Design of Cognitive Conflict-Based Generative Learning Worksheet on Measurement Material to Improve Creative Thinking Ability of Class X High School Learners

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ABSTRACT

Education and learning play an important role in developing individual character and skills. Learning is a process that is specifically designed to help individuals develop their thinking skills. Learning models can be an effective tool to achieve optimal learning. Worksheet will certainly be more effective with the help of learning models in improving student learning outcomes. The problem found is that the use of Worksheet in learning has not helped students to construct new knowledge with old knowledge they already have, the learning model is not optimal for building new knowledge of students and students' creative thinking skills are still relatively low. This research aims to develop a valid and practical cognitive conflict-based generative learning Worksheet. This research uses the Research and Development (R&D) method with the 4D development model (define, design, develop, disseminate). The define stage includes needs analysis and problem identification. At the design stage, the Worksheet was designed by considering the content, structure, and aesthetic components. The develop stage involves validity testing by experts, as well as practicality testing by practitioners and users. Based on the validation and practicality instruments that have been analyzed, it can be concluded that the Worksheet for cognitive conflict-based learning on measurement material produced is valid with Aiken's V of (0.9) with a valid category. While the practicality of educators and students is obtained at (90.1) and (90.4) with a very practical category.

Keywords: Worksheet, Generative Learning, Measurement, Cognitive Conflict, Creative Thinking.

I. INTRODUCTION

In order to develop individual character and skills to face today's global challenges, education and learning have a very important role. As two concepts that are interrelated but have different meanings, education functions as a conscious and planned effort to develop human potential through the teaching process. The purpose of education is not only to improve knowledge but also to instill values, attitudes, and skills needed in everyday life [1]. Learning is defined as a process specifically designed to help individuals develop their own learning activities [2]. Learning that uses a particular learning model can effectively increase learner activeness, helping learners achieve learning goals.

Learning models can be an effective tool to achieve optimal learning. A good learning model is one that encourages students to develop their own knowledge by conducting experiments, solving problems, and working together with the subject matter. The student worksheet is one of the learning resources needed for the chosen learning model. Worksheet is one of the learning alternatives that encourages students to be active and participate in order to achieve learning goals [3]. Worksheet used in education addresses issues that need to be addressed collaboratively in order to develop learning activities that can foster students' creativity in solving problems and allow them to develop the ability to work together in understanding physics concepts [4]. The use of worksheet will certainly be more effective with the help of learning models in improving student learning outcomes.

Learning outcomes describe the process of educational activities to determine the level learning of student. Learning Results demonstrate pupils' competency and achievement levels after participating in educational activities. One of the learning outcomes is that students can understand each step of the learning process, which will improve their understanding and performance. Good learning outcomes also show good student thinking skills. One of the many skills that make up pupils' thinking abilities is their capacity for creative thought. Creative thinking is said to be the ability to create determine something new or find ways to solve problems [5]. Creative thinking is considered the highest level of cognitive processes, which automatically includes all other low cognitive processes.

Based on the initial study, it is known that the situation in the field does not reflect the ideal conditions expected from a learning process. The first fact relates to the lessons offered at school. The learning that is offered has little to do with the students' real world, so it is difficult to encourage them to participate actively in class activities [6]. The second real condition relates to the use of worksheet in schools. The worksheet used at school fails to capture students interest. Worksheet measurement material in schools is not in accordance with the guidelines for making worksheet according to Depdiknas 2008. Based on the existing worksheet in schools, there are components that are missing, including activity instructions, supporting information, and materials.

The third real condition relates to the learning model used during learning. The model for learning used in schools has not encouraged students to get used to building new knowledge. The learning model used is still focused on the educator's explanation so that students are less active in participating to construct their knowledge. So the weakness of the learning model used by educators is the absence of students' active involvement in the educational process. The fourth real condition related to the creative thinking ability of students obtained from their learning outcomes remains comparatively low. This condition is obtained from the analysis of spupils' learning outcomes at SMAN 1 Koto Balingka. These results are obtained from the End of Semester Assessment (PAS) data of Class X Phase E of the 2023/2024 School Year with an average of 52.32%, and the creative thinking ability of students obtained from the initial test results with an average of 44.4% is categorized as low. Additionally, the findings of a survey given to students regarding their capacity for creative thought in the low category with a value of 42.5%.

Based on several literature studies, learning outcomes have a close relationship with students' creative thinking skills. Based on [7] shows that creative thinking ability affects students' learning outcomes and is positively correlated. Then, based on [8] also discovered that students' learning outcomes are significantly impacted by their capacity for creative thought. Furthermore, [9] discovered a favorable correlation between students' cognitive learning outcomes and their capacity for creative thought.

Based on several factors of the problems that occur, the solution presented is to use learning that can encourage students to find new knowledge. So, students can construct the new knowledge with the knowledge they already have, which in turn can improve students' capacity for original thought in resolving practical issues [10]. One of the suitable teaching materials used in learning that encourages students to discover new knowledge is worksheet.

Learner worksheets are learning tools in the form of a set of materials related to agreed tasks. The aim is to make it easier for students to learn the material independently, so that there is more effective interaction between students and increase their level of creativity [11]. The following are the things listed in worksheet: title, activity objectives, material, information, tools and materials, activity duration, and tasks that must be done after the practicum activity is completed [12]. Effective use and utilization of worksheet will increase students' understanding and responsiveness [13]. In other words, worksheet is a set of guidelines that outline the activities to be carried out during the long-term learning process.

In learning, worksheet is very effective in overcoming students' learning difficulties. Therefore, worksheet is described by providing clear illustrations and up-to-date information about the material and questions [14]. Worksheet can be used to train independence, self-awareness, discipline, responsibility, and self-control [15]. The conditions and circumstances of the learning activities that will be implemented are taken into consideration when designing and developing worksheet. As a result, worksheet in learning activities would facilitate students' independent and active learning so they can comprehend the material.

Generative learning means that knowledge is obtained by learners from the construction of their knowledge, which comes from new experiences related to existing knowledge [16]. Generative learning is said to be able to help students reach their learning objectives, where students actively participate in the learning process and develop knowledge from information that serves as both their initial understanding and their own knowledge. As students develop their own knowledge, their level of engagement will increase with the use of educational technologies the learning process [17]. Generative learning encourages students to actively participate in the learning process to understand facts and concepts as well as new principles that are connected to the knowledge students already have and the new knowledge they acquire.

Cognitive conflict learning strategy, formed due to conceptual conflict in the minds of learners. Cognitive conflict is a challenging phase for learners to test the truth of their initial conception compared to the conception

of scientists [18]. The three primary components of cognitive conflict strategy collaboration, reformulation, and awareness are essential to the learning process. Cognitive conflict technique has the following benefits: it pays attention to learners' conceptions, observes the relationships between concepts, actively engages learners to help them understand the concept, correctly embeds new concepts, and lasts for a long time [19]. Therefore, cognitive conflict can be employed to make students feel motivated to study new things in order to increase their knowledge.

Generative learning model applied with cognitive conflict strategy encourages learners to focus on the problem solving process by exploring various information to define their own concepts by following appropriate instructions on achieving learning objectives [10]. Generative learning is learning that focuses on previously learned concepts, which will then form new concepts.

There are six stages in generative learning: 1) The orientation stage aims to attract attention and increase the activity of students' understanding of the topic to be discussed. 2) The cognitive conflict stage aims to help learners recognize misunderstandings in the material. 3) The disclosure stage aims to trigger learners to think about problem solving ideas. 4) The construct stage aims to build concepts in accordance with scientific concepts based on ideas that have been put forward and evaluate and classify ideas. 5) The application stage aims to verify and refine the design/knowledge that has been designed and think in various dimensions critically and creatively to solve problems. 6) The reflection and evaluation stage aims to provide feedback on events, activities, knowledge received and process evaluation and correction of weaknesses in the knowledge development process [19].

The advantages of generative learning are that students are provided with the chance to share their thoughts, understandings and communicate their opinions on learning concepts. Learners are also given the opportunity to be active and creative in constructing their own knowledge. Meanwhile, the weakness of generative learning is that passive learners feel terrorized to construct concepts and require a relatively long time [20].

Based on the need for the significance of instructional resources that are beneficial to students in cognizing their thinking abilities, the design research of worksheet was conducted. The goal objective this study is to generate a generative learning worksheet using cognitive conflict on measurement material to enhance the high school students in class X's capacity for creative thought who are valid and practical to use during the school's physics lesson.

II.   METHOD

This research uses the *Research and Development* (R&D) research type. Research is needed to design a product. The product design resulting from this research is a generative learning worksheet based on cognitive conflict on measurement material to improve the creative thinking skills of grade X high school students. Making worksheet in this study uses the 4-D model which is reduced to 3-D. According to [21] the 4-D model consists of 4 main stages, namely: 1) *Define*; 2) *Design*; 3) *Develop*; and 4) *Disseminate.*

The *Define* stage aims to establishing and defining the needs and prerequisites for learning. There are five primary processes in this stage, including initial analysis and learner analysis, which examines the traits of students as observed in field research. Learners, task analysis, idea analysis, and learning objective formulation all occur during the learning process. The goal of the design phase is to create educational resources. The choice of media, format, and worksheet 's original design are the three steps that make up this stage. The goal of the development stage is to create a product. At this stage, product validation will be carried out with the intention of providing an assessment of the product that has been made. Furthermore, the product is tested to experts to find out the shortcomings of the worksheet to be corrected according to the suggestions and comments from the expert team until the product is declared good and suitable for use by students.

Validation sheets and practicality sheets were the tools utilized to gather data for this investigation. The validity sheet is used to assess the validity of the generative learning worksheet, conversely the practicality sheet is utilized to evaluate the feasibility of the generative learning worksheet and see whether the generative learning worksheet can develop students' creative thinking skills. This validity instrument is used in research after conducting product design aimed at validators, namely experts from Physics lecturers at FMIPA UNP by providing an assessment of the developed worksheet. The practicality instrument contains statements about the product developed to determine the level of practicality of the product.

The data analysis technique used to determine the validity and practicality of the generative learning worksheet is quantitative data analysis. The validation and practicality sheets used are arranged based on a Likert scale, as in Table 1.

Table 1. Likert Scale

Likert Scale	Assessment
1	Strongly Disagree

2	Disagree
3	Simply
4	Agree
5	Strongly Agree

[22]

The validator's assessment of each question assessed was then analyzed using the validity index compiled by *Aiken's V*. The validity data obtained was analyzed using *Aiken's V* validity index formulated as follows:

$$V = \frac{\sum S}{[n(c-1)]}, dengan\ S = r - l_0$$

Description;

V = Rater agreement index

S = the smallest score in the category used and set by the validator

r = the number given by the validator

l_0 = the lowest validity rating number

c = the highest validity rating number

n = number of validators

The criteria used in determining the validity of worksheet can be seen in Table 2.

Table 2. Aiken's V Validity Criteria

Interval	Assessment
$V < 0,8$	Invalid
$V > 0,8$	Valid

(Source: Ref[23])

The technique of analyzing the practicality of this generative learning worksheet is based on the assessment of educators and students. The assessment instrument that has been filled in by educators and students is then processed using a percentage technique with the equation:

$$Nilai = \frac{skor\ yang\ diperoleh}{skor\ maksimum} \times 100\%$$

The scores given by educators and students are calculated based on these instructions then the final results are matched with a Likert scale table. The categories used to determine the practicality of the product can be seen in Table 3.

Table 3. Practicality Level Decision

Interval	Criteria
80-100	Very practical
66-79	Practical
56-65	Simply
40-55	Less
30-39	No

[24]

III. RESULTS AND DISCUSSION

Results

The *define* stage is the initial stage that aims to obtain information about the state of students, problems in learning, methods used by teachers, media and teaching materials and other supports used in learning. Based on the results of distributing questionnaires obtained information that the learning process takes place with the *expository* method. Learning takes place using student book teaching materials and rarely teachers make worksheet. Student learning is limited to recording, writing and memorizing so that the cognitive learning outcomes of students are low.

The *design* stage includes several steps, namely, media selection, format selection and initial design. This stage aims to draft the worksheet that will be used for students. Cognitive conflict-based generative learning worksheet on measurement material to be developed. The development stage, this stage is continued to produce generative learning worksheet's on measurement material for class X phase E SMA. This stage involves validity and practicality tests.

The results of the validation carried out based on the assessment of the worksheet generative learning measurement material on all components can be seen in Table 4.

Table 4. Results of Validity Test Analysis by Validators

No.	Aspects	Average Aiken's v score	category
1.	Feasibility of worksheet	0,91	Valid
2.	Structure of worksheet	0,91	Valid
3.	Generative learning steps	0.88	Valid
	Average	0,9	Valid

The validation results in the table above show that the developed worksheet is valid. This shows that the generative learning worksheet both from the three assessments, the feasibility of worksheet, worksheet structure and generative learning steps are valid. The learning process can make use of this legitimate worksheet, the average validity of the generative learning worksheet is 0.9. During the validation process, the validator provided several suggestions in the form of input so that the developed product becomes more feasible.

After the product has been developed and validated by the validator, then the practicality stage is carried out with educators and students. The practicality test is a test conducted at the worksheet phase of development that seeks to ascertain the value and usability of the worksheet created. Practicality data is obtained from a questionnaire that has been filled in by educators and students.

The results of the practicality test filled in by practitioners on the ease of use of worksheet can be seen in Table 5.

Table 5. Data Analysis of Educator Practicality towards Ease of Use of Worksheet's

No.	Statement	Practicality Score (%)	Practicality category
1.	WORKSHEET instructions are easy to understand	100	Very practical
2.	The developed material is easy to implement	90	Very practical
3.	Statements at the orientation stage are easy to implement	90	Very practical
4.	Statements at the cognitive conflict stage are easy to implement	80	Very practical
5.	Statements at the disclosure stage are easy to implement	80	Very practical
6.	The statements at the construct stage are easy to implement.	80	Very practical
7.	The statements at the implementation stage are easy to implement.	80	Very practical
8.	The statements at the reflection stage are easy to implement.	100	Very practical
9.	Statements at the evaluation stage are easy to implement	90	Very practical
	Average	87,8	Very practical

The data from table 5 on the ease of use component obtained an average value of practicality filled by educators of 87.8%.

The results of the practicality test filled in by practitioners on the attractiveness of worksheet can be seen in Table 6.

Table 6. Data Analysis of Educator Practicality on Worksheet Attractiveness

No.	Statement	Practicality Score (%)	Practicality Category
1.	The display on the worksheet cover is interesting	100	Very practical
2.	The content of worksheet is easy to understand	80	Very practical
3.	The font type on the worksheet is clear	100	Very practical
4.	The appearance of worksheet uses an attractive color combination	90	Very practical
	Average	92,5	Very practical

The data from table 6 on the attractiveness component obtained an average value of practicality filled by educators of 92.5% with a very practical category.

The results of the practicality test filled in by practitioners on the clarity of the worksheet can be seen in Table 7.

Table 7. Data Analysis of Educator Practicality on Worksheet Clarity

No.	Statement	Practicality Score (%)	Practicality Category
1.	Learning outcomes are clear	90	Very practical
2.	Learning objectives are clear	80	Very practical

No.	Statement		Practicality Category
3.	The instructions for using the worksheet are clear	100	Very practical
4.	The instructions given in the worksheet are clear	90	Very practical
	Average	90	Very practical

The data from table 7 on the clarity component obtained an average value of practicality filled by educators of 90% with a very practical category.

The results of the practicality test filled in by practitioners on the benefits of worksheet can be seen in Table 8.

Table 8. Data Analysis of Educator Practicality on the Benefits of Worksheet

No.	Statement	Practicality Score (%)	Practicality Category
1.	Worksheet can be used as a tool to support self-learning	100	Very practical
2.	Worksheet can help understand the concept of measurement	80	Very practical
3.	Worksheet can be used to facilitate learning	90	Very practical
	Average	90	Very practical

The data from table 8 on the benefits component obtained an average value of practicality filled by educators of 90% with a very practical category.

The results of the practicality test filled in by practitioners on the implementation of creative thinking skills can be seen in Table 9.

Table 9. Data analysis of educators' practicality on the implementation of creative thinking skills

No.	Statement	Practicality Score (%)	Practicality Category
1.	Worksheets help learners to clearly express as many correct ideas as possible.	90	Very practical
2.	Worksheets help learners to come up with many or diverse ideas	100	Very practical
3.	Worksheets help learners to come up with ideas or ideas that are unique and unusual.	90	Very practical
4.	Worksheets help learners to explain factors that add detail to an idea or ideas	80	Very practical
	Average	90	Very practical

The data from table 9 on the implementation component of creative thinking skills obtained an average value of practicality filled by educators of 90% with a very practical category. The results of the practicality value of the five test components consisting of; 1) ease of use component, 2) attractiveness, 3) clarity 4) benefits and 5) implementation of creative thinking skills. Can be seen from Table 10.

The results of the practicality filled by educators on the generative learning worksheet are presented in Table 5.

Table 10. Results of Practicality Test Analysis by Educators

No.	Statement	Average Practicality Score (%)	Practicality Category
1.	Ease of use	87,8	Very practical
2.	Attractiveness	92,5	Very practical
3.	Clarity	90	Very practical
4.	Benefits	90	Very practical
5.	Implementation of creative thinking skills	90	Very practical
	Average	90,1	Very practical

The results of practicality in table 10 can be concluded that in all aspects of the practicality of the product the educator's response shows that the developed worksheet is very practical. This demonsrates that the generative learning worksheet both from the elements of usability, attractiveness, clarity, benefits and implementation of creative thinking skills are practical. This practical worksheet can be applied to the process of learning. The average value of the practicality of the learning worksheet for Phase E SMA is 90.1%.

Furthermore, the practicality is carried out on students. The results of the data analysis of the practicality assessment of the generative learning worksheet from students.

The results of the practicality test filled in by students on the ease of use of worksheet can be seen in Table 11.

Table 11. Data Analysis of Practicality of Learners on Ease of Use of Worksheet

No.	Statement	Practicality Score (%)	Practicality Category
1.	I easily understand the instructions for use at each stage in the worksheet	88	Very practical
2.	I easily understand the material that has been presented in the worksheet	92	Very practical
3.	I can follow directions regarding the concepts to be learned with the help of worksheets	87	Very practical
4.	I can understand the problems or statements in the conflict with the help of worksheet.	89	Very practical
5.	I can express my ideas with the help of worksheet	89	Very practical
6.	I can do construct activities with the help of worksheets	88	Very practical
7.	I can apply the results contained in the constructs that have been carried out with the help of worksheets.	86	Very practical
8.	I can reflect on learning with the help of worksheets	89	Very practical
9.	I can follow the learning evaluation with the help of worksheet	88	Very practical
	Average	88.4	Very practical

The data from table 11 on the ease of use component obtained an average value of practicality filled in by students of 88.4% with a very practical category.

The results of the practicality test filled in by practitioners on the attractiveness of worksheet can be seen in Table 1.

Table 12. Data Analysis of Practicality of Learners on the Attractiveness of Worksheet

No.	Statement	Practicality Score (%)	Practicality Category
1.	The display on the worksheet cover is interesting	89	Very practical
2.	The content of worksheet is easy to understand	89	Very practical
3.	The font type on the worksheet is clear	91	Very practical
4.	The worksheet display uses an attractive color combination	92	Very practical
	Average	90,3	Very practical

The data from table 12 on the attractiveness component obtained an average value of practicality filled in by students of 90.3% with a very practical category.

The results of the practicality test filled in by practitioners on the clarity of the worksheet can be seen in Table 13.

Table 13. Data Analysis of Practicality of Students on the Clarity of Worksheet

No.	Statement	Practicality Score (%)	Practicality Category
1.	Learning outcomes are clear	87	Very practical
2.	Learning objectives are clear	87	Very practical
3.	The instructions for using the worksheet are clear	94	Very practical
4.	The instructions given in the Worksheet are clear	93	Very practical
	Average	90,8	Very practical

The data from table 13 on the readability component obtained an average value of practicality filled in by students of 90.8% with a very practical category.

The results of the practicality test filled in by practitioners on the benefits of worksheet can be seen in Table 1.

Table 14. Analysis of student practicality data on the benefits of Worksheet

No.	Statement	Practicality Score (%)	Practicality Category
1.	Worksheet can help me learn on my own	92	Very practical
2.	Worksheet can help me understand the concept of measurement	93	Very practical
3.	Worksheet can help me in the learning process	94	Very practical
	Average	93,1	Very practical

The data from table 14 on the benefits component obtained an average value of practicality filled in by students of 93.1% with a very practical category.

The results of the practicality test filled in by practitioners on the implementation of creative thinking skills can be seen in Table 15.

Table 15. Data analysis of students' practicality on the implementation of creative thinking skills

No.	Statement	Practicality Score (%)	Practicality Category
1.	Worksheets help learners to clearly express as many correct ideas as possible.	92	Very practical
2.	Worksheets help learners to come up with many or diverse ideas	88	Very practical
3.	Worksheets help learners to come up with ideas or ideas that are unique and unusual.	88	Very practical
4.	Worksheets help learners to explain factors that add detail to an idea or ideas	89	Very practical
	Average	89,2	Very practical

The data from table 15 on the implementation component of creative thinking skills obtained students' average practicality score was 89.2%, with a very practical category. The results of the practicality value of the five test components consisting of; 1) ease of use component, 2) attractiveness, 3) clarity 4) benefits and 5) implementation of creative thinking skills. Can be seen from Table 16.

Table 16. Results of Practicality Test Analysis by Learners

No.	Statement	Average Practicality Score (%)	Criteria
1.	Ease of use	88,4	Very practical
2.	Attractiveness	90,3	Very practical
3.	Clarity	90,8	Very practical
4.	Benefits	93,1	Very practical
5.	Implementation of creative thinking skills	89,2	Very practical
	Average	90,4	Very practical

The results of practicality in Table 6 can be concluded that in all aspects of the practicality of the product the educator's response shows that the developed worksheet is very practical. This shows that the generative learning worksheet is good from the aspects of ease of use, attractiveness, clarity and practical benefits. This practical worksheet can be used in the learning process. the average practicality value of learning worksheet for Phase E SMA is 90.4%. Based on this analysis, an average value of 90.4% was obtained. This proves that the students' assessment based on the students' response questionnaire has a relevant relationship. Generative learning worksheet on measurement material is useful and practical for students.

Discussion

This study aims to develop a valid and practical generative learning worksheet for class X Phase E high school students, especially on measurement material. The development process uses the 4-D model in which there are stages of *define*, *design*, *develop* and *disseminate*. Each stage has an important role in ensuring that the worksheet developed can meet the needs of effective learning and in accordance with the independent curriculum. At the *define* stage, initial analysis showed that generative learning worksheets were needed at SMAN 1 Koto Balingka, with 91.41% of educators expressing support for the development of worksheets.

This validity assessment is obtained through various indicators developed according to the phases of the generative learning model, starting from the orientation stage to the reflection and evaluation stage. Each of these stages makes an important contribution to the worksheet and ensures that the worksheet can guide learners gradually through an active and participatory learning process.

At the orientation stage, the worksheet begins with an opening question and relevant context to attract students' focus on the material to be learned. Based on the validation results, the orientation stage of the worksheet received a validation index value of 0.88 which is categorized as valid. This value indicates that the orientation component in the worksheet has been designed in accordance with the aim of arousing the curiosity of students. Learning begins with relevant activities and also helps learners link new concepts with prior knowledge [16].

The cognitive conflict stage aims to provide challenges that encourage learners to question their initial understanding through problems that trigger creative thinking. Considering the outcomes of the verification of the cognitive conflict stage gets a validation index of 0.88 which is categorized as valid. Cognitive conflict triggers concept change, helps learners recognize misconceptions and encourages students to improve processing

of irrelevant stimuli [18]. High validity at this stage indicates that the worksheet has successfully facilitated learners in overcoming intellectual challenges that increase their activeness in learning.

The idea disclosure stage provides space for learners to express ideas, test ideas and discuss new ideas with their peers. This stage obtained a validation index value of 0.88 which is categorized as valid. This value indicates that this stage provides opportunities for learners to convey their understanding freely and discuss. This stage helps learners expand their understanding and learn from their peers' ideas [19]. The high validity at this stage confirms that the worksheet has accommodated learners' involvement in meaningful and collaborative discussions.

The construct stage on the worksheet allows students to build understanding independently through experimental activities. Based on the validation results, the construct stage of the worksheet received an index value of 0.88 which is categorized as valid. This index value indicates that the worksheet has facilitated learners with activities that allow them to form new knowledge independently, according to the guidelines of generative learning.

The application stage gives giving pupils the chance to put their knowledge into practice constructed in real situations or the context of everyday life. The validation results show that the application stage in the worksheet obtained an index value of 0.88 which is categorized as valid. This stage provides an opportunity for learners to solve problems through the application of concepts that have been learned [25].

The reflection and evaluation stage provides opportunities for learners to assess their own understanding, evaluate the learning process and identify concepts that still need to be improved. Based on the validation results, the reflection and evaluation stage obtained an index of 0.94 and 0.88 which were categorized as valid. This stage provides an opportunity for learners to evaluate and correct weaknesses in the knowledge formation process [25].

In addition to the validity test, the developed worksheet was also tested for its practicality. Validity and practicality tests are evaluations of the practical use of a product developed. Based on the results of the practicality test of 5 components, namely: ease of use, attractiveness, clarity, benefits and implementation of creative thinking skills, the assessment conducted by educators averaged 90.1% with a very practical category. With a very practical category, the students' assessment yielded an average practicality value of 90.4%.. This high practicality value indicates that the generative learning model can increase the involvement of active and participatory students in learning. This shows that the generative learning worksheet product on measurement material is practical and data is utilized by educators and students in the learning process.

Overall, this study shows that generative learning worksheet based on cognitive conflict on measurement material can improve the creative thinking ability of grade X high school students. The assessment of validity and practicality by educators and students shows that this worksheet is prepared for more field testing to provide the achievement of students' competencies in learning Physics.

IV. CONCLUSION

According to the study's findings, the worksheet generated has demonstrated a sufficient degree of validity and applicability, specifically: The Aiken's V index of 0.9, which signifies the validity of the worksheet, was attained. Teachers evaluated the worksheet's practicality at 90.1%, while students scored 90.4% in the highly practical category.

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