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Development of REACT-Oriented Student Worksheets to Improve Physics Learning Outcomes

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Abstract: This research is developer research that aims to develop student worksheets. The subjects of this research trial were 35 students of class XI MIPA 2 of State Senior High School 1 Majene. This study uses the ADDIE model development. The instruments used in this study were validation sheets for student worksheets, teacher response questionnaires and student responses, as well as physics learning outcomes test instruments. The eligibility criteria for student worksheets are seen from the validation aspect. The practicality criteria can be seen from the assessment of the teacher's and students' responses to the students' worksheets, and the effectiveness criteria can be seen from the increase in physics learning test results. Based on the results of the analysis, it can be concluded that: (1) Student worksheets developed based on expert judgment using Aiken V index analysis are declared valid and suitable for use with minor revisions; (2) Student worksheets in terms of the physics teacher's response are in the very good category; (3) Student worksheets in terms of student responses are in the very good category; (4) The application of student worksheets seen from the ability of physics learning outcomes analyzed by N-gain obtained an average value of 0.7 in the high category which means that there is an increase in the ability of physics learning outcomes so that it can be said that student worksheets which was developed is effective in improving physics learning outcomes in Majene 1 State Senior High School.

Keywords: Effectiveness; Physics learning outcomes; Student worksheets

Introduction

In the current 21st century, the quality of the nation's life is determined by educational factors. Education is one way to improve self-quality, both directly and indirectly, to sustain and keep up with the pace of development in science and technology. In law No. 20 of 2003 concerning national education stated its purpose. Educational goals can be achieved if all components are interrelated in an integrated manner (Saputri et al., 2019).

A set of lesson plans including arrangements regarding objectives, learning content, teaching materials, and methods used as guidelines for organizing activities, as well as evaluation of learning in a structured curriculum. The current curriculum is the 2013 curriculum which emphasizes the pedagogic dimension in learning, namely the scientific approach. The scientific approach plays an important role in developing students' attitudes, skills and knowledge (Kemendikbud, 2013).

Good physics learning is based on the nature of physics, namely students need to master physics processes and products, as well as attitudes (Cahyono et al., 2017). Physics as an attitude means cultivating scientific attitudes such as responsibility, honesty, objectivity, openness, curiosity, trust, and others (Agustiawan et al., 2019). Physics as a process means that physics is found from scientific research processes including observing, measuring, interfering, formulating hypotheses, carrying out experiments, and compiling graphs and data tables. Physics as a product is defined as a collection of scientific products such as facts, principles, and concepts resulting from the scientific processes that have been carried out (Kristyowati et al., 2019).

Direct learning activities are an effective way for students to improve physics learning outcomes in both cognitive, affective and psychomotor aspects. Students

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who have direct experience in learning will gain better knowledge by discovering for themselves the facts, principles, and concepts of physics found in the surrounding environment compared to teachers who convey material to students.

Efforts to improve student learning outcomes are a problem that is often encountered in physics lessons, for this reason teachers are required to be more creative in preparing the learning process in class so as to increase students' learning interest. Increasing student learning outcomes depends on the course of the learning process in class. The learning process requires the provision of direct experience to students to build their own knowledge which can be realized with the existence of teaching materials (Chodijah et al., 2012).

The development of teaching materials must be based on the 2013 curriculum, where the 2013 curriculum in the learning process prioritizes creativity, activeness, and focuses on students. One of the printed teaching materials used is student worksheets. Student worksheets are learning tools that contain guidelines for students to carry out activities programmatically. Student Worksheets are simple, versatile, and relatively easy to apply (Daling et al., 2022). Student worksheets also function as student study guides and make it easier for students and teachers to carry out the teaching and learning process (Nugeraha M et al., 2020). If learning activities are available learning resources that are interesting and sufficient to support the smooth running of teaching and learning activities, it will foster students' interest in learning.

Implementation in the field is not all effective because there is still a lack of interaction, teaching materials, and a conducive environment. Even though media as teaching materials can improve learning outcomes in the learning process so that students can understand and understand lessons easily and increase student motivation (Nurrita, 2018). This happened in one of the schools, namely State Senior High School 1 Majene.

Based on the results of observations made at State Senior High School 1 Majene, it shows that students tend to have a kinesthetic learning style, where students more easily receive and process information through a series of activities that move and practice what they learn. But the student worksheets provided in schools are not in accordance with the achievement of basic competencies, namely analyzing (C4). The Student Worksheet only contains practice questions or evaluation questions that are more dominant in the aspects of understanding (C2) and applying (C3). In addition, student worksheets are more repeating material without developing thinking skills. For this reason, students are less trained to carry out scientific processes, find a concept, and apply existing concepts in everyday life. This requires teaching materials based on the REACT strategy that are appropriate to the learning process so that the goals are achieved.

In connection with this problem, efforts are needed to develop Student Worksheets so that active learning occurs which demands students. The use of Student Worksheets in the learning process will not be optimal without using learning strategies. One of the alternatives used is the REACT (relating, experiencing, applying, cooperating, transferring) oriented Student Worksheet.

Student worksheets that are already in school are then combined with student worksheets developed according to the REACT learning strategy syntax. The student worksheets provided at school when following the REACT syntax are only at the transferring stage. This is not in accordance with the needs of students who have a kinesthetic learning style. Whereas the REACT-oriented student worksheets have a syntax in the form of relating, experiencing, applying, cooperating, transferring according to the needs of students (Sugita et al., 2020).

REACT-oriented student worksheets were chosen because students are required to learn to associate the material being studied with real life which is in the relating stage, provides facilities for students to find concepts in practicum activities which are in the experiencing stage, and applies the concepts obtained by The concepts that have been learned are at the transferring stage. In addition, students are trained to cultivate scientific attitudes such as responsibility, honesty, curiosity, and self-confidence which are at the cooperative stage.

This is in accordance with the curriculum set in schools, namely the 2013 curriculum. This curriculum develops attitudes, knowledge, and skill competencies, where the learning process encourages students to be more capable in observing, asking, trying or collecting data, associating or reasoning, and communicating. Also, the subject matter is related to facts or phenomena in everyday life. So that the curriculum used is in accordance with the REACT syntax with the developed student worksheets, for this reason it is suitable for application in schools.

Related to this, research conducted by Anas et al. (2018) obtained research results which showed that the product in the form of student worksheets using the character-based REACT strategy on the subject of Newton's law could be used as a supporting medium for learning physics.

The REACT-oriented student worksheets that have been developed are able to have a good impact on student learning outcomes such as improving student physics learning outcomes and analyzing teacher responses to REACT-oriented student worksheets in improving student physics learning outcomes. Therefore, the researchers proposed a study "Development of REACT-Oriented Student Worksheets

to Improve Physics Learning Outcomes at State Senior High School 1 Majene.

Method

The type of research used is Research and Development (R&D) with the ADDIE development model. The procedure for developing REACT (Relating, Experiencing, Applying, Cooperating, Transferring) oriented student worksheets uses the ADDIE development model which consists of five stages, namely analysis, design, development, implementation, and evaluation. The research and development stages of the ADDIE model are as follows:

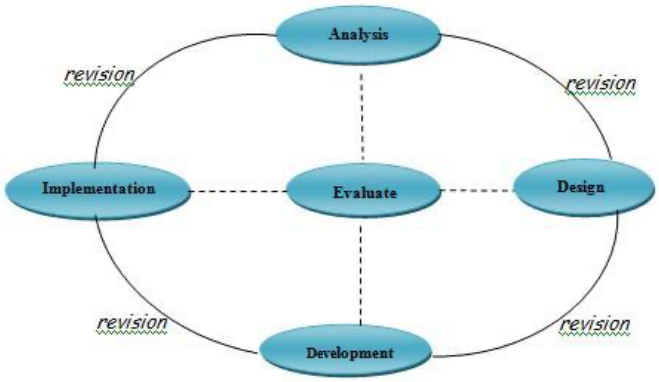

Figure 1. ADDIE Development Concept (Branch, 2009)

The data used in this study were obtained by data collection techniques in the form of interviews to obtain initial information about the learning process in schools, expert validation questionnaires, teacher and student response questionnaires, and learning achievement tests.

The subjects in the study were students in class XI MIPA 2 and teachers at State Senior High School 1 Majene, as well as several high school physics teachers in Majene Regency. This development research was carried out in the even semester of 2021-2022 in class XI MIPA 2 State Senior High School 1 Majene.

The trial design used in this development research, namely the pre-test and post-test groups. This test was carried out 2 times, namely before and after treatment. The trial design used in the implementation phase of the ADDIE model is as equation 1. (Sugiyono, 2021)

$$O_1 \quad X \quad O_2 \tag{1}$$

Information:

X : Treatment

O_1 : Before the application of student worksheets (Pre-test)

O_2 : After applying the student worksheet (Post-test)

Before the questionnaires were distributed to students and teachers, an analysis of validation data was carried out which had been assessed by three (3) experts. The analysis used to determine the level of relevance by three experts used the content validity coefficient (Aiken's V) using equation 2 (Azwar, 2015).

$$V = \frac{\sum s}{n(c-1)} \tag{2}$$

Information:

V : Rater agreement index on item validity

s : The score set by each rater minus the lowest score in the category used ($s = r - l_0$, with r = rater's choice category scores and l_0 = lowest score in scoring category)

n : Many raters

c : The highest validity rating score

Based on the Aiken's V test conditions, after calculating if the value of V = 0.4, the rater agreement index (V) is said to be valid. Assessment of the respondent's questionnaire on REACT-oriented student worksheets was carried out after using the developed student worksheets. The scale used in the teacher response questionnaire and student responses is the Likert scale which can be seen in table 1 (Sugiyono, 2018).

Table 1. Teacher and Student Response Statement Scores

Score	Category
4	Strongly agree
3	Agree
2	Disagree
1	Strongly Disagree

Processing of teacher response questionnaire scores and student responses is carried out by categorizing the criteria obtained after calculating the ideal score (maximum score) for each item from the teacher and student response statements. Then calculate the total score obtained for each item from the teacher and student response statements, and determine the categorization of teacher and student assessment score criteria. The determination of categories for teacher and student response questionnaires can be seen in table 2 (Widoyoko, 2016).

Table 2. Categorization of Teacher and Student Assessments

Formula	Classification
$X > \bar{X}_i + 1{,}8 \times sb_i$	Very good
$\bar{X}_i + 0{,}6 \times sb_i < X \leq \bar{X}_i + 1{,}8 \times sb_i$	Good
$\bar{X}_i - 0{,}6 \times sb_i < X \leq \bar{X}_i + 0{,}6 \times sb_i$	Enough
$\bar{X}_i - 1{,}8 \times sb_i < X \leq \bar{X}_i - 0{,}6 \times sb_i$	Not enough
$X \leq \bar{X}_i - 1{,}8 \times sb_i$	Very less

Measuring the effectiveness of REACT-oriented students' worksheets was used to test the physics learning outcomes in the form of multiple-choice

questions. The scoring of each question is based on the assessment guidelines. After being given a score, it is analyzed. As for how to calculate the percentage of learning outcomes test scores, such as Equation 3.

$$P = \frac{\sum x}{\sum xi} \times 100\% \quad (3)$$

Information:
P : Percentage
∑x : The number of respondents' answers in one item
∑xi : Total ideal score in items

The percentage of respondents' responses to each statement uses the criteria according to Table 3 (Riduwan, 2015).

Table 3. Criteria for the Percentage of Students' Physics Learning Outcomes

Percentage (%)	Category
0 – 20	Very less
21 – 40	Not enough
41 – 60	Enough
61 – 80	Good
81 – 100	Very good

Furthermore, to find out the increase in students' physics learning outcomes, an analysis was carried out using the data from the pre-test and post-test results which were analyzed using N-Gain. As for knowing the N-Gain can be searched by Equation 4 (Sundayana, 2016).

$$g = \frac{X_{posttest} - X_{pretest}}{X_{max} - X_{pretest}} \quad (4)$$

Information:
g : Percentage
S_{pre} : Score pretest
S_{post} : Score posttest

The categorized N-Gain criteria can be seen in table 4.

Table 4. N-Gain Criteria

N-Gain Value	Interpretation
0.70 < g ≤ 100	High
0.30 < g ≤ 0.70	Medium
0.00 < g ≤ 0.30	Low
g = 0.00	No increase
-1.00 ≤ g < 0.00	There was a decline

Result and Discussion

Results of Valid REACT-Oriented Student Worksheet Development Analysis

REACT-oriented student worksheet validation results

The results of the validation of REACT-oriented student worksheets were assessed by the three experts, where the assessment aspects were presentation feasibility, content feasibility, language feasibility, and graphic feasibility. Furthermore, the results of content validation were analyzed using the Aiken's V index which is tabulated in Table 5.

Table 5. Test of Content Validity Analysis of REACT-Oriented Student Worksheets

Aspect	Total Score Item Validity	V	Category
Presentation	7.22	0.80	Valid
Fill	6.67	0.74	Valid
Language	7.33	0.81	Valid
Graphics	8.00	0.89	Valid

Based on table 5, the presentation aspect obtained a validity index (V) of 0.80 and is in the valid category. Then for the feasibility aspect of the content obtained a validity index (V) of 0.74 and is in the valid category, for the aspect of language feasibility obtained a validity index (V) of 0.81 and is in the valid category, and for the graphical aspect obtained a validity index (V) score of 0.89 and is in the valid category. The results of the three experts' analysis of REACT-oriented student worksheets with the Aiken's V index are then presented in Table 6.

Table 6. Percentage of Eligibility for REACT-Oriented Student Worksheets

Aspect	Number of Item Scores Obtained	Ideal Score	Percentage %
Presentation	92	108	85.2
Fill	87	108	80.6
Language	93	108	86.1
Graphics	99	108	91.7

Based on table 6 above that for the acquisition of the eligibility aspect of presentation a total score of 92 with an eligibility percentage of 85.2%, for the content feasibility aspect a total score of 87 is obtained with an eligibility percentage of 80.6%, for the language eligibility aspect is obtained at 93 with a feasibility percentage 86.1% and for the graphical feasibility aspect, a total score of 99 is obtained with a feasibility percentage of 91.7%.

After the expert assessments were analyzed, the same conclusions were obtained in the form that they could be used with minor revisions. Then revisions were made based on suggestions and criticisms from the three validators on the worksheets of REACT-oriented students which were declared worthy of being tested in the field.

Results of questionnaire validation of teacher responses to REACT-oriented student worksheets

Each assessment component available on the teacher's response questionnaire sheet instrument consists of several assessment items assessed with a Likert scale. Then an analysis of the coefficient of content validity was carried out using the Aiken's V expert

agreement index on the teacher's response questionnaire. From the results of the analysis of the Aiken's V index with the Likert scale, the score obtained by the validator can be presented in Table 7.

Table 7. Test the Analysis of the Validity of the Teacher Response Questionnaire Content with the Aiken's V Index

Aspect	Total Score Item Validity	V	Category
Presentation	4.50	1.13	Valid
Fill	4.82	1.21	Valid
Language	5.14	1.29	Valid
Graphics	5.40	1.34	Valid

Based on the content validation analysis test of the teacher's response questionnaire using the Aiken's V index with four assessed aspects obtained for the feasibility aspect of presenting expert agreement with an average (V) of 1.13 in the valid category, for the content feasibility aspect obtained an expert agreement index with an average (V) of 1.21 is in the valid category, then for the language feasibility aspect the expert agreement index is obtained with an average (V) of 1.29 and the feasibility aspect of the implementability aspect is obtained by the expert agreement index with an average (V) of 1.34 which is in the valid category.

After testing the content validity analysis of the expert agreement index with the Aiken's V index, the percentages for each aspect of the teacher response questionnaire instrument were carried out which can be seen in table 8. Table 8 is given data for the presentation feasibility aspect, the total acquisition score is 44 with a percentage of 91.7%, for the content feasibility aspect, the acquisition score is 42 with an eligibility percentage of 87.5%, and for the language feasibility aspect, an acquisition score is 40 with a validity percentage of 83.3%. Also, for the feasibility aspect of implementation, an acquisition score of 39 was obtained with a percentage of 81.3%. The expert assessment of the teacher response questionnaire was developed with minor revisions.

Table 8. Percentage of Eligibility Questionnaire Teacher Responses to REACT Oriented Student Worksheets

Aspect	Number of Item Scores Obtained	Ideal Score	Percentage %
Presentation	44	48	91.7
Fill	42	48	87.5
Language	40	48	83.3
Graphics	39	48	81.3

Questionnaire validation results of student responses to REACT-oriented student worksheets

Student response questionnaire sheets that have been developed are then tested for validity using the Aiken's V index. The scores obtained from each validator on student responses are tabulated in Table 9.

Table 9. Test of Analysis of the Validity of Student Response Questionnaire Content with the Aiken's V Index

Aspect	Total Score Item Validity	V	Category
Presentation	4.98	1.25	Valid
Fill	4.80	1.20	Valid
Language	4.66	1.17	Valid
Graphics	5.40	1.35	Valid

Based on table 9 shows that the feasibility aspect of presentation obtained an expert agreement index of 1.25 in the valid category, then on the content feasibility aspect the expert agreement index of 1.20 was obtained which was in the valid category, and aspects of language feasibility aspects obtained an agreement index of 1.17 are in the valid category, as well as the feasibility aspect of implementation, the expert agreement index is 1.35, which is in the valid category. So that it can be said that the student's response to the student's worksheet with the Aiken's V index is greater (>) than 0.4, it is stated that the student's response questionnaire sheet is valid.

After testing the content validity of the Aiken's V index on the student response questionnaire, the feasibility test category was calculated with the percentage in each aspect of the response questionnaire instrument tabulated in table 10. Table 10 provides data for the feasibility aspect of presentation, a total score of 41 is obtained with a percentage of 85.4%, for the content feasibility aspect, an acquisition score of 42 is obtained with a percentage of 87.5%. Then for the language feasibility aspect, an acquisition score of 43 was obtained with an eligibility percentage of 89.6% and for the eligibility aspect of implementation, an acquisition score of 39 was obtained with an eligibility percentage of 81.3%.

Table 10. Percentage of Eligibility Questionnaire Student Responses to REACT Oriented Student Worksheets

Aspect	Number of Item Scores Obtained	Ideal Score	Percentage %
Presentation	41	48	85.4
Fill	42	48	87.5
Language	43	48	89.6
Graphics	39	48	81.3

Expert assessment of student response questionnaires can be concluded that this instrument used a slight revision. Then from the suggestions and input of the three validators, the researcher revised several aspects of the student response questionnaire sheets. Furthermore, the results of the validator's assessment of the student response questionnaire instrument were declared feasible for use.

Test validation results of students' physics learning outcomes

Data from expert validation results on the physics learning outcomes test instrument that has been analyzed using the Aiken's V formulation with the condition ≥ 0.4. The results of the content validity of the learning outcomes test items tested in the research obtained an average (V) of 0.84 in the valid category. The expert's assessment of the physics learning achievement test found that the learning achievement test could be used with minor revisions.

Results of the Development of REACT-Oriented Student Worksheet Trial

Teacher response questionnaire to react oriented student worksheets

The results of the teacher's response questionnaire obtained that the number of teachers in the REACT-oriented student worksheet trials were 10 teachers with a total of 16 statements. From the results of the questionnaire filled out by the teacher, the highest score was 40 and the lowest score was 36, so the average score obtained in the questionnaire assessment of REACT-oriented student worksheets of 39. The assessment of the teacher's response questionnaire was categorized based on the categorization made in the form of Table 11.

Based on table 11, it is explained that of the 16 statement items given to teachers to assess REACT-oriented student worksheets, where there are 16 statements in the very good category, so it is concluded that the questionnaire statements on REACT-oriented student worksheets are declared feasible to be tested in the field.

Table 11. Teacher Questionnaire Assessment Scores on the Quality of REACT-Oriented Student Worksheet Development

Average Score	Classification	Frequency
X > 3.4	Very good	16
2.8 < X ≤ 3.4	Good	0
2.2 < X ≤ 2.8	Enough	0
1.6 < X ≤ 2.2	Not enough	0
X ≤ 1.6	Very less	0

Questionnaire of student responses to react oriented student worksheets

Assessment of students' response questionnaires to student worksheets aims to see the quality and implementation. Students who filled out the REACT-oriented student worksheet development assessment questionnaire were 35 people with 16 statement items.

The results of the acquisition of student assessment scores show that the number of students in the student worksheet trials of 35 students obtained the highest score of 129 and the lowest score of 116, so that an average score was obtained on student assessment of REACT-oriented worksheets of 3 ,5. The categorization of student assessment scores for the statement items of REACT-oriented student worksheets, in table 12.

Table 12. Categorization of Student Assessment of the Development of REACT Oriented Student Worksheets

Average Score	Classification	Frequency
X > 3.4	Very good	14
2.8 < X ≤ 3.4	Good	2
2.2 < X ≤ 2.8	Enough	0
1.6 < X ≤ 2.2	Not enough	0
X ≤ 1.6	Very less	0

Based on Table 12, it shows that of the 16 questions given to students to assess REACT-oriented student worksheets, there were 14 statements that students assessed were in the very good category, and 2 statements that students assessed were in the good category. So it can be concluded that the worksheets of REACT-oriented students are declared feasible to be tested in the field.

Results of the analysis of applying REACT-oriented student worksheets to improve student physics learning outcomes

Measuring the effectiveness of the developed REACT-oriented student worksheets can be seen from the physics learning outcomes of students by giving tests before and after treatment in the form of 25 multiple choice questions. The results of the analysis of the physics learning outcomes test before and after being given REACT-oriented student worksheets are tabulated in Table 13.

Table 13. Results of Statistical Analysis of Students' Physics Learning Outcomes

Parameter	Physics Learning Outcomes	
	Pre-test	Post-test
Respondents	35	35
The maximum ideal score obtained	25	25
The minimum ideal score obtained	0	0
The highest score obtained	14	24
The lowest score obtained	3	11
Average score	7	16

Based on the picture above, it shows an overview of the assessment scores obtained before and after the student worksheets were given. The physics learning outcomes assessment scores showed that 35 students took the pre-test and post-test, where the highest pre-test score was 14 and the post-test was 24. Meanwhile, the lowest score for the pre-test was 4 and the post-test was 11, so that the average pre-test is 7 and the post-test is 16.

Scores of students' physics learning outcomes against REACT-oriented student worksheets before and after treatment are made in Table 14. Table 14 shows an increase in students' physics learning outcomes before and after being given treatment. The number of test

subjects was 35 people, where for the pre-test there were 13 people with a percentage of 37% who were in the very low category, as many as 12 people with a percentage of 34% who were in the low category, and as many as 10 people with a percentage of 29 people who were in the medium category.

Table 14. Pre-test and Post-test Scores of Physics Learning Outcomes of Class XI MIPA 2 Students of State Senior High School 1 Majene

Score Range	Category	Pre-test		Post-test	
		F	%	F	%
0 – 5	Very low	13	37	0	0
6 – 10	Low	12	34	0	0
11 – 15	Medium	10	29	11	31
16 – 20	High	0	0	16	46
21 – 25	Very high	0	0	8	23

As for the physics learning outcomes test after being given REACT-oriented worksheets, 11 students with a percentage of 31% were in the medium category, 16 people with a percentage of 46% were in the high category, and as many as 8 people with a percentage of 23% were in the very high category.

Then an analysis of the increase in physics learning outcomes was carried out using the data from the pre-test and post-test results and the N-Gain. Physics learning outcomes test before and after being given REACT-oriented student worksheets. The results of the N-Gain analysis can be seen in Figure 2.

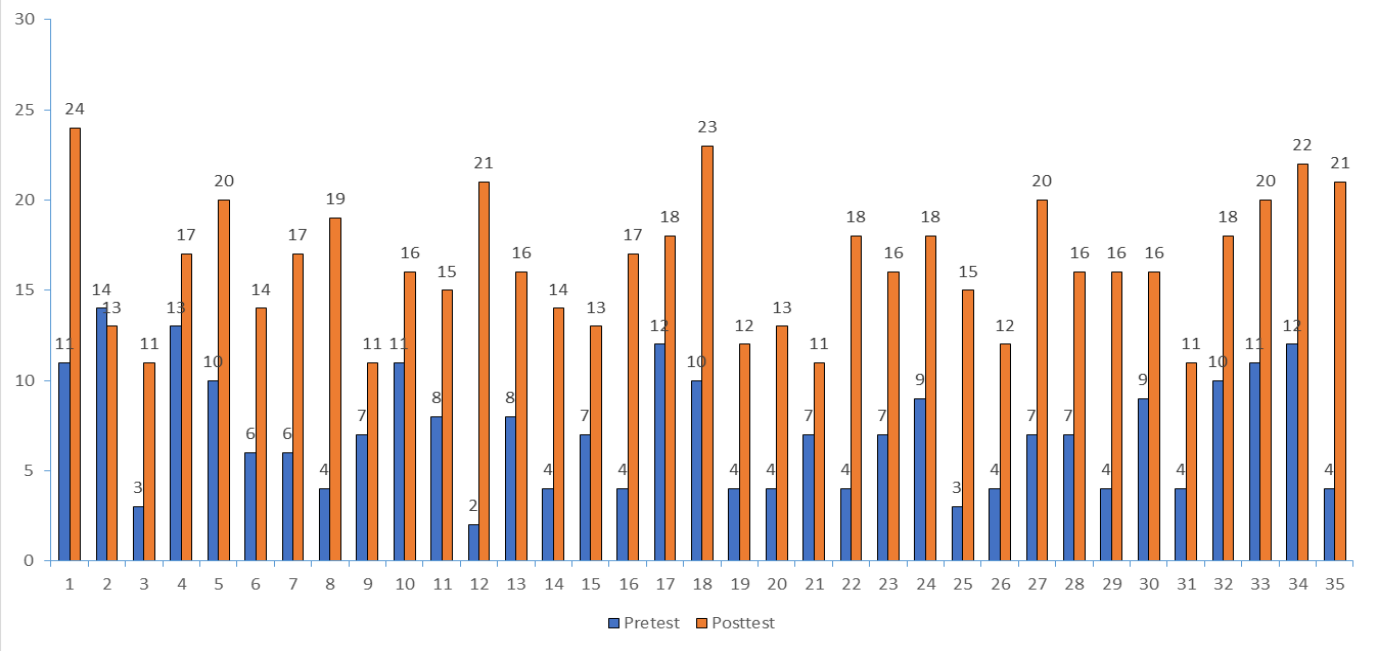

Figure 2. Pre-test and post-test of students' physics learning outcomes

The results of the students' pre-test and post-test were analyzed using N-Gain to see an increase in students' physics learning outcomes after using REACT-oriented student worksheets presented in a bar chart as shown in Figure 2. Based on the bar chart of students who experienced an increase in results learning physics in the high category as many as 11 students, for students who experienced an increase in physics learning outcomes in the medium category as many as 19 students, for the low category as many as 5 students, and there were no students for the category there was no increase, and there was decline. This can be seen in table 15.

Table 15. N-Gain Value of Physics Learning Outcomes of Class XI MIPA Students of State Senior High School 1 Majene

N-gain value	Category	Number of Students	Percentage (%)
$0.70 \leq g \leq 1.00$	High	11	31.4
$0.30 \leq g \leq 0.70$	Medium	19	54.3
$0.00 < g \leq 0.30$	Low	5	14.3
$g = 0.00$	No increase	0	0.0
$-1.00 \leq g < 0.00$	There was a decline	0	0.0
Amount		35	100.0

Table 15 shows that the number of students with an increase in physics learning outcomes in the high category is 11 people with a percentage of 31.4%,

students with an increase in moderate learning outcomes are 19 people with a percentage of 54.3%, students in the improvement category low physics learning outcomes as many as 5 people with a percentage of 14.3% and there are no students in the category of no increase and decrease.

Overall, the average pre-test and post-test N-Gain scores on the physics learning outcomes of class XI MIPA students at State Senior High School 1 Majene is 0.7 in the high category. So that the increase in physics learning outcomes in class XI students of State Senior High School 1 Majene is in the high improvement category.

Results of the Development of REACT-Oriented Student Worksheets

Based on the results of research conducted by researchers in the form of analysis of the content validity of REACT-oriented student worksheets by experts or validators. The development of Student Worksheets refers to the ADDIE development model consisting of analysis, design, development, implementation, and evaluation.

The analysis phase is the initial stage of designing the development of REACT-oriented student worksheets. In this stage, a needs analysis is carried out to determine the right problems and solutions in the research and development process that will be carried out. The intended needs analysis is to analyze students' learning styles and abilities, as well as analyze the material to find out the material that will be applied to the preparation of REACT-oriented student worksheets. The analysis phase was carried out to see how superior the developed REACT-oriented student worksheets were.

The next stage, the design stage, is the design of the developed REACT-oriented student worksheet framework. This design phase consists of two stages, namely format selection and initial design. The stages of preparing the design or design of REACT-oriented student worksheets that are developed are first selecting a format, where the REACT-oriented student worksheet format uses one learning material, namely Elasticity and Hooke's Law. This student worksheets is adapted to the 2013 curriculum learning design (K13). The developed REACT-oriented student worksheets consist of relating, experiencing, applying, cooperating, and transferring. Then the initial draft, namely the initial design of REACT-oriented student worksheets, was the initial draft that was tried out. The steps for compiling student worksheets were developed based on the 2013 curriculum (K13). The details of the initial drafts of student worksheets are REACT oriented, in the form of covers, prefaces, table of contents, instructions for use, display of sub-chapter and group identities, as well as unique topics.

After designing the overall worksheets for REACT-oriented students, a questionnaire was also carried out for teachers' and students' responses, as well as test instruments for students' physics learning outcomes. The third stage is the development stage, where the products that have been developed are validated by three competent experts to assess the worksheets of REACT-oriented students and provide advice who are physics lecturers at Makassar State University. Based on the results of the assessment and suggestions from the three experts, the REACT-oriented student worksheets were declared valid and suitable for use with minor revisions.

The fourth stage, the implementation stage. At this stage the worksheets of REACT-oriented students were tested on class XI students of State Senior High School 1 Majene with a total of 35 students and 10 teacher questionnaires, where 3 teachers were physics teachers who taught at State Senior High School 1 Majene, and 7 teachers were from from several high school equivalents in Majene Regency. The fifth stage is the evaluation stage, this stage is an evaluation at each stage of the ADDIE development model before proceeding to the next stage.

Teacher Questionnaire on the Development of REACT-Oriented Student Worksheets

Based on the results of the analysis of the teacher's response questionnaire, it shows that the worksheets of REACT-oriented students are in the very good category. This means that the developed REACT-oriented student worksheets are easy to use in the learning process, so that students can easily understand physics concepts in relating everyday life and solving given problems.

In addition, the instructions for use on student worksheets make it easier to complete the developed REACT-oriented student worksheets. Also, several pictures are presented in accordance with the material on elasticity and Hooke's law which are related to everyday life, and use easy-to-understand language for students to easily understand, as well as product practicality when it is easy to use. So that student worksheets developed are easy to use by teachers and students.

Student Assessment of the Development of REACT-Oriented Student Worksheets

The results of student responses to REACT-oriented student worksheets show that student worksheets facilitate students in the learning process. Apart from having an attractive appearance, attractive illustrations and clear language. This student worksheet also invites students to associate concepts they have with everyday life, and work together in experimental activities.

The responses given by the students to the worksheets of REACT-oriented students were in the very good category, seen from the results of the analysis of the students' response questionnaires. The results of the response were very positive, which helped students in the learning process.

Use of REACT Oriented Student Worksheets

The use of REACT-oriented students' worksheets in learning physics in class XI MIPA 2 State Senior High School 1 Majene was carried out in six meetings. The worksheets of REACT-oriented students were then tested for their effectiveness on Elasticity and Hooke's Law material. In REACT-oriented student worksheets, students are directed to associate physics concepts with everyday life, carry out experimental activities, and work in groups.

This is shown in the activeness of students in the learning process using REACT-oriented student worksheets that have been developed. REACT-oriented student worksheets at the relating stage are related to everyday life so that students can understand concepts easily. Then, students are able to apply physics concepts to experiencing activities. Based on this, students will more easily understand, apply, and analyze physics concepts.

The results of the students' physics learning outcomes test before being given treatment (pre-test) were in the low category. One of the factors that influence this is due to the incompatibility of the teaching materials used with the learning styles of students which causes the ability to understand, apply, and analyze the basic concepts of physics to be low. Then given treatment in the form of providing REACT-oriented student worksheets, then given a final test (post-test). The results of the post-test given to students are in the high category.

As according to Djamas (2015) teaching materials can be said to be effective if students are active in the learning process. For this reason, it can be concluded that student worksheets are oriented towards having a positive impact on learning physics in class XI MIPA State Senior High School 1 Majene in improving physics learning outcomes. This is shown by the results of increasing the value of students' physics learning outcomes before and after being given REACT-oriented student worksheets.

Conclusion

Based on the results of research and trials of REACT-oriented student worksheets, it can be concluded that the results of developing REACT-oriented student worksheets that have been developed meet the valid criteria. Assessment of the teacher's response to the developed REACT-oriented student worksheets gave a positive response in a very good category. Assessment of students' responses to the developed REACT-oriented student worksheets gave positive responses in very good categories. The application of REACT-oriented student worksheets that were developed was effective for improving physics learning outcomes at State Senior High School 1 Majene with a moderate category worth 0.7. Critical thinking skills have a positive and significant indirect effect on physics learning outcomes through the achievement motivation of class XI IPA students at State Senior High School 2 Gowa.

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