

# The Validity of Newton's Law Gravity Teaching Materials through Creative Problem Solving Models to Improve Problem Solving Skills

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**Abstract:-** The lack of teaching material on Newton's law of gravity that contains creative problem solving models that can improve problem-solving skills. This study aims to describe the validity of the teaching material. The method used is research and development with the ADDIE model. The research design is pre experiment design (the one group pretest-posttest design). The subjects of the trial, namely 17 students of class X MIPA 2 SMAN 1 Amuntai. The data collection technique was obtained through the instrument of validity of teaching materials which were validated by 2 academic experts and 1 practitioner expert. The data analysis technique is calculated by averaging the total score for each aspect assessed and the reliability of the validation results is calculated using the Cronbach-Alpha formula. The results showed that the validity of the teaching material with an average score of 3.45 categories was very valid with a reliability of 0.79 good categories, so that the teaching material of Newton's law on gravity through a creative problem solving model to improve problem-solving skills was declared valid for use in learning.

**Keywords:-** Creative Problem Solving, Newton's Laws On Gravity, Problem-Solving Skills, Teaching Materials.

## I. INTRODUCTION

Physics is included as the basis of science that helps learners understand the natural phenomena around them. Physics is learning that requires skills, including problem-solving skills. Physics is presented with the hope that students are able to solve problems by mastering concepts, scientific methods, and applying them based on a scientific attitude (Dwi Sambada, 2012). Plotzener in Susiana, Yulianti, dan Latifah (2017), Plotzener in Susiana, Yulianti, and Latifah (2017), that solving this problem is an efficient way to study physics and solve problems related to physics questions independently and consistently. Problem solving is possible by learning what the learner needs to learn first and applying it to the situation according to the steps to solve it (Thersia et al., 2019). Therefore, familiarizing learners with problem solving is a capital for learners to acquire problem-solving skills.

Problem-solving skills are a person's initial skills to solve problems, including critical, logical, and systematic thinking (Nayazik, 2017). Misbah (2016) stated that

improving problem-solving skills can be done by learning oriented towards problem solving and practice on an ongoing basis to get used to solving problems with complete stages from the beginning of understanding the problem to finding and re-examining the units and results obtained.

The results of research from Rahimah, Salam & Haryandi (2021) at SMA Negeri 10 Banjarmasin found that students were indicated to have low problem-solving skills. Based on the results of interviews conducted by researchers at SMAN 1 Amuntai, it was found that when students are faced with physics problems in the form of questions at the C3 level and above, students have difficulty when analyzing questions to solve the given problems. The first stage of problem-solving skills is to describe problems related to the analysis process, the process will be connected to the second stage of determining the amount known and asked, then using the right equations to solve the problem. Learners also do not re-examine the answers and do not make conclusions. Thus, it can be said that the problem-solving skills of learners are still low and need to be improved. The low problem-solving skills are because in schools there is no teaching material that contains problem-solving skills in it. So that there is a need for teaching materials that contain problem-solving skills that can improve the problem-solving skills of students.

Efforts to improve the quality of physics learning are carried out through the development of teaching materials by containing problem-solving skills in it using a creative problem solving model. Teaching materials should be simpler and more detailed with many sample questions so that students can easily understand complex material (Prastowo, 2015). And most importantly, the material can encourage learners to actively participate in the learning process, which can improve their skills, especially in problem solving. In accordance with research conducted by Habibi, Zainuddin, dan Misbah (2017) found that the science material developed focused on problem-solving skills worthy of use in learning.

Research on the development of teaching materials with problem-solving skills has been widely carried out. However, so far there has been no development of teaching materials that contain problem-solving skills that are integrated with the creative problem solving model. Pepkin in Indrasari (2021) explained that the creative problem solving model is a learning model that focuses on teaching problem-solving skills followed by strengthening these skills. Every problem

given, students can use problem-solving skills and answer creatively. Rendhana (2008) argues that developing problem-solving skills can stimulate critical thinking skills through experience or learning to learners. Solving problems requires critical thinking and quick and precise decisions are made.

Creative problem solving learning models can also help in improving students' understanding of physics concepts. Saprudin (2010) explained that the creative problem solving learning model is a learning model that creates learning activities based on finding problem solutions. Learning with problems gives learners hands-on experience. Hands-on experience guarantees that the concepts learned will last longer.

Based on the description above which is related to low problem-solving skills, the researcher will conduct development research to overcome the problem. The research was carried out by developing teaching materials for Newton's law of gravity through creative problem solving models to improve problem-solving skills. The purpose of this writing is to describe the validity of newton's law of gravity teaching materials through creative problem solving models to improve problem-solving skills.

**II. METHOD**

The type of research used is research and development (R&D). The model used is the ADDIE (Analyze, Design, Development, Implementation, and Evaluation) model. The trial design in this study is a one-group pretest-posttest design shown by Figure 1. The explanation of the research steps is presented in Table 1.

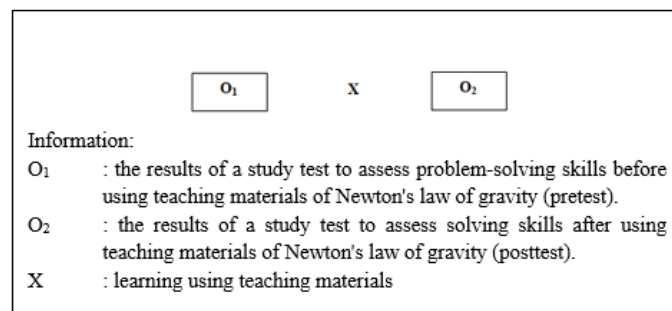


Fig 1:- Trial Design

This research was conducted at SMAN 1 Amuntai in February 2022. The test subjects in the study were 17 students of class X MIPA 2. The subject of the study was teaching material for Newton's law of gravity through creative problem solving models to improve problem-solving skills. The instruments used consist of instruments of validity of teaching materials. The validity assessment instrument aims to determine the validity of the teaching material of Newton's law of gravity based on the results of the validator's assessment. The characteristics of validity assessment instruments are based on aspects of format, language, content, presentation, benefits/usability. Validity assessment instruments are used to determine the quality of teaching materials of Newton's law of gravity. Validity assessment instruments were developed by researchers.

Data collection techniques are carried out through validity assessments. The validity assessment is carried out by two academics and one practitioner in the field of physics. Assessment of validity by putting a tick on the column of the grading scale for each aspect with a scale range of 1 to 4. Data analysis was carried out by averaging the total score for each aspect assessed and the results were adjusted to the criteria in Table 2.

Development Steps	Activity
<i>Analyze</i>	Analysis of existing products and needs in the field, analysis of the curriculum, analysis of material characteristics of Newton's law of gravity, and analysis of the characteristics of learners.
<i>Design</i>	The teaching materials are designed to contain problem-solving skills and are arranged based on a creative problem solving model.
<i>Development</i>	Activities in this, researchers develop teaching materials based on development design.
<i>Implementation</i>	The products that have been developed are applied to real situations, namely in teaching and learning activities.
<i>Evaluation</i>	The evaluation stage is divided into two, namely, formative and summative.

Table 1:- Explanation of the Stages of Teaching Material Development with the ADDIE Model

The validation result data is calculated with the average total score for each aspect assessed and the results are adjusted to the criteria in Table 2.

Formula	Average Score	Classification
$X > \bar{X}_i + 1,8 \times sb_i$	$\bar{x} > 3,4$	Very valid
$\bar{X}_i + 0,6 \times sb_i < X \leq \bar{X}_i + 1,8 \times sb_i$	$2,8 < \bar{x} \leq 3,4$	Valid
$\bar{X}_i - 0,6 \times sb_i < X \leq \bar{X}_i + 0,6 \times sb_i$	$2,2 < \bar{x} \leq 2,8$	Quite valid
$\bar{X}_i - 1,8 \times sb_i < X \leq \bar{X}_i - 0,6 \times sb_i$	$1,6 < \bar{x} \leq 2,2$	Less valid
$X \leq \bar{X}_i - 1,8 \times sb_i$	$\bar{x} \leq 1,6$	Very lacking valid

Table 2:- Criteria for Aspects of Validity of Teaching Materials  
Adapted from (Widoyoko, 2017)

### III. DISCUSSION

Researchers make teaching materials by adjusting the aspects to be measured, namely the problem-solving skills of students based on the theory of the principles of preparation of teaching materials that researchers study (Sugiyono, 2017). The teaching material made consists of the front cover, preface, introduction, table of contents, concept map, keywords, basic competencies, learning objectives, more information, important, sample questions, CPS dialogue,

problems, summary, competency test, answer key, bibliography, author's biodata.

The researcher then validated the teaching material through a test of the validity of the teaching material conducted by 2 educational experts (academics) and 1 practitioner, obtained results as shown in Table 3. The validity of this teaching material has 5 aspects of review with 69 validity criteria. The review aspect consists of format, language, content, presentation, and benefits/uses.

No	Aspects of the review	Average per aspect	Category
1	Format	3,47	Very valid
2	Language	3,39	Valid
3	Fill	3,42	Very valid
4	Serving	3,51	Very valid
5	Benefits/Uses	3,44	Very valid
<b>Overall average</b>		<b>3,45</b>	<b>Very valid</b>
<b>Reliability coefficient</b>		<b>0,79</b>	<b>Good</b>

Table 3:- Results of Validity of Teaching Materials

Table 3 shows that the review aspect of the teaching material has very validity, except for the language aspect of the category of valid. Overall, the validity results show that the category teaching materials are very valid with good reliability. The format of the teaching material in accordance with the standard criteria of a good teaching material format indicated by the results of the validity of the aspects of the material format is very valid. The criteria that have been met by the teaching materials developed include a cover that has an appeal. The cover design is made with a combination of dark and light colors and cover images that depict the topic of the material, thus attracting students to open and learn the teaching material. The components of the student's teaching material are also fulfilled, including learning objectives and summaries / summaries that are in accordance with the description of the material. The teaching materials developed have a clear numbering system, types, and size of letters that are clear and appropriate, namely using the Times New Roman typeface with a size of 14 which makes the appearance of letters not monotonous and clearly visible. The design and space / layout aspects of the teaching material content are appropriate, with balanced placement of text and image illustrations. The teaching material has a physical size suited to the students of class X SMA and the column format is in accordance with the paper format. The acquisition of aspects of the teaching material format thanks to this very valid category also shows that the teaching material has good

teaching material characteristics. This is in line with what Prastowo (2014) revealed that a good teaching material format must meet characteristics such as a clear and attractive design, the order of content must be easy, a short title, a clear cognitive structure, a complete teaching material component, easy to read (letters are not too small), and a structured text sequence.

The language aspect of the teaching material is categorized as valid so that it can be said that the teaching material has been prepared according to good and correct Indonesian rules. The standard criteria for the language of teaching materials that are met in the preparation of teaching materials include in accordance with the development of students, namely the level of development of students' thinking and the level of social emotional development of students. The teaching material is also communicative, characterized by the students' understanding of the message and the suitability of the illustrations with the substance of the message. Teaching materials are also dialogical and interactive, namely teaching materials are able to motivate students to respond, as well as encourage students to think and learn independently, especially in improving problem-solving skills. The teaching material developed means that in accordance with statement Komalasari (2011) states about the aspects of language and readability in the teaching material that must meet several standards such as the use of sentences

according to good and correct Indonesian rules, as well as sentence arrangements that contain coherent and logical thinking patterns. The sentence structure used must also be communicative and in accordance with the stage of language mastery of the learner. Arsanti (2018) also explained the same thing, namely the language of good teaching materials must be communicative and easy to understand by students.

The criteria that are met next are straightforward which means that the teaching material uses the right sentence structure, standard terms, and does not use double meanings. The teaching material developed has coherence, collapse of the mindline, and consistency, which means that the teaching material has interrelationships between chapters, between chapters and subsections, between sub-sections in chapters, between paragraphs in sub-sections. Teaching materials also have interrelationships between sentences in one paragraph, as well as the integrity of meaning in chapters, in subsections, and meanings in one paragraph. Consistency in the use of variations in type and size of letters, as well as consistency in the use of spacing, spacing between the title and the first line, and between the title and the main text have also been fulfilled in the developed teaching materials. This will make it easier for students to understand the material and problem-solving skills used.

Conformity with the correct rules of Indonesian is also filled with teaching materials because the teaching materials use the right grammar and spelling. The criteria for consistency in the use of terms and symbols / symbols in the developed teaching materials have also been met. Valid categories in the language aspect of teaching materials show that the characteristics of good teaching materials according to Prastowo (2014) have also been met, namely language that is easy to understand, judging from the flowing vocabulary, sentences and relationships between clear califold, and non-verbose sentences. Situmorang (2013) also explained that good teaching materials must use language that is in accordance with good and correct Indonesian rules, according to the development of students, communicative and easy to understand, and use accurate terms, formulas, and symbols.

The content aspect of the developed teaching material obtained a very valid category, which means that in terms of material coverage, the developed teaching material has a very good breadth of material and depth of material. The accuracy of the material in the teaching material is also very good, which includes the accuracy of facts, concepts, concept maps, legal principles, theories, terms, symbols, and units. This is supported by the existence of indicators of problem solving skills using a creative problem solving model that makes the teaching materials developed can improve students' problem-solving skills.

The acquisition of very valid categories in the aspect of teaching materials also indicates that the teaching materials are up-to-date, namely having the recency / maturity of features and examples in accordance with the development of science. This is in accordance with statement Komalasari (2011) regarding the content of good teaching materials that must be accurate and actual (according to the development of

science). This statement is strengthened by Situmorang (2013) regarding the standards for the content of good teaching materials, namely: Accuracy and completeness of teaching materials; Breadth of the material, which includes the actuality and clarity of the presentation of the teaching material; The depth of the material, that is, the presentation of teaching material properly.

Aspects of presenting teaching material include 3 criteria that must be met so that the presentation of the material is classified as good, including presentation techniques, supporting the presentation of the material, and presenting learning in good student teaching materials. The results of the validity test on the aspects of presenting the developed teaching material obtained a very valid category, which means that the criteria for good teaching material have been met in the developed teaching material. In terms of the criteria for presentation techniques, teaching materials have consistent presentation systematics in chapters / subsections, logical presentations, and coherent concepts. The teaching material developed also has relationships between facts, between concepts, and between principles, as well as between theories, besides that the balance between chapters and the balance of substance between subsections in chapters are also owned by teaching materials. In terms of illustrations in the teaching material, it also has conformity / accuracy, then the presentation of tables, drawings, and attachments has been accompanied by identity.

The next criteria that are met by the teaching material developed are in terms of supporting the complete teaching material, marked by the presence of a preface, introduction, table of contents, concept map, examples of questions, CPS dialogues, problems, summaries, competency tests, answer keys, and bibliography. Teaching materials that include all the completeness of presentation can be used well by students in the learning process. Situmorang (2013) menjelaskan mengenai penyajian materi ajar yang baik harus memuat komponen yang lengkap, dan tata letak desain yang sesuai.

The aspect of the presentation of learning in the teaching material of students can also be said to be good because it can be used with a creative problem solving model that makes students more creative in solving problems in the teaching material, so that learning can give rise to student involvement and is student centered. Teaching materials can also create interactive communication in learning, which is also supported by conformity with the characteristics of the subject matter. Teaching materials are able to stimulate the depth of thinking of students, bring out the creative thinking of students, foster curiosity, and provide challenges to learn further.

The aspect of the benefits / usefulness of the teaching material developed obtains a very valid category, so it can be said that the teaching material can be used as a guide for teachers in learning, can be used as a guide for students in independent learning and can be used to improve students' problem-solving skills. This is because the teaching material contains instructions for use, in accordance with Prastowo explanation (2014) that the teaching material must be



instructional so that it makes it easier for teachers to teach materials and students to learn independently, especially in improving problem-solving skills.

The results of the validation of the teaching materials developed show that the overall aspects of the category are very valid with good reliability. The results of valid category validation show that the teaching material developed meets the standards of good teaching material characteristics, with the meaning that it can be used but must go through the revision stage first (Sugiyono, 2017). Thus, teaching materials can be used in learning because they have valid or valid assessments and the assessment can be trusted.

#### IV. CONCLUSION

Based on the results of research and development, it can be concluded that the teaching material of Newton's law on gravity through the creative problem solving model is declared valid to be given to students as a learning resource, especially in improving problem-solving skills.

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