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DEVELOPMENT OF TEACHING MATERIALS WITH PYROLYSIS TOOLS TO OVERCOME STUDENT'S UNCEPTIONAL MISCONCEPTIONS IN THE PHYSICS STUDY IN SMA LUBUKLINGGAU CITY

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Abstract. This study aims to develop teaching materials with pyrolysis tools at temperature and heat materials that are valid, practical, and effective. This type of research is R & D with the ADDIE model, the research subjects are 3 schools in SMA Kota Lubuklinggau in the high, medium, and low categories. The research sampling technique used purposive sampling technique. From the three schools, a sample of 30 students was obtained, for each school, there were 10 students as the sample. The 30 students have high, medium, and low abilities. The validation obtained from the three material, language, and media expert validators is that 80.49% of the teaching materials are in the very good category. Student response to teaching materials was 82.36% in the category of strongly agree. Student learning outcomes increased after being given a test of 5 questions, seen from t_{count} = 36.20 and t_{table} = 2.04 because t-count ≥ t table so it can be said that Ha is accepted and Ho is rejected. Therefore, the average value of the cognitive learning outcomes of students can be said to increase. And also get an n-gain score of 0.76 with high criteria. So that physics teaching materials using pyrolysis tools can be said to be valid, practical, and effective

Keywords: *development, physics module, learning outcomes.*

INTRODUCTION

Law Number 20 of 2003 concerning the National Education System article 3 explains that the function of national education is to develop the ability and shape the character and civilization of the nation with dignity to educate the life of the nation, aiming to develop the potential of students to become human beings who believe and fear God. The One and Only, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens.

One of the efforts that the government has made to date is to continue to upgrade the existing education system to suit the demands of the times. As intended in Government Regulation Number 13 of 2015 concerning National Education Standards that, "The curriculum is a set of plans and arrangements regarding the objectives, content, and learning materials as well as methods used as guidelines for implementing learning activities to achieve certain educational goals".

SMA is an educational institution that carries out the duties of the government as an education provider. The implementation of education at the high school level in the 2013 curriculum has changed and improved the learning process. The learning process is no longer teacher-centered but student-centered (A.Purmadi, 2016)

A teacher in learning not only has to deliver material but also has to carry out meaningful learning. Meaningful learning must be carried out in all subject areas including physics (Oktaviani et al., 2017). Physics is a science that studies natural events and their regularities (Latifah & Utami, 2019).

One of the necessary learning supporters currently developed to complement existing facilities/infrastructure is the availability of adequate teaching materials. With the existence of adequate teaching materials, students can learn and discuss teaching materials before learning begins. Besides, teaching materials are also able to provide clear guidance regarding the competencies that students want to achieve (Satriawan, 2016).

The development of this teaching material was motivated by the occurrence of student misconceptions in the physics subject matter of temperature and heat in class XI SMA Lubuklinggau. Misconceptions occur because there is no manifestation of student learning experiences. Learning experiences will not be able to materialize because learning is carried out conventionally and does not activate students. Therefore it is necessary to develop

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teaching materials with pyrolysis tools that are considered capable of realizing student learning experiences. Teaching materials are designed to contain experimental activities accompanied by tools. Experimental activities to prove the concept of the material supported by tools. Proof of the concept needs to be done following the character of the material that is concrete in nature, so it is necessary to conduct experiments and direct observations in the learning process. This study aims to produce teaching materials with pyrolysis tools and to determine the effect of students' misconceptions. The teaching materials used are in the form of modules that will be used by students when learning takes place so that student learning outcomes increase.

The use of modules in physics learning is also expected to help students improve mastery by studying objectives, material summaries, structured exercises, exercises that must be solved, and answer keys. Through this physics module, students can learn more, improve problem-solving skills through practice, assessing The results of the work that has been done are very important to do to train the initiative, independence, and self-confidence of students in learning (M. Kuswandari et.al, 2019).

METHODS

This research is classified into research and development (R & D). This research method refers to the ADDIE model development design (Analysis, Design, Development, Implementation, Evaluation). The ADDIE development model was chosen because each step described was very systematically structured and very easy to understand. This stage starts from the needs analysis stage in the research to be carried out, to the stage of evaluating the product being developed. However, this research will be carried out only up to the formative evaluation stage. This is because the research carried out did not aim to evaluate the product extensively so that the summative evaluation stage could not be implemented

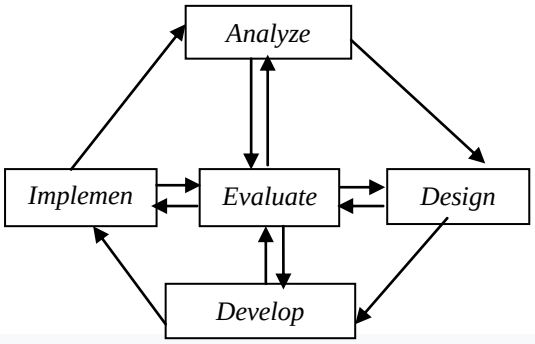

Figure 1.Steps for the ADDIE Learning Device Development Model (Tegeh, 2015)

Borg and Gall (Sugiyono, 2017) state that development research is a process used to develop and validate products used in education and learning.

This research purpose to develop physics teaching materials (modules) with the pyrolysis of temperature and heat material at the high school education unit level in the City of Lubuklinggau. This research was carried out in the 2019/2020 school year at the high, medium, and low level of the High School Unit in the Education and Culture Office of the City of Lubuklinggau, because the three schools represent the total number of schools in Lubuklinggau City. The subjects in this study were students of class XI at SMA Negeri 3, SMA Negeri 8, and SMA Negeri 9 in Lubuklinggau City. The sampling technique used was the purposive sampling technique. From the three schools, a sample of 30 students was obtained, each school had 10 students as the sample. The 30 students have high, medium, and low abilities.

The data used in this development research are qualitative and quantitative data, qualitative data in the form of input, correction, and criticism given by material expert lecturers, media expert lecturers, and language expert lecturers. Quantitative data is research data obtained from research sheets or questionnaires by material experts, media experts, linguists, student response questionnaires, and student learning outcomes in the form of pretest and posttest. The analysis phase in this study was carried out to see and observe the problems that exist in SMA Kota Lubuklinggau in learning related to physics teaching materials (modules) used by physics teachers for temperature and heat material. Because it is known that so far the material of temperature and heat is taught conventionally without the props used, so students are less motivated and less active in learning, especially practical activities. Then at the research design stage, physics teaching materials (modules) in the form of modules with pyrolysis tools make it easier for students to understand and be interested in temperature and heat material.

After obtaining the results of the problem analysis at school, the research team took the next stage, namely the design in the form of making physics teaching materials (modules) and pyrolysis tools as learning aids, then continued with the development stage including the validation stage of physics teaching materials (modules). The feasibility data for physics teaching materials (modules) were obtained from validator analysis, by giving questionnaires to material experts, linguists, and media experts.

Furthermore, research is included in the evaluation stage, evaluation is a process to see whether the physics teaching material (module) developed has been successful and is suitable for use as learning material or not (Benny, 2016).

Data Collection Technique

Data collection in this research and development was carried out using the following techniques: 1) observation, 2) interviews, 3) questionnaires, 4) physics teaching materials (modules) and 5) learning outcomes tests.

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Observation

Observation as a data collection technique has specific characteristics when compared to other techniques. Data collection techniques with observation are mostly used to observe people's behavior or the work process of a product that is produced from research and development, which can be done by researchers or other people who are given the task of collecting data(Sugiyono, 2016). Observations were made on the process of teaching and learning activities for class XI SMA Negeri 3, SMA Negeri 8, and SMA Negeri 9 Lubuklinggau to determine the process of learning physics using physics teaching materials (modules) at the time of learning. Observation activities were carried out before the researcher conducted the research. Researchers also carry out observation activities during the learning process. Researchers used observation sheets of the learning activity process in class.

Interview

The interview is a method used to collect information, the process of which is carried out by conducting verbal, face-to-face questions and answers, and with predetermined goals (Sudijono, 2016). Interviews are conducted as a data collection technique when a researcher wants to conduct a preliminary study to find a problem that must be researched, as well as to find out more in-depth matters from a respondent (Sugiyono, 2016).

From the expert's explanation above, it can be concluded that the interview is a question and answer process conducted by researchers to obtain information needed in-depth from a respondent. In this case, the interview was conducted at the time of initial observation to obtain the necessary information for the researcher. Interviews were conducted by researchers to physics subject teachers and to three students who were in class XI IPA as samples in the study.

Questionnaire

(Arikunto, 2016) states that a questionnaire is some written questions that are used to obtain information from a respondent in the sense of a report about his personality or some things he knows. Questionnaires are used to obtain information about data. This sheet is in the form of a student response questionnaire which contains statements that are used to see the students' responses to the physics teaching materials (modules) being developed. The questionnaire used to see the responses of students to the physics teaching material (module) that was developed was using a trial questionnaire sheet. This practicality response questionnaire is given in small group trials and large group trials. The type of questionnaire used is a type of open questionnaire, with the scale used in this questionnaire being a Likert scale type 4. These instruments are first validated by expert lecturers in their respective fields. This technique aims to measure the appropriateness of the tool in terms of various aspects including:

The validity of physics teaching materials (modules)

Product validity was carried out to determine the quality of physics teaching materials (modules) developed for use in research. The validity of physics teaching materials (modules) is carried out to experts including material experts, linguists, and media experts.

Student and Teacher Response

Student and teacher responses were carried out to see the practicality of physics teaching materials (modules). The one to one trial was given a questionnaire to 3 students, the limited trial was given a questionnaire to 9 students and the broad group trial was given a questionnaire to 30 students.

Physics teaching materials (modules)

The learning tools developed in this study are physics teaching materials, especially on the subject of temperature and heat. The physics teaching material (module) developed is physics teaching material (module) using a pyrolysis tool that is tested in class XI IPA. The questions contained in this physics teaching material (module) are used to measure the achievement of students' physics learning outcomes.

Learning Outcomes Test

This study using instruments in the form of test questions. According to (Arikunto, 2016) the test is a series of questions or exercises and other tools used to measure the skills, intelligence knowledge, abilities, or talents possessed by an individual or group. Therefore, in this case, the researcher used a test to determine the student's cognitive learning outcomes on temperature and heat learning materials using physics teaching materials (modules) with pyrolysis tools. The test questions in this final evaluation use 5 essay questions taken from the UN questions. Test questions are given to see the effectiveness and learning outcomes of students after using physics teaching materials (modules) developed on temperature and heat material.

Data Analysis Technique

The data analysis technique used in this research is descriptive quantitative to measure the feasibility and response of students, the activeness of students, and the analysis of the achievement of cognitive learning outcomes of the physics teaching materials (modules) developed. After the module is declared valid by the material, language, and media expert validator it is ready to be used for one-to-one trials, small group trials, and field tests.

Feasibility Analysis and Student Response to Physics Teaching Materials (modules)

Data analysis techniques to measure the feasibility and responses of students to physics teaching materials (modules) by analyzing the questionnaire that has been given by the researcher. The feasibility questionnaire sheet and students' responses to the physics teaching material (module) use the test sheet instrument

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and the student response questionnaire which is used to measure and assess when the product testing process is carried out. The compilation of a questionnaire or questionnaire is carried out based on a grid, the questionnaire instrument is prepared using a Likert scale and has been corrected in advance by an expert lecturer in their respective fields. The main purpose of giving the questionnaire is to find out the student's response and to find out the practicality of the physics teaching material (module) being developed. The answer for each instrument that uses the Likert scale has a gradient from very positive to very negative. (Sugiyono, 2017) states that the answers to each instrument item using the Likert scale have a gradient from very positive to very negative which can be categorized as Strongly Agree (SS), Agree (S), Disagree (TS), Strongly Disagree (STS)). (Sugiyono, 2016) states that the predetermined score can later be calculated using the following formula:

$$\text{Percentage} = \frac{score\ obtained}{maximum\ score}\ x\ 100\%$$

One to One Evaluation
Positive Statement
Maximum score : $7 \times 4 = 28$
Scale : 4
Negative Statements
Minimum score: $3 \times 4 = 12$
Scale : 4
Score range : $\frac{maximum\ score}{scale} = \frac{40}{4} = 10$

From the results of measurements that have been made using the student response questionnaire, the percentage and range of scores from each of these questionnaires can be obtained in table 1.While on a continuum, the total score can be seen in figure 2.

Table 1. Percentage of assessment and one to one evaluation

Score Range	Percentage	Category
31-40	76,25% = P = 100%	Strongly agree
21-30	51,25% = P < 75%	agree
11-20	26,25% = P < 50%	Disagree
0-10	0% = P < 25%	Totally disagree

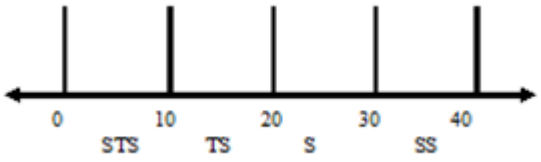

Figure 2.Range of student response questionnaire assessment one to one evaluation

Small-Group Evaluation
Positive Statement
Maximum score : $7 \times 4 = 28$
Scale : 4
Negative Statements
Minimum score : $3 \times 4 = 12$
Scale : 4
Score range : $\frac{maximum\ score}{scale} = \frac{40}{4} = 10$

From the results of measurements that have been made using the student response questionnaire, the percentage and range of scores from each of these questionnaires can be obtained in table 2.While on a continuum, the total score can be seen in Figure 2.

Table 2. Percentage of assessment and small group evaluation

Score Range	Percentage	Category
31-40	76,25% =P = 100%	Strongly agree
21-30	51,25% = P < 75%	Agree
11-20	26,25% = P < 50%	Disagree
0-10	0% = P < 25%	Totally disagree

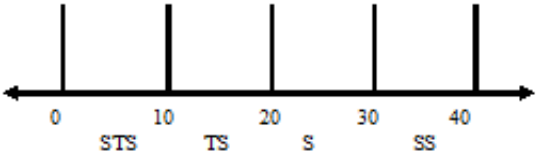

Figure 3.Range of student response questionnaire assessment small group evaluation

Field Test Evaluation
Positive Statement
Maximum score : $11 \times 4 = 44$
Scale : 4
Negative Statements
Minimum score : $9 \times 4 = 36$
Scale : 4
Score range : $\frac{maximum\ score}{scale} = \frac{80}{4} = 20$

From the results of measurements that have been carried out using the student response questionnaire, the percentage and range of scores from each of these questionnaires can be obtained in table 3.While on a continuum, the total score can be seen in Figure 4.

Table 3. Percentage of assessment field test evaluation

Score Range	Percentage	Category
61-80	76,25% =P = 100%	Strongly agree
41-60	51,25% = P < 75%	Agree
21-40	26,25% = P < 50%	Disagree
0-20	0% = P < 25%	totally disagree

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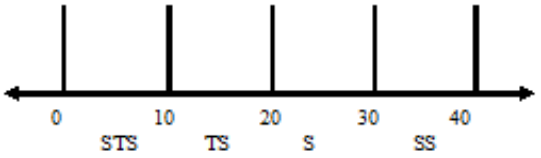

Figure 4. Range of student response questionnaire assessment small group evaluation

Analysis of Achievement of Cognitive Learning Outcomes

The achievement of student learning outcomes in the physics learning process using physics teaching materials (modules) can be seen from the final score obtained from each student is working on the questions that had been prepared previously in the student activity sheet. The data obtained will be analyzed using hypothesis testing. (Sugiyono, 2016) states that the hypothesis is a temporary answer to the formulation of research problems, where the formulation of the research problem has been previously stated in the form of a question sentence. Meanwhile, according to (Arikunto, 2016) a hypothesis is a question that has a very important position in a study.

To test this hypothesis, a one-sample t-test can be used as follows:

$$t = \frac{M_d}{\sqrt{\frac{\sum x^2 d}{N(N-1)}}}$$

with: $M_d = \frac{\sum d}{N}$

Information :

M_d = the mean of the difference between pretest and posttest

Xd = deviation of each subject ($d - M_d$)

$\sum x^2 d$ = the sum of the squares of the deviation

N = number of subjects / students in the sample

d.b. = determined by N - 1

The value hypothesized in this case is 70. The hypotheses tested in this study include:

H_a = The average posttest results of students after participating in the learning process using physics teaching materials (modules) with pyrolysis tools increased significantly. ($H_a: \mu_2 > \mu_1$).

H_o = The average posttest results of students after participating in the learning process using physics teaching materials (modules) with pyrolysis tools did not increase. ($H_a: \mu_2 \leq \mu_1$).

According to (Sugiyono, 2017) states that the t_{count} price will be compared with the t_{table} price by using the degrees of freedom (dk) = n-1 and the error rate α = 5% on the one-tailed test. Where in this case the criteria used are if $t_{count} \geq t\ t_{able}$ then Ho is rejected and Ha is accepted and if $t_{count} < t_{table}$ then Ho is accepted and Ha is rejected.

Analysis of Improved Learning Outcomes

The gain test is carried out to see the increase in student learning outcomes after using physics teaching materials (modules) on the subject of temperature and heat. Sundayana in (Sugiyono, 2017) states that to calculate the N-Gain Score you can use the following formula, and the categories in the gain score can be seen in table 4.

$$< g >= \frac{Postest\ score}{total\ score} - \frac{pretest\ score}{pretest\ score}$$

Table 4. Category Gain Score

No.	Score <g>	Criteria
1.	$<g> \geq 0{,}7$	High
2.	$0{,}7 > <g> \geq 0{,}3$	Enough
3.	$<g> < 0{,}3$	Less

The results of the N-gain score data are analyzed if the magnitude of the N-gain score is ≥ 0.3, it can be said that physics teaching materials (modules) using pyrolysis are effective in improving student learning outcomes.

RESULTS AND DISCUSSION

The Attractiveness of Physics Teaching Materials (Modules) Empirically

One to One Test

The questionnaire given in the assessment of physics teaching materials (module) has 3 indicators, namely: (1) attractiveness of physics learning books, (2) readability of the material, and (3) ease of understanding the material. From the questionnaire given to students, only 1 person gave comments and responses, no other 2 people gave their comments or comments. For students who did not give their responses and comments, the researchers considered that the physics teaching materials (modules) were good and according to what they wanted. The results of the percentage of students' responses to physics teaching materials (modules) in the one to one trial are presented in the form of a diagram in Figure 5.While the results of the recapitulation of the questionnaire assessment in the one to one trial can be seen in table 5.

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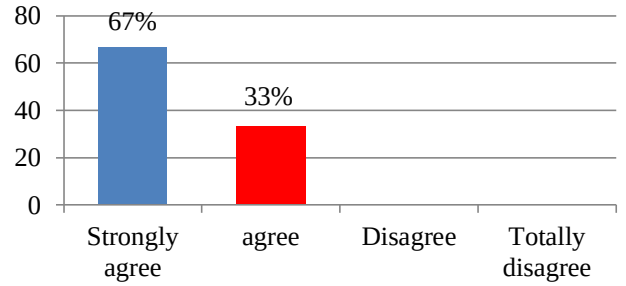

Figure 5. Diagram of the results of students' responses in the one to one trial

Table 5. Results of the questionnaire recapitulation in the one to one trial

No.	The subject	Rating result	Percentage	Category
1.	S-1	32	80%	Strongly agree
2.	S-2	34	85%	Strongly agree
3.	S-3	34	85%	Strongly agree
Total		100	83,33%	Strongly agree

Small-Group Test

The results of the recapitulation of the questionnaire assessment in small/limited group trials can be seen in Table 6 below.

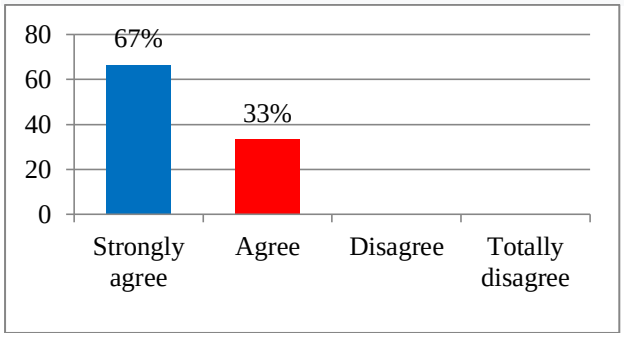

Figure 6. Diagram of student response results in small/limited group trials

Table 6. The results of the questionnaire recapitulation in small/limited group trials

No.	The subject	Rating result	Percentage	Category
1.	S-1	35	87,5%	Strongly agree
2.	S-2	32	80%	Agree
3.	S-3	35	87,5%	Strongly agree
4.	S-4	35	87,5%	Strongly agree
5.	S-5	32	80%	Agree
6.	S-6	34	85%	Strongly agree
7.	S-7	35	87,5%	Strongly agree
8.	S-8	35	87,5%	Strongly agree
9.	S-9	32	80%	Agree
Total		305	84,7%	Strongly agree

Field Test

The results of the questionnaire calculation in the large/final group test can be seen in Figure 7. While the results of the recapitulation of the questionnaire assessment in small/limited group trials can be seen in table 7.

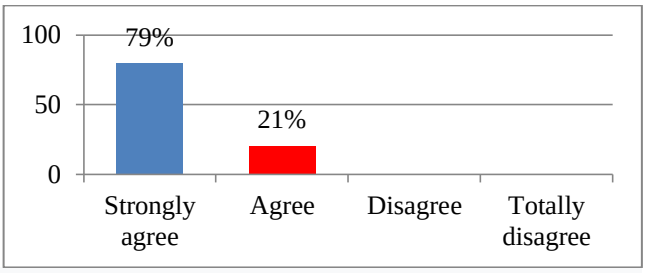

Figure 7. Diagram of Student Response Results in the Large / Final Group Test

Table 7. Results of the questionnaire recapitulation in large group trials

No.	The subject	Rating result	Percentage	Category
1.	Students	63,26	79,08%	Strongly agree

Because the questionnaire given occurred 3 times, it is necessary to know the average value to see the practicality of physics teaching materials (modules) on Temperature and Heat material in class XI. The results of data analysis from the sum of the questionnaire values in the one to one trial, small/limited group trials and large/final group trials can be seen in table 8.

Table 8. Results of Practicality Questionnaire Assessment Recapitulation

No.	The subject	Rating result	Percentage	Category
1.	Siswa	33,33	83,3%	Strongly agree
2.		33,88	84,7%	Strongly agree
3.		63,26	79,08%	Strongly agree
Total		43,49	82,36%	Strongly agree

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Test questions

The test questions were given to see the increase in the completeness of the cognitive learning outcomes of students in class XI IPA. Based on the calculation of increasing students' learning outcomes in the cognitive domain, it can be said to be effective if the learning outcomes obtained by students increase from previous learning outcomes (pretest). Data gain is done to see the increase in student learning outcomes after using physics teaching materials (modules). The gain data was obtained by looking at the difference between the results of the acquisition of the pretest and posttest scores of students. Recapitulation of gain values can be seen in table 9.

Table 9. Average Learning Outcomes

Pretest	***Posttest***	***Gain***	***N-Gain***	**Criteria**
9,46	78,73	69,26	0,76	High

From table 10 it can be concluded that the average pretest results of students before using physics teaching materials (modules) are 9.46 and increased to 78.73 and get an n-gain score of 0.76 with high criteria after applying to learn using materials teach (module) physics. The evaluation of the test questions was attended by 30 students. Of the 30 students, 25 students scored> 70 while 5 students scored <70. The questions given were essay questions with categories C3 to C6, totaling 5 questions. The questions given are valid and reliable because they use questions that come from UN questions and semester exam questions. The results of the average value of all students can be calculated using a one-sample t-test. Where tcount = 36.20 and ttable = 2.04 because $t_{count} \geq t_{table}$ so it can be said that Ha is accepted and Ho is rejected. Therefore, the average value of the cognitive learning outcomes of students can be said to increase

.

The effectiveness of physics teaching materials (modules)

Effective learning is a measure of a teacher's success in managing the class. A learning process can be said to be effective if all students can be actively involved, mentally, physically, or socially (Susanto, 2016). Furthermore (Nini et al., 2015) revealed that effectiveness is the extent to which the level of achievement of student learning outcomes is following the learning objectives to be achieved and paying attention to student activities in the process of achieving these learning objectives.

According to (Widya, 2017) a learning device developed has been effective if students have reached 75% of the learning objectives that have been previously set. From some of the opinions above, it can be concluded that effectiveness is a form of measuring learning outcomes from a learning process that is adjusted to predetermined indicators. According to (Suhana, 2015) effective learning is strongly influenced by two factors, namely external factors, and internal factors. Internal factors that influence effective learning include: 1) intelligence, 2) talents and interests, 3) motivation, 4) self-confidence, 5) commitment, and 6) physical health. Meanwhile, the external factors in question include: 1) teacher competence, 2) teacher qualifications, 3) supporting facilities, 4) quality of peers, and 5) cost.

Based on the description of the factors that affect the effectiveness of a lesson, the effectiveness of this research is:

1. Student learning outcomes increase to reach the completeness of the KKM predetermined by the school. The Ministry of National Education (Susanto, 2016) says that learning can be said to be effective if students can improve to achieve KKM completeness by a rate of ≥75%.
2. Student response in the good category.

Based on the description above, the researcher has obtained the results from a broad group trial to see the effectiveness of the physics teaching material (module) being developed. This broad group trial was conducted in class XI SMA Negeri 3, SMA Negeri 8, and SMA Negeri 9 Kota Lubuklinggau by taking the research sample using purposive sampling. The effectiveness can be seen from the cognitive learning outcomes of students. Learning outcomes using test questions of 5 questions with the criteria C3 to C6. (Susanto, 2016) said that learning outcomes are a level of student success in learning school subject matter which is expressed in the form of scores obtained from test results regarding several certain subjects. The learning outcomes of students are following the research that has been carried out in class XI with an average increase in student learning outcomes of 78.73% and get an n-gain score of 0.76 with high criteria. Thus it can be concluded that the physics teaching material (module) developed has met the effectiveness criteria in terms of the cognitive learning outcomes of students.

To achieve an increase in students 'cognitive learning outcomes, it can be calculated using a one-sample t-test where in this case t = 36.20 and t_{table} = 2.04 because $t_{count} \geq t_{table}$ then Ha is accepted, thus the average value of the participants' cognitive learning outcomes. students can be said to increase. From several explanations regarding the instruments used by researchers in measuring the effectiveness of the physics teaching materials (modules) developed, physics teaching materials (modules) can be said to be effective, namely the learning outcomes of students reaching> 75% of the total number of students in 1 class.

From the results of the data obtained, it states that the physics teaching material (module) developed has been effectively used in the learning process with a percentage as described in Figure 8.

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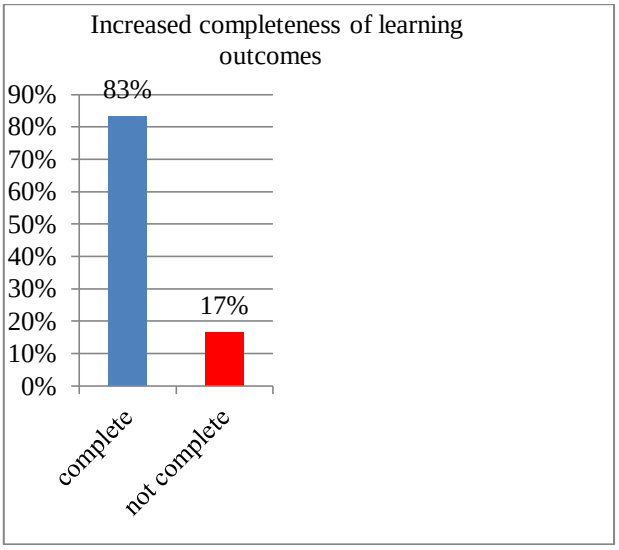

Figure 8. Diagram of the Results of the Effectiveness of Physics Teaching Materials (Modules) in terms of Improving Student Learning Outcomes

CONCLUSION

Based on the results of research using physical teaching materials (modules) of temperature and heat material and the samples were studied in one to one trials, small group trials, and field tests. The following are the results of the research

1. Physical teaching materials (modules) of temperature and heat material can improve student physics learning outcomes in SMA Kota Lubuklinggau.
2. The feasibility of physics teaching materials (modules) of temperature and heat material is valid, practical, and effective with very good categories. Based on the evaluation following the suggestions and responses from experts. The results of the validator's assessment of the quality of physics teaching materials (modules) with the percentage of all these components are 80.49%.
3. Effectiveness is seen based on the results of increasing student learning outcomes in the cognitive domain by increasing student learning outcomes by 78.73%.

Bibliography

A.Purmadi. (2016). Pengembangan Bahan Ajar Berbasis WEB Berdasarkan Gaya Belajar Siswa untuk Mata Pelajaran Fisika. *Inovasi Teknologi Pendidikan*, *3*(2), 151–165.

Arikunto, S. (2016). *Prosedur Penelitian: Suatu Pendekatan Praktik*.

Benny, A. P. (2016). *Desain dan Pengembangan Program Pelatihan Berbasis Kompetensi Implementasi Model ADDIE*.

Latifah, S., & Utami, A. (2019). *Pengembangan Bahan Ajar Interaktif Berbasis Media Sosial Schoology*. *02*(1), 36–45.

M. Kuswandari et.al. (2019). Pengembangan Bahan Ajar Fisika SMA dengan Pendekatan Kontekstual pada Materi Penukuan Besaran Fisika. *Jurnal Pendidikan Fisika*, *53*(9), 1689–1699. https://doi.org/10.1017/CBO9781107415324.004

Nini, W. O., Salam, M., & Masi, L. (2015). Efektivitas Penerapan Model Pembelajaran Kooperatif Tipe Think Pair Share Terhadap hasil Belajar Matematika Materi Pokok Statistika Pada Siswa Kelas IX SMP Negeri 2 Kendiri. *Jurnal Penelitian Pendidikan Matematika*, *3*(1), 153–166.

Oktaviani, W., Studi, P., & Fisika, P. (2017). Pengembangan Bahan Ajar Fisika Kontekstual untuk Meningkatkan Penguasaan Konsep Siswa. *Jurnal Pendidikan Fisika Dan Teknologi (ISSN. 2407-6902), Vol III No. 1*, *III*(1), 1–7.

Satriawan, M. (2016). Pengembangan Bahan Ajar Fisika Berbasis Kontekstual dengan Mengintegrasikan Kearifan Lokal untuk Meningkatkan Pemahaman Konsep Fisika pada Mahasiswa. *Pendidikan Sains Pascasarjana Universitas Negeri Surabaya*, *6*(1).

Sudijono, A. (2016). *Pengantar Evaluasi Pendidikan*.

Sugiyono. (2016). *Metode Penelitian Pendidikan dan Pendekatan Kuantitatif, Kualitatif dan R&D*.

Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*.

Suhana, C. dan N. H. (2015). *Konsep Strategi Pembelajaran*.

Susanto, A. (2016). *Teori Belajar dan Pembelajaran*.

Tegeh, I. . et. a. (2015). *Pengembangan Buku Ajar Model Penelitian Pengembangan dengan Model ADDIE*. 208–216.

Widya, et. a. (2017). Kualitas Perangkat Pembelajaran Fisika Berbasis Model Creative Problem Solving Dengan Pendekatan Open-Ended Pada Materi Usaha Dan Energi Terintegrasi Energi Biomassa. *Gravity : Jurnal Ilmiah Penelitian Dan Pembelajaran Fisika*, *3*(2), 158–171. https://doi.org/10.30870/gravity.v3i2.2600