Development of USA method (understanding, sketching, analysing) as practical way to resolving classical mechanics problems for physics lesson

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Abstract. This study aims to develop a problem solving method known as the USA method (Understanding, Sketching and analysing) as a practical method to solving classical mechanics problems. This research method uses the ADDIE Research and Development model (Analysis, Design, Develop, Implementation and Evaluation) with data analysis techniques using Aiken's validation and reliability analysis. Research subjects in several physics subject teachers and science class students in West of Papua with the research stages used Problem Analysis and learning needs, USA method design, method development, implementation and evaluation of method. Researchers used 21 validators consisting of 13 validators from physics and mathematics experts who teach at universities and 8 physics teacher participants as practitioners who teach in schools. The results of this development indicate that the level of validity of all assessment indicators reaches 0.75 to 0.928 with a reliability of 0.82 where this interval is called high validity and reliability. The final step is to apply the USA method and then analyse the effectiveness and practicality of this method. The important results obtained by the researcher were 92.5% of respondents stated that the USA method was effective as a better method to supporting the quality of learning physics in classical mechanics lessons. Meanwhile 94.3% of respondents said the USA method was practical as an easy way to understand classical mechanics.

1. Introduction

As one of the supports for the development of world technology, so, the understanding of children in the field of physics is very urgent, this affects the knowledge, interest and depth of children's exploration when studying physics. Starting from the assumption that in the transition to the twenty-first century, the development of technology has become a major milestone in the development of access to the convenience of human life. Meanwhile, the interest of the Indonesian generation to study physics thoroughly is increasingly being challenged by the 'difficult' mind-set of Physics lessons [1] Sometimes students struggle "half to death" to understand physics and eventually have to fall into the difficulty of understanding physics problems that require a long way without certainty the answer is right or wrong.

In the case of West Papua, students who are interested in physics are still lacking, because students tend to be more comfortable learning social scientists and humanities than studying science [2]. For them, learning physics is like doing a forced job. One student said "During the physics class, I felt depressed and dizzy, because I had to memorize concepts, memorize formulas and calculate at the same time". In a different class the researcher meet one students, he said, sometimes he feels strange about physics lessons, because the questions or other cases that are used as training material in class are different from the questions or cases in assignments or exams that have the shape and direction of the
questions outside of predictions. This fact shows that physics lessons provide several difficulties for students, especially in the process of solving problems or problems.

As stated [3] that students’ difficulties in learning physics are found in problem solving (32%), understanding concepts and formulas (26%), applying equations or formulations in questions (18%), graphs and pictures analysing (17%) and summarizes the material that has been studied (7%). Meanwhile, according to [1] it is stated that the difficulty of calculating 39.97% and the difficulty of mastering the concept of 46.42% are the basic problems in solving physics problems. Meanwhile, [4] added that the difficulty of learning physics consists of two indicators, namely the difficulty in connecting graphics or images with material concepts and difficulties in connecting graphs or images to cases or the real world. So that from this data, it can be seen that the learning difficulty of physics starts from mastery of concepts, numeracy skills, determining equations in problems, analysing cases, graphs and Image analysing. To solve this problem, a practical method of solving physics problems is needed to help students get the right answer.

In addition to some of the problems above, it is also suspected that other difficulties are caused by less mathematical skills and the quality of students 'understanding of concepts and the students' own weak analytical and reasoning skills. This is in accordance with [5] which states that if math skills are high, the ability to solve problems is also high. The existence of this weakness, prompts a significant decrease in even profound traumatic interest in studying physics. Therefore, what needs to be resolved first is the process of improving mathematical skills and analysing exercises on several cases that can connect the physics-mathematics concepts and its application.

The form of solving this problem is by using a systematic problem solving method in order from emphasizing the conceptual understanding to the analysis stage and finally the students understand the stages of solving the problems. Activities to understand this concept can be guided by the use of visualization through sketches or the like, so that students are helped by cases of factual physics to facilitate the analysis process. This is considered important because a good understanding of the concept facilitates activities at the mathematical analysis stage of physics problems [6]. So it is deemed necessary to develop a practical and efficient method in the process of solving physics problems, because the output of the effort to use this latest method is to facilitate the process of student understanding of physics material, so that he looks younger to learn.

2. Method
The method used in this research is a development method using the ADDIE model (Analysis, Define, Design, Implementation and Evaluation). In the analysis stage, the researcher uses two main analyses, namely performance analysis and needs analysis. Performance analysis includes an analysis of teacher and student performance in learning activities that analyses the possibility of the influence of teacher performance in teaching on student difficulties in solving classical mechanics questions or the possible consequences of a decrease in student performance in learning on interest in solving questions. In this needs analysis, the researcher analyses the need for the use of new methods to solving classical mechanics problems.

The stages of development (Design) focus on the USA method design according to the stages of its application. In this section the researcher compiles the stages of solving the problem scenario by considering several indicators including the ability of the method developed in: a). stimulate student motivation and interest in learning, b). to stimulate the development of the student's personality. c). provide opportunities for students to be creative, explore skills and innovate, d). Train students to study independently, e). Realizing real learning (factual), f). Encouraging the regularity of students' attitudes in learning, g). Improve student learning skills, h). Make it easy for teachers to teach, i). Speed up the process of understanding students, j). Adaptation to subject matter, k). Use of media / simple learning facilities, n). Guiding basic cognitive abilities, o). Time efficiency in achieving learning objectives, and p). Make learning assessment easy.

Stages of development (develop), the researcher validates the method developed by referring to the indicator method as described above. At this stage, the researcher used 21 validators consisting of 13
validators who are physics and mathematics experts who teach at universities and 8 validators are physics teachers as practitioners who teach in schools. The validator's suggestion is used as a revision in improving the stages of the developed method, the validation of this method is used by referring to this validity rule by Aiken.

The stages of product development implementation (USA method), in the form of product use for middle school and university students, researchers have selected 120 high school students from 5 schools, 62 junior high school students from 3 schools and 30 existing elementary education students in West Papua as a sample implementation in this development research. The evaluation stage directs researchers to analyse student responses after the use of the USA method in learning activities, this evaluation refers to indicators; a). The accuracy of students' answers, b). Percentage of students' understanding of concepts, sketches and analysis. c). Student speed answered questions, d). Ease of students in learning. The results of this analysis are presented in the form of a percentage.

3. Result and Discussion

From these various challenges in learning physics, researchers have developed a physics learning method that focuses on fast and precise events in solving cases of classical mechanics. Researchers chose to focus on classical mechanics material because this material tends to be processed by the analytical power of junior high school and high school students. The material in question is the material of straight motion kinematics, parabolic and circular motion, dynamics, work, energy, fluid mechanics, thermodynamics, rigid body equilibrium, rotation / moment of inertia dynamics, elasticity and Hooke's law, Pascal's law, temperature and heat, kinetic theory of gases, thermodynamics, waves, optics and Kepler's laws. The determination of this material is based on whether or not students can visualize the case being asked as material for questions in the material. Because the first step so that students answer cases with the right answers, it is determined by the student's visualization ability before finally carrying out analysis and calculations. The results of this study follow the steps to develop Addie's model as follows:

3.1. Analyze

At this stage, an analysis of the reasons for the emergence of the USA method offer is carried out as the objectives stated in the background above. This analysis departs from the results of observations at school and interviews of teachers and students. From this activity, a concrete conclusion was found about the physics learning process in high school. Even though high school students are in the age range of 16-20 years, which is the normal age for learning, there were obstacles in the process of analysing a case. In fact, high school age children have entered a formal operational period where children at this stage are able to think abstractly, are painstaking in using reasoning, are skilled in drawing conclusions, but in fact, in physics learning activities these skills are only owned by an average of 10% of children from each class. Having explored why, the teacher and students provide different arguments. A teacher stated that his students were lazy to learn, their analytical power was low and their basic mathematics was bad so that it was difficult to pursue physics, but students revealed that they had difficulty following the teacher's teaching flow, teachers' explanations were difficult for students' minds to process and its methods that did not emphasize quality and completeness of understanding for all students but only for a few students who are able to adapt to the way the teacher teaches. So that most students choose to be indifferent in learning.

From the students' arguments, the general conclusion was that the teacher was not totally incomplete in teaching, only emphasizing students who quickly understood the material. Students who understand more quickly certainly have good analytical and reasoning power, besides that, they can also deliver thoughts with visual sketches in their reasoning so that they are able to understand the concept of cases and material well. However, in some circumstances, students who looked rather smart were also found to be mistaken in solving cases, this was due to misconceptions and errors in the analysis stage. The output of the analysis stage of this research is that it is found that the methods used by physics teachers
are less effective in teaching in class, because they have not found patent patterns and are effective in
increasing the accuracy of the results of student work analysis from given cases. Therefore, the
researcher designed a new method as a step in solving physics cases quickly and accurately, I wrote the
method with the name USA method (understanding-sketch and analysis).

3.2. Design
At this stage, the researcher designs a learning method which the researcher calls the USA method,
in accordance with the research objectives. In this phase, the researcher compiles a pattern of learning
methods that are ordered according to the hierarchy of the stages of solving the case / problem. This
pattern is suggested as a standard pattern not to be randomized, because the structure contains a gradual
range of students' abilities. This pattern begins with the understanding stage and ends at the analysis
stage. The USA method design description is described in the following descriptions:

3.2.1 Understanding. The first step in the search for knowledge is to try to understand the existing
problem [7]. In the USA method, the understanding stage in question is an understanding of the direction
of the case and the parameters available in the practice questions. The researcher puts this stage at the
beginning of the method, because after the teacher provides practice cases, students then try to
understand the meaning of the case. This understanding activity begins with students reading or listening
to the cases presented or delivered by the teacher. Then the students sort out the case phrase by phrase
to understand it. It should be noted that students' understanding is in accordance with their analytical
power and accuracy in examining the language of the cases presented. As a consideration, most cases
or physics practice questions are presented in the form of story or narrative questions, so that the
children's reading comprehension ability determines whether the students' understanding is correct or
wrong. At this stage the teacher works to train students' hospitality to the case. The understanding
phase consists of two types, namely:

3.2.2 Understanding case and Problem. At this stage the student learns to understand the words
presented in the problem or problem, then he understands the series of words in the form of a sentence,
then he understands the sentence in full text so that he can understand the parameters presented in the
story problem or the picture contained in it in its entirety, and he is able to understand the direction of
the questions. As an example, in a mechanics case is presented as follows:

A spring is used to measure fluid pressure, this spring has a constant of 1,000 N / m, and cylinder
piston has a diameter of 2.00 cm. When the gauge is lowered into the water, the piston moves 0.500 cm.
calculate the change in depth that causes the piston to move?

In this case, students are assisted by illustrated images, so that from this picture students can imagine
the direction of the questions they get. In the first sentence, students understand that there is a spring
that is used to measure fluid pressure. So that this sentence is stored in the students' memory as a
comparison for the continuation of the next sentence. The next sentence is "this spring has a constant of
1000 N / m". In students' memory it is recorded that the number 1000 is used in the analysis stage.
"When the meter is put in water, the piston will move as far as 0.500 cm", in this sentence, students
imagine that this spring is pressed inward this far. Then the question is to determine the depth of entry
of the piston in the water. After students read the questions thoroughly, students begin to connect what
they understand with the concept of the material they have learned.

3.2.3 Understanding the Concept. At this stage, students use a concept that is understood related to the
material received from the teacher or reading material in the form of textbooks or other sources
recommended by the teacher. Understanding the concept in question is the student's effort to be able to
apply the concept of material into the process of solving the case at hand. When ignoring the above case,
with the sentence formulation:
"A spring has a constant of 1,000 N / m attached to a piston which is used to measure fluid pressure, meanwhile, the piston is cylindrical with a diameter of 2.00 cm. When the gauge is lowered into the water, the piston moves 0.500 cm. calculate the change in depth that causes the piston to move? ”.

So, students can simultaneously use the concept of fluid mechanics and the concept of springs in solving this case. For example, in the first sentence, "A spring has a constant of 1,000 N / m attached to a piston that is used to measure fluid pressure, meanwhile, the piston is a cylinder with a diameter of 2.00 cm"

Students can put forward the concept that the spring constant in question is the strength of the spring per meter, where if it shifts, it is depressed or stretched, there will be an increase or decrease in length with the symbol \( \Delta x \), then in the next sentence it is said that the piston is a cylinder with a diameter of 2.00 cm, this indicates that the cylinder is a model of the tube, where the tube has the diameter and height of the tube itself. From this language, students can understand that there is a concept of the surface area of a cylinder that is directly in contact with the surface of the water, so this surface area is taken from the surface area of the cylinder which is considered to have regularity so that it is formulated with the formula for circular area \( A = \pi r^2 \) while the radius of this circle is taken from the concept that the radius of a circle is half the size of the diameter of the circle. Furthermore, in the continued question sentence,

“When the gauge is lowered into the water, the piston moves 0.500 cm. calculate the change in depth that causes the piston to move? ”

From the direction of the sentence in this case, the students can understand that the piston surface is touching and pressing the water surface, this pressing activity causes the spring to be pressed inward with a shift of 0.500 cm. the amount of the spring shift figure is called \( \Delta x \). Whereas the concept of the direction of the question is to calculate the depth of the piston pressed so that the spring shifts with the value mentioned earlier. Because the question questions depth, students can use the concept of force on hydraulic pressure.

3.2.4 Sketch. In studying exact sciences, imaginary learning can be avoided, because it makes it difficult for students to imagine the conditions presented in the questions or questions. To anticipate this, a simple visualization in the form of a sketch by hand, can help students understand the case and the material provided. In line with this, [8] explain that freehand sketching enhances the quality and novelty of ideas. This is due to the ability to convert abstract things into real things in the mind. In addition [9], reinforces that Sketches can be used to visualize or imagine physical or technical things that are suitable for physics subjects, especially classical mechanics.

In this USA method, the researcher designed the stages of visualizing case sketches on the blackboard or through other media. In the USA method, Sketching activities include: 1). Static Sketch, is a still image sketch, in the form of an image depicted by the teacher or student in front of the class, or other similar images that are included in the still image category, this still image can be created by the teacher in teaching in the form of a sketch on the blackboard according to the teacher's skills, hand-drawn sketches on cardboard or printout sketches prepared by the teacher before teaching in class. 2). Dynamical Sketch, is a type of moving sketch, using either media assistance or sketches that are practiced directly by lecturers or students. In this dynamic sketch, the researcher divides this dynamic sketch into two types, namely: a). Motion Digital Sketch, a sketch that is assisted by computer software using several applications available on the computer. To be able to use this type of sketch, the teacher can operate the software both in its design and operation. However, this type of sketch still requires a visualization screen that can be displayed to students or students, here the teacher still needs supporting tools. b). Human demonstration Sketch is a dynamic sketching activity or active demonstration either carried out by a lecturer / teacher or demonstrated directly by students or students. In this sketch, an in-depth understanding of the problem, case or problem at hand is needed. A teacher or lecturer is considered capable of conducting demonstrations in front of the class to be able to deliver student understanding to the learning objectives desired by the teacher. The sketch stage in this case can be continued if you have passed the understanding problem and concept stage as described in the previous
stage, in this case, the teacher or lecturer can choose to draw a sketch according to the case request in the available questions. In other references, it is stated that the use of sketches can help form ideas because sketches can reduce the ambiguity of a problem, so that students can think in detail and thoroughly [10].

Meanwhile, in terms of the steps for using this method, the sketch is divided into two types, namely 1). Sketch Basic Object, which is the activity of drawing several objects that are presented in question questions, this activity is needed to be able to deliver student understanding to be able to approach the real situation presented in the questions. Sketch objects are needed to support sketching the next problem. 2). Sketch Basic Problem, that is, a sketch of the problem that is understood from the question is carried out, all the commands and conditions in the question are included in the sketch as well as containing all the possibilities that exist in the problem.

As in the case presented by the researcher above, with a case example: “A spring has a constant of 1,000 N / m attached to a piston that is used to measure Fluid Pressure, meanwhile, the piston is a cylinder with a diameter of 2.00 cm. When the gauge is lowered into the water, the piston moves 0.500 cm. calculate the change in depth that causes the piston to move? ”.

In this case, the teacher can design a sketch according to the question request, from the question sentence it is found that a spring is attached to a piston, from this language, the teacher designs that a spring is inside a piston. In the sentence “A piston is a cylinder” the teacher can draw a piston that is in the shape of a cylinder in which there is a spring. “When the gauge is lowered into the water, the piston moves” of this language, the teacher draws the design of the service piston surface so that it can move up and down. After this sketch stage, then the teacher adds information to some of the parameters expressed in the questions so that students can also analyse using pictures. So that the sketch of the above case becomes:

![Figure 1: Hand sketching of classical mechanical problem](image)

Sketching by hand is a practical way that can be used even without involving other learning media. This way just use pencil or marker that can be drawn directly on paper or on the board. This method is recommended for teachers who are trained in drawing or sketching. After observing this sketch directly, the teacher arranges the students' understanding so that they can understand the picture as a whole, starting from the concept of the image, to the concept of description and material. Thus, at the analysis stage students are no longer overwhelmed or mistakenly analysed the cases that have been given. The more proficient students are in doing sketch as an aid to understanding, the more confident the student is with the answer, as mentioned [11] The student's ability to sketch a given problem case can foster students' confidence in getting the right answer.

### 3.2.5 Analysis

Students' analytical skills in solving various questions and problems become an indicator of students in getting the correct answers according to the target questions in the questions. This analytical power is a person's ability to relate the concept he has with the effort to solve the case or problem at hand. Analytical activities in learning activities can occur anywhere, this is as explained by [12] which states that analysis or reasoning can occur in science class when students listen to lectures, read texts, do lab work, run computer simulations, search for literature or Internet sources, participate in debates or undertake applied projects that involve rational thinking.
Analysis is a difficult stage where errors are often found in solving questions in science, this analysis includes intelligence that can read several situations at the same time remembering knowledge in the form of equation and concepts that have been learned. This analysis activity includes,

3.2.6 Reasoning Problem Analysis. Student situation are required to be able to reason about the problem in depth and with great care by considering all the situations presented in the questions. In this part of the analysis, students connect concept by concept and relate it to the equation. For example in the previous case with the problem: a spring has a constant of 1,000 N / m attached to a piston that is used to measure Fluid Pressure, meanwhile, the piston is a cylinder with a diameter of 2.00 cm. When the gauge is lowered into the water, the piston moves 0.500 cm. calculate the change in depth that causes the piston to move?

Teachers and students understand the concept of this question by using the concept of force on a spring with the equation $F = -k \times \Delta x$ because the spring constant and piston displacement are known. Then associated with Force in hydraulics with a formulation $F = \rho \times g \times h \times A$ where the surface area refers to the outer surface of the cylinder forming a circle with the area $A_c = \pi r^2$ of the radius back to the concept $r = d/2$ as it appears in the parameters presented in the problem. By collecting various concepts of this equation, then the teacher guides students to be able to reason about the use of this equation so that they form an equation that is comparable and effective for solving existing cases.

3.2.7 Analysis of Equation. On equation applied to solving physics problems, there are three types of answers to questions that are often encountered, namely a) Problems whose answers are equations or comparisons so that there is no calculating activity in them, only using overall reasoning. This type of problem requires the ability of students to understand the concepts and some rules of applied mathematics in physics. b). Questions for which the answer is a number. This type of problem usually uses a formula to calculate the answer to the question. To solve this problem, students are required to have good mathematical reasoning skills. c). the question for which the answer is a mixture of numbers and unvalued quantities. This type of problem arises as a result of the existence of one of the quantities as a parameter required in the equation, but the question does not calculate its value but only gives a symbol according to the name of the quantity. d). Problems with descriptive answers, are questions that ask the concept of the material whether there are numbers or symbols in it or not, while the answers are in the form of conclusions or short descriptions.

For the previously presented problem, with the question "A spring has a constant of 1,000 N / m, it is attached to a piston that is used to measure fluid pressure, meanwhile, the piston is a cylinder with a diameter of 2.00 cm. When the gauge is lowered into the water, the piston moves 0.500 cm. calculate the change in depth that causes the piston to move. Then the teacher and students can see some important words from this problem that represent several parameters to be included in the equation. The first step in the analysis phase of this equation is to identify several quantities and concepts that affect the answer. From this example problem, it can be understood that there is a spring constant with the symbol $(k) = 1000N / m$, the cylinder diameter with the symbol $(d) = 2.00$ cm while the piston shift $(\Delta x) = 0.500$ cm. After identifying some of these parameters, the students then reasoned about the possible equation used based on the several parameters revealed in the questions. Because the questions reveal about springs and fluids, students can use a comparison of the parameters of these two materials. The relationship between the two is in the concept of recovery force on the spring and compressive force on the fluid with the following ratio

\[ F_s = F_h \]  

This comparison is the ratio between the Force on the spring and the Force on the fluid, then the equation of these two forces is derived to be:

\[ -k\Delta x = \rho ghA \]  

7
\[
\frac{-k\Delta x}{\rho g A} = h
\]

(3)

\[
h = \frac{-k\Delta x}{\rho g A}
\]

(4)

\[
h = \frac{100 \text{ N/m}^2 \times (5.00 \times 10^{-3} \text{ m})}{(10^3 \text{ kg/m}^3) \times (9.80 \text{ m/s}^2) \times (1.00 \times 10^{-2} \text{ m})^2}
\]

\[
h = \frac{5 \text{ N}}{(9.80 \times 10^3 \text{ kg/m}^3 \times 9.80 \times 10^{-4} \text{ m}^2)}
\]

(5)

\[
h = \frac{5 \text{ N}}{3.0772 \text{ kg/s}^2} = \frac{5 \text{ kgm/s}^2}{3.0772 \text{ kg/s}^2} = 1.625 \text{ m}
\]

After getting the final equation that matches the question request, students just need to enter the value of the number listed. However, in the early stages of deriving this equation, the teacher can guide students in order to derive it while still paying attention to the comparability of the dimensions in the two parts of the equation. In the derivation section of this equation, it needs to be done carefully because if at this stage there is a mistake in placing the quantities, it will cause an error in the answer.

3.2.8 Result Analysis. This activity to analyzing the student answer by entering numbers, calculating and checking the results of the calculation to get the right and correct results. Enter numbers according to known parameters in questions with full accuracy to avoid errors, calculate the results of value and variable operations by paying attention to the correct mathematical rules so that the results are considered accurate and check the results of the analysis and calculations to ensure that the answers written are correct and correct. In accordance with the case example presented above, the result analysis stage is applied:

\[
h = \frac{-k\Delta x}{\rho g A}
\]

(6)

\[
h = \frac{100 \text{ N/m}^2 \times (5.00 \times 10^{-3} \text{ m})}{(10^3 \text{ kg/m}^3) \times (9.80 \text{ m/s}^2) \times (1.00 \times 10^{-2} \text{ m})^2}
\]

\[
h = \frac{5 \text{ N}}{(9.80 \times 10^3 \text{ kg/m}^3 \times 3.14 \times 10^{-4} \text{ m}^2)}
\]

(7)

\[
h = \frac{5 \text{ N}}{3.0772 \text{ kg/s}^2} = \frac{5 \text{ kgm/s}^2}{3.0772 \text{ kg/s}^2} = 1.625 \text{ m}
\]

Equations (5) and (6) contain three stages, namely the stages of entering numbers, counting and checking the calculation results for the examination of the results of the calculation and analysis of instructions from the teacher to students to be careful in the analysis and calculation.

3.3. Develop
This stage is the product verification stage of the method being developed. The purpose of product verification is intended to revise the method developed based on the advice of the validator as an expert, with the aim of the effectiveness of the method in achieving learning objectives. Another goal of this develop stage is to choose the best method that helps students and teachers in the physics learning process in the classroom. In this development, the researcher has determined 21 validators consisting of 13 physics education expert lecturers who teach from several campuses in Indonesia and 8 teachers who
teach in several junior high and high school in Sulawesi and West Papua, There from several practitioners and experts from some universities in Indonesia. The indicators used in this validation are:

| Item                                                      | Validity |
|-----------------------------------------------------------|----------|
| Stimulation of motivation, interest or passion for student learning | 0.881    |
| Developmental stimuli for student personality activities.  | 0.762    |
| Provide opportunities for students to create, innovate and explore | 0.821    |
| Train students to learn independently                      | 0.869    |
| Encourage real (factual) learning                         | 0.833    |
| Encouraging the regularity of students’ attitudes in learning | 0.821    |
| Improve student learning skills                           | 0.893    |
| Make it easy for teachers to teach                        | 0.785    |
| Accelerate the process of understanding students          | 0.928    |
| Can adjust to the subject matter                         | 0.893    |
| Simple use of media / learning facilities                 | 0.75     |
| Can guide students’ basic cognitive abilities             | 0.821    |
| Time Efficiency in achieving learning objectives          | 0.797    |
| Make learning assessments easy.                          | 0.773    |

In this development process activity, the validator provides suggestions for improving the developed method scheme. The focus of the validator's suggestions lies in the ability of the method to stimulate student motivation, interest or passion, encourage real (factual) learning, make it easier for teachers to teach and accelerate the process of student understanding. These suggestions emphasize the emphasis on syntax in order to enable the final target of using the method to be achieved, namely the acceleration of students' understanding of the teaching material. The validity coefficient ranges from 0.75 to 0.928. This range indicates that it is above the minimum range at 0.5 so that with this category, it can be concluded that the USA method is valid for use in the learning process.

3.4. Implement
At this stage the researcher tests or implements the resulting development product, namely in the form of a method of solving problems in a fast and precise way called the USA method which consists of three stages, namely the stage of strengthening understanding of the question (Understanding), the visualization stage (Sketch) and the Analysis Stage. This trial activity is carried out on several objects, namely students or students and students in higher education. The number of samples used in this study were 120 high school students from 5 schools, 62 junior high school students from 3 schools and 30 elementary education students in West Papua. This implementation activity begins with the delivery of material delivered by the tutor, then after entering the question practice process and independent assignment to the questions, students are led to go through the three stages that have been designed in the product of this method. Some of the questions that are used as practice questions are solved through teacher or tutor guidance, but some of the questions are in the form of independent assignment questions in class, the teacher only supervises and corrects students' answers when errors are found. In the process of implementing this development product, respondents study diligently and show optimal interest in learning.
3.5. Evaluate

This section is a continuation of the implementation stage as the output of the trial activities using the developed method, namely the results of an evaluation of the effectiveness of the developed method in terms of the responses of students who take part in the learning process using the USA method, the response indicator is representative of a). The accuracy of students' answers, b). Percentage of students' understanding of concepts, sketches and analysis. c). The percentage of students' understanding of the stages of the USA method, d). The speed at which students answered questions, e). Ease of students in learning. The results of this analysis are presented in the following percentages:

| Evaluation Indicators                                      | Percentage  |
|-----------------------------------------------------------|-------------|
| The accuracy of the student's answer                       | 89,13%      |
| Percentage of students' understanding of the concept of teaching material | 98,53%      |
| The percentage of students' understanding of the stages of the USA method | 92,70%      |
| The speed at which students answer questions,              | 87,33%      |
| Ease of students in solving questions                      | 94,82%      |

The results of the evaluation of the use of the USA method reached an average of 92.5%, this percentage shows that the method developed has been maximal in guiding students to get the right answers, supporting students to understand the teaching material, guiding students to understand the USA method and making it easier for students to solve it.

4. Conclusion

It turns out that solving physics problems mainly related to classical mechanics is not as difficult as most students' story materials, we only need a systematic method that is given the acronym USA (understanding, sketching and analysis). At the understanding stage, students interpret and understand the indicators described in the questions, the sketching stage, students make sketches, pictures or other forms of visualization that interpret the parameters and direction of the questions. And the last stage of analysis, namely the activity of entering equation, substituting numbers, calculating looking for answers and checking the correctness of the answers. From the results of the method validation, there is a high level of validity that reaches an average of 0.82 and the percentage of student responses to the use of the method reaches 92.5%, this value also explains that the USA method is valid and effective for use in solving physics problems. The findings are important to contribute to resolving learning difficulties experienced by students and teachers, because if this is allowed, it will have an effect on reducing interest in learning physics or other sciences that use a lot of analysis.

The findings obtained in this study indicate that although the learning method is not the only element that determines the success of learning activities in class. However, the use of the right method with a perfect composition of learning indicators will maximize the teacher's efforts in teaching. So that after this research, the researcher hopes that the next development research that focuses on the formulation of sustainable methods with the USA method in the learning process, because the USA method in this study only focuses on solving problems or physics problems, not yet on the method of transferring knowledge from teachers to students.

5. References

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