

**DEVELOPMENT OF GIS BASIC KNOWLEDGE MODULES
CLASS X IIS MAN 1 BANDAR LAMPUNG**
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ARTICLES INFORMATION**Article status:**Received: Apr, 12th 2022Accepted: May, 12th 2022Published online: June, 15th 2022**Keywords:***basic knowledge of GIS, module development, SIG.***Kata kunci:**pengetahuan dasar SIG,
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ABSTRACT

This research is a development study that aims to develop geographic information system on basic knowledge materials geographic information systems and analyzing the level of feasibility and effectiveness of the geographic Information system module. The type of research used is R&D (Research and Development) research with a 4D development model, developed by S. Thiagarajan et al. Based on the results of the study show that (1) the feasibility level of the module based on the assessment of the three experts get an average score of 3.10 with a very feasible category, (2) the feasibility level of the module based on the assessment of students in large group tests get an average score of 3.22 with a very feasible. For the level of effectiveness of the module measured the test results show an increase in value before and after using the module. At Pretest the mean score obtained by students was 60.68 and the mean score increased to 89.72 at Posttest.

Penelitian ini merupakan penelitian pengembangan yang bertujuan untuk mengembangkan modul SIG pada materi pengetahuan dasar SIG dan menganalisis tingkat kelayakan dan efektivitas dari modul sistem informasi geografi tersebut. Jenis penelitian yang digunakan adalah penelitian R&D (Research and Development) dengan model pengembangan 4D yang dikembangkan oleh S. Thiagarajan dkk. Berdasarkan hasil penelitian menunjukkan bahwa (1) tingkat kelayakan modul berdasarkan penilaian ketiga ahli mendapatkan rerata skor sebesar 3,10 dengan kategori sangat layak, (2) tingkat kelayakan modul berdasarkan penilaian siswa pada uji kelompok besar mendapatkan rerata skor sebesar 3,22 dengan kategori sangat layak. Sedangkan untuk tingkat efektifitas modul hasil tes menunjukkan adanya kenaikan nilai sebelum dan sesudah menggunakan modul. Pada saat Pretest rerata skor yang didapatkan siswa sebesar 60.68 dan mengalami kenaikan rerata skor menjadi 89,72 saat Posttest.

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PRELIMINARY

Teaching materials are a systematically arranged learning material that is used by teachers and students in the learning process to assist students in achieving predetermined competency standards. Teaching materials consist of printed and non-printed teaching materials. Usually, teaching materials are independent, meaning that they can be studied by students independently because they are systematic and complete (Panen and Purwanto, 2004: 16).

The teaching materials chosen to be developed in this study are teaching materials in the form of modules. Modules are learning tools or tools that contain materials, methods, boundaries, and ways of evaluating that are systematically and interestingly designed to achieve the expected competencies according to their level of complexity, (Sudrajat, 2008: 15).

This research is a study that aims to develop a teaching material in the form of a GIS module on the basic knowledge material of Geographic Information Systems. This Geographic Information System material was chosen for the author to

develop because of the lack of students' mastery of the basic concepts of geographic information system material. Mastery of this basic concept is needed so that at the time of practice students can easily apply what has been learned before.

On October 1, 2019, observations were carried out and it was known that the teaching materials used by teachers and students in the learning process in the classroom were in the form of LKS (Student Worksheets) and package books. In general, the LKS used is not interactive. Because the structure of LKS only contains a summary of the material, sample questions, and practice questions. This pattern gives students a narrow view of the GIS subject matter because the material, sample questions, and practice questions presented are said to lack explanation. This causes students to not understand the concepts and materials taught. In addition, the package books they use are still in the form of long descriptions with minimal images so that students are less interested in learning about them.

In a follow-up study conducted on December 11, 2018, researchers gave questionnaires to 88 students at MAN 1 Bandar Lampung regarding students' interest in GIS lessons. Based on the questionnaire, data were obtained by 70% or equivalent to 62 students experiencing learning difficulties both caused by external factors and internal factors, then 30% or equivalent to 26 students did not experience difficulties in GIS lessons.

When interviewed, students revealed that they needed teaching materials that could increase their understanding of the Geographic Information System material. One of the teaching materials that is felt to be able to help students and teachers in overcoming these problems is the need for innovation in the form of developing teaching materials in the form of a Geographic Information System module.

Thus, to minimize the difficulties faced by students, the author will conduct a research with the title "Development of GIS Modules for Basic Knowledge Material of Geographic Information Systems Class X IIS MAN 1 Bandar Lampung".

RESEARCH METHODS

The type of research that will be used is R&D (Research & Development) research, which is research that is oriented towards researching, designing, producing, testing, validity of the products produced (Sugiyono, 2015: 30). Research and Development (R&D) is a process or step to develop a new product, or perfect an existing product, which can be accounted for.

As for the model used in this study, it is the development of the 4-D model developed by S. Thiagarajan et al (1974: 5) this model consists of 4 main stages, namely Define, Design, Develop and Disseminate or adapted into a 4-P model, namely defining, designing, developing and deploying (Trianto, 2010: 189)

The data collection method used to test the feasibility level of the module is to use test instruments in the form of questionnaires filled out by material experts, design experts and linguists. As for the effectiveness test, the instrument used is in the form of a written test given to students in the form of Pretest and Posttest. After obtaining data on the results of the module feasibility level questionnaire from the three experts and from students at the time of the product trial. The assessment is converted into quantitative data with the following criteria:

Category	Score
Excellent	4
Good	3
Less	2
Very Lacking	1

Source: Mardapi, 2008.

Then from the number of scores obtained, the average value is then found with the following formula:

$$M = \frac{\sum X}{N}$$

Information:

M = Average score

$\sum X$ = Number of Scores

N = Number of Appraisers

The average score that has been obtained is then changed to a qualitative value with the following criteria:

Score range	Criterion
$X \geq M + SBi$	Very Worthy
$M + SBi > X \geq M$	Proper
$M > X \geq M - 1 SBi$	Less Viable
$X < M - 1 SBi$	Very Less Viable

Source: Mardapi, 2008.

Information:

X = Score obtained

M = Average Ideal Score

$$= (1/2) (\text{Ideal highest score} + \text{Score}$$

Lowest Ideal)

$$= 1/2 (4 + 1)$$

$$= 2.5$$

SBi = Standard Deviation

$$= (1/6) (\text{Ideal Highest Score} - \text{Score}$$

Ideal Lowest)

$$= 1/6 (4 - 1)$$

$$= 3/6$$

$$= 0.5$$

Based on these data, a table of criteria for assessing GIS module teaching materials can be compiled which can be concluded in the following table:

Score	Score Range	Category
4	$X \geq 3.0$	SL (Very Worthy)
3	$3.0 > X \geq 2.5$	L (Worth)
2	$2.5 > X \geq 2.0$	KL (Less Feasible)
1	$X < 2.0$	TL (Not Worth It)

Source: Mardapi, 2008.

In this study, the feasibility value of gis module teaching materials was determined with a minimum value of "L" with the category Feasible. So if the results of the assessment by material experts, design experts, linguists and student responses on average give a final grade of "L", then the teaching material development product in the form of a GIS module is suitable for use.

After the final assessment of the module feasibility test is obtained, then the effectiveness test of the module is carried out. The guidelines used for the assessment of effectiveness tests are to use the N-gain formula as follows:

$$g = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}}$$

Furthermore, if the value has been obtained, then the next step is converted into the interpretation of the gain value as follows:

No.	Value (g)	Classification
1	(N-gain) ≥ 0.7	Tall
2	$0.7 > (N-gain) \geq 0.3$	Keep
3	(N-gain) < 0.3	Low

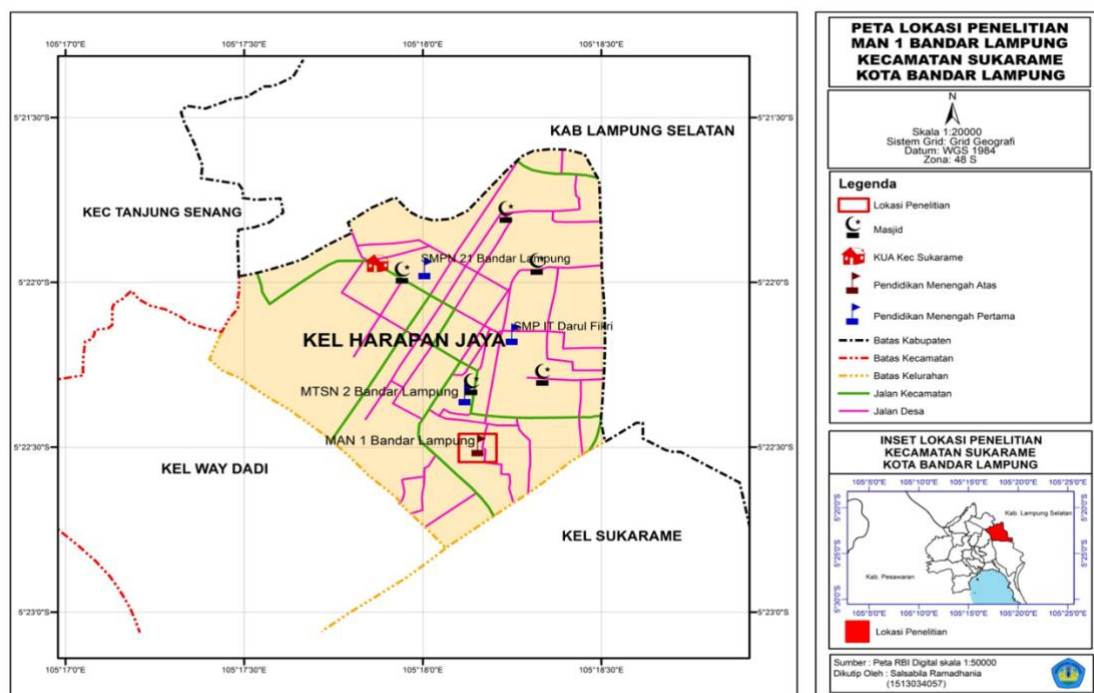
Source: Hake, 1998.

1. Research Location

This research is located at MAN 1 Bandar Lampung precisely on Jalan Lieutenant Colonel Endro Suratmin, Sukarame District, Harapan Jaya Village, Bandar Lampung City. Astronomically MAN 1 Bandar Lampung is located at latitude $5^{\circ}22'28.96''\text{LS}$ and is located at longitude $105^{\circ}18'10.76''$. The administrative boundaries of the MAN 1 Bandar Lampung location are as follows:

1. The North is bordered by South Lampung Regency.
2. The South borders with Way Dadi Village and Kelurahan Sukarame
3. The East Borders with South Lampung Regency
4. The West borders with Tanjung Senang Subdistrict and Way Dadi Village

To be clearer the location of MAN 1 Bandar Lampung can be seen in the following map image:



RESULTS AND DISCUSSION

1. Expert Validation Results

Expert validation was carried out by three geography lecturers at the University of Lampung consisting of material experts, design experts and linguists. For the results of the expert assessment of the material, an average overall score of 3.26 was obtained. The results of the design expert assessment were 3.00 and the results of the linguist assessment were 3.06. Based on the assessment results of the three experts, the average final overall score of 3.10 was obtained so that the teaching material product in the form of a GIS basic knowledge module could be said to be feasible for use in accordance with the revisions suggested by the three experts.

2. Small Group Trial Results

The small group test is the first stage of testing which aims to determine the feasibility level of the module being developed. This small group trial is carried out by giving students a module for them to study then students are given a questionnaire to assess the feasibility of the module. This test was carried out by 6 students of class X IIS 1 MAN 1 Bandar Lampung. From the results of the small group test assessment, an average final score of 3.30 was obtained, which is qualitatively included in the category of "very feasible"

3. Large Group Trial Results

The large group test was carried out after a module revision from the previous trial, namely the small group test. This large group test involved 29 students of class X IIS MAN 1 Bandar Lampung. From the results of the assessment of large group tests obtained an average score of 3.22 which qualitatively belongs to the category of "very feasible".

4. Student Pretest and Posttest Results

The student's Pretest and Posttest tests are carried out to determine the level of effectiveness of the modules developed by looking at the difference in scores before and after students learn by using the modules. This test was conducted by 29 students of class X IIS 1 MAN 1 Bandar Lampung. The results of the pretest obtained an average score of 60.68 and the average score of the posttest was 89.72. Based on the results of the pretest and posttest, a gain value of 0.76 was obtained. The gain score obtained shows that there is an increase in students' understanding of GIS material after learning to use teaching material products in the form of GIS modules.

5. Module Eligibility Level

Based on the results of module validation by material, design and language experts. It is known that the GIS module on the Basic Knowledge material of geographic information systems is included in the "very feasible" assessment category ($X \geq 3.00$) with the average score of the final assessment results from the three experts of 3.10. This shows that modules can be used as an alternative to student learning both in the learning process and for independent learning.

Furthermore, for the feasibility test results based on large group and small group trials, the final average score of the two trials was 3.30 each for small group trials and 3.22 for large group tests where both values were qualitatively included in the "very feasible" category ($X \geq 3.0$). Based on the results of the assessment, it can be seen that some students consider the module worthy of their use as an alternative in the learning process.

The conclusion from the results of the assessment above is that the basic knowledge module of the Geographic Information System class X IIS MAN 1 Bandar Lampung can be accepted by both teachers and students, and has been declared suitable for use in the learning process in the classroom and independently.

6. Module Effectiveness Level

In the module effectiveness level test, pretest and posttest tests are carried out. The results obtained from the Pretest test or before students learn to use the module are 62.17 while the score result at the time of Posttest or after students learn to use the module is 89.72. From the results of the scores above, it can be seen that there is an increase in scores before and after students learn to use modules.

Apart from being seen from the comparison of Pretest and Posttest value scores, it can also be seen from the score gains. The gain score is obtained from the comparison of the average value of the pretest and posttest in learning using module teaching materials. From the results of the calculation using the formula N-gain. The final score of 0.72 was obtained with the category of "high" ($(N\text{-gain}) \geq 0.7$).

The increase in student scores in GIS subjects based on pretest and Posttest scores and using the N-gain formula shows that in general, teaching materials in the form of basic knowledge modules of the Geographic Information System that have been developed can increase students' understanding and interest in studying Geography Information System materials.

CONCLUSION AND SUGGESTIONS

A. Conclusion

The conclusions obtained from this development research are:

1. The GIS learning module on the basic knowledge material of geographic information systems has been developed using a 4D stage model, namely define or defining stage, *design* or design stage, *develop* or development stage, and *desseminate* or deployment stage.
2. The module teaching materials developed are considered very feasible and effective to be used as one of the learning resources for GIS learning. This is reviewed based on the results of the feasibility test assessment from material experts, linguists, design experts and also the increase in student scores obtained based on *the posttest* results after learning to use the module can be seen as follows:
 - a. Feasibility test results based on material expert validation obtained an average score of 3.26. Based on the validation of design experts, an average score of 3.00 was obtained. And finally, based on linguists, an average score of 3.00 was obtained.
 - b. For feasibility test results based on large group and small group trials. For small group trials, an average score of 3.35 was obtained in the aspect of ease of understanding and an average score of 3.25 in the aspect of ease of use. The average overall score of the two aspects is 3.30 which is qualitatively categorized as "very feasible" ($X \geq 3.0$). Meanwhile, in large group trials, an average score of 3.27 was obtained in the aspect of ease of understanding and an average score of 3.17 in the aspect of ease of use. The average overall score of the two aspects is 3.22 which is qualitatively categorized as "very feasible" ($X \geq 3.0$).
3. The teaching materials for the modules developed have been considered effective in increasing students' understanding of the basic knowledge material of the Geographic Information System as seen from the average pretest score obtained by students of 89.72 which is an increase when compared to the average posttest score of previous students of 62.17. And also the value of the N-gain score obtained reached 0.72 with the category of "high" ($(N\text{-gain}) > 0.7$).

B. Suggestion

Based on the results of this study, there are several suggestions including the following:

1. For Teachers

The GIS learning module on the basic knowledge material of the Geographic Information System that has been developed can be one of the alternative teachers in overcoming student learning difficulties.

2. For Students

This GIS learning module can be used by students to learn independently, especially in the basic knowledge material of geographic information systems.

3. For Schools

Schools can facilitate this GIS module to be developed for the better to increase students' interest and motivation in learning GIS, especially in the basic knowledge material of Geographic Information Systems.

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