of the complete learning device validation data can be seen in table 2.

Expert validators provided notes on improvements to the product design. The content presented in this module has covered various aspects of knowledge relevant to the curriculum and learning objectives. The material that has been compiled is systematic and in-depth, so that it can provide a comprehensive understanding to students. However, the validator team

found several words and spellings that were not in accordance with good and correct Indonesian language rules. The language used in this module is generally good enough and easy for students to understand. However, there are several sentences that are less effective and several terms that are not used correctly.

Table 2. Percentage Index of Validation of Learning Experts' Assessment Results of Validators

Components of Learning Devices that are Assessed	Percentage index (%)	Learning Devices Percentage Index (%)
Linguistics		
a. Legibility	83	
b. Conformity of rules	79	80.3
c. Language Logic	79	
Validity		Valid

Material Validation Results for Material Experts

The presentation component obtained the largest Percentage Index, namely 82%. Details of the complete learning device validation data can be seen in table 3.

The researcher conducted a stage I revision of the teaching module design consisting of RPP, LKPD, teaching materials, and assessments according to the suggestions of the validator. After the learning device was revised, the learning device was validated again by

the validator. The validation results of the product design of geography module based on group investigation integrated with high order thinking skills on exogenous material showed the Percentage Index data for learning devices of 93.5 with very valid validity criteria. The validator provided recommendations for the design of the product learning devices that are suitable for use in learning in high school without major revisions.

Table 3. Percentage Index of Validation of Material Experts from Validator Assessment Results

Components of Learning Devices that are Assessed	Percentage index (%)	Learning Devices Percentage Index (%)
Presentation		
a. Technique	79	
b. Material	86	82
c. Presentation	85	
d. Advanced and developing insights	80	
e. Diversity of social values	80	
Validity		Valid

Table 4. Percentage Index of Revised Learning Devices

Components of Learning Devices that are Assessed	Percentage index (%)	Learning Devices Percentage Index (%)
Lesson Plan	92.3	
Teaching materials	95.1	
LPKD	94.7	93.5
Instructional Media	91.4	
Evaluation instruments	93.8	
Validity		Very Valid

Results of Student Practicality Response Analysis

Student response data was obtained by asking students to fill out a questionnaire by checking the numbers 1-5 on the linkert scale for each statement in the questionnaire. The results of the analysis obtained a percentage index of 81%. Based on the interpretation of the criteria for the level of practicality, the percentage index of 81% indicates that the product of the development of the geography module based on group investigation integrated with high order thinking skills on exogenous material is very practical to use in

learning. Students generally feel that the sentences and paragraphs in the module are clear and easy to understand, with around 70% of students strongly agreeing and 70% agreeing that the language used is simple and helps them understand the lesson. This is important to ensure that students can follow the material easily without language barriers.

As many as 79% of students agreed that the module helped them focus more on learning exogenous material, and 76% of students felt that this module made them more enthusiastic about learning. The visual appearance

of the module was also considered attractive by 77% of students, who stated that the module design provided a good overview of the content (Harahap et al., 2024).

The module also successfully encouraged students to care more about their critical thinking skills, with 75.5% of students agreeing that the module helped them to improve their critical thinking skill. This module contains a summative test that aims to measure students' understanding of the material on exogenous. As many as 78.6% of students agreed that this test was effective in testing their understanding, which helps in evaluating whether students have understood the material in depth.

Overall, the results of the practicality test indicate that based on group investigation integrated with high order thinking skills is very suitable for use in the learning process. This module not only meets the criteria of practicality, but is also welcomed by students because of its simplicity in language, its relevance to the local context, and its visual appeal. These aspects support the success of this module in improving students' critical thinking skills with a contextual and relevant approach.

Results of Model Development Effectiveness Test

The product of the development of the based on group investigation integrated with high order thinking skills which has been declared feasible by the validator and declared very practical when conducting a limited trial, is applied in the treatment class.

The geography teacher carries out geography learning in class using the development product of the based on group investigation integrated with high order thinking skills which has been declared very valid by the validator, has a very practical level of practicality and has been revised again based on their input. The steps for implementing the learning take place like the model he observed in class in accordance with the syntax of the group investigation learning model.

The results of the average pre-test and post-test scores of students can be seen in Figure 1, which shows an increase in the average scores of students in the treatment class or in the quasi-experimental class. The pre-test and post-literacy scores of students were 41.2 and 56.35, respectively. The data on the average pre-test and post-test scores were analyzed for differences using the Independent sample t-test.

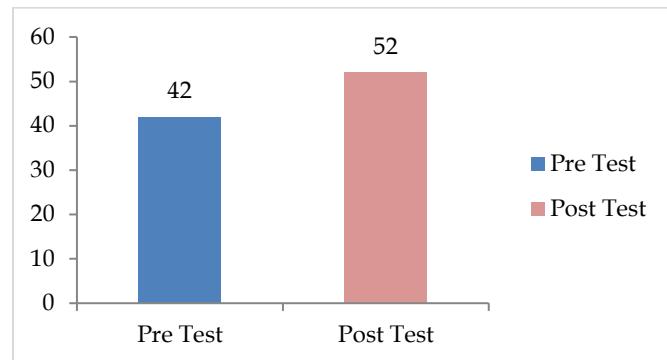


Figure 1. Diagram of critical thinking score

Table 5. Results of Independent Sample t-Test

Test Results	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	
Equal variances assumed	.007	.83	-4.75	62	.00	
Equal variances not assumed			-4.75	58.309		.00

With equal variance the sig. value (2-tailed) = 0.000. Since the significance value is less than 0.05, it can be concluded that there is a significant difference in the average between the two groups. Based on the results of the t-test, there is a significant difference between the averages of the two groups. A p-value <0.05 indicates that this difference is statistically significant.

The results of the statistical analysis showed that the use of based on group investigation integrated with high order thinking skills was effective in improving students' critical thinking skills. A significant increase in the average post-test score of the experimental class compared to the control class showed that this module succeeded in enriching students' understanding of the material, especially with group investigation learning model. This is in accordance with previous studies showing that the developed module or group

investigation model is effective in improving students' critical thinking skills (Taohid, 2022; Cahyani et al., 2023; Fahmi et al., 2024; Sultoni et al., 2023).

Group Investigation learning model affects students' critical thinking skills. Because learning does not occur in an informative way, it has been shown that the use of Group Investigation improves critical thinking by previous studies (Mushoddik et al., 2016). To increase students' critical thinking skills, teachers often use the Group Investigation cooperative learning model (Yuliyanti & Rahayu, 2021). The Group Investigation (GI) model is said to have an influence on improving students' critical thinking skills because the experimental class is said to be more active than the control class. This dynamic is shown by students' ability to express opinions in the experimental class (Sukmawati & Putra 2020). Because several previous

studies have discussed the influence of Group Investigation on students' critical thinking skills, it can be concluded that the Group Investigation learning model is very influential and can help teachers improve students' critical thinking skills in the classroom.

In the experimental class, the use of the Group Investigation learning model is very significant in influencing students' critical thinking skills. This can be seen from the average critical thinking skills and gain scores of the experimental control class which are higher when compared to the control class that uses the conventional learning model and the majority of teachers are still active in participating in the learning. In the experimental class, students are effectively associated with all stages of learning, including determining points/topics, preparing investigation plans, implementing investigations, planning investigation reports, presenting the results of investigation analysis, and evaluating learning. Students will begin to train high-level thinking skills such as critical thinking by investigating the problems they face. In addition, this model provides opportunities for students to collaborate with other students in the form of problem-solving group discussions.

By using the Group Investigation model for geography learning, students understand the group choice problem very well. This is evidenced by the student response of 76% who agreed and 24% who strongly agreed that they understood the problem they were investigating. 64% of students also agreed that they could formulate problems well on the problem topics raised through group investigation activities. This is because students during learning are actively involved in every step of the investigation and are independent in answering all problem formulations that have been made by the group before they carry out investigations in the field. This is in line with Yulianto's opinion that through systematic investigation activities, group investigation learning emphasizes deepening concepts so that students can develop their understanding comprehensively (Yulianto, 2020). Students can also offer opinions based on facts and evidence that are meaningful and meaningful at every stage of the decision-making process by participating in group investigations. This is evidenced by 58% of students agreeing, 36% of students strongly agreeing, and 6% of students disagreeing. The existence of these activities will certainly increase students' confidence in providing assumptions in the form of problem-solving solutions after conducting group investigations. Building students' self-confidence begins with self-belief in being able to do something and being facilitated to express this belief (Ma'rufi et al., 2018).

Conclusion

Based on the description and discussion of research results it is known that expert validation shows that the module has a validity index of 93.5% with a very valid category. The practicality level of the module reaches 81% with a practical category. Effectiveness testing using the independent sample t-test produces a sig. (2-tailed) value of 0.000 (<0.05), which shows that the module is effective in improving students' critical thinking skills. So that the geography module based on group investigation integrated with high order thinking skills on exogenous material is valid, practical, and effective in improving students' critical thinking skills.

Acknowledgments

Acknowledgments are expressed by the researchers to the team so that researchers can complete research in the form of journal publications.

Author Contributions

Conceptualization, A. S., and M.N.; methodology, A. S., and M.N.; validation, A. S., and M.N.; formal analysis, A. S., and M.N.; investigation, A. S., and M.N.; resources, A. S., and M.N.; data curation, A. S., and M.N.; writing—original draft preparation, A. S., and M.N.; writing—review and editing, A. S., and M.N.; visualization, A. S., and M.N. All authors have read and agreed to the published version of the manuscript.

Funding

No external funding.

Conflicts of Interest

No conflict interest.

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