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Development of problem-based learning worksheets combined with the make a match cooperative model to enhance students' critical thinking skills in biology

Sari Putri Ramadani Tambunan*), Khairuna Khairuna
Tadris Biology, Universitas Islam Negeri Sumatera Utara, Medan, Indonesia

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ABSTRACT

This study aims to (1) produce Problem Based Learning-based Learning Worksheets combined with Make A Match which is feasible to use based on expert judgment assessment (2) to determine the effectiveness of Problem Based Learning-based Learning Worksheets combined with Make A Match and (3) to determine the practicality of Problem Based Learning-based Learning Worksheets in training students' critical thinking skills in the biology subject X-MIA virus material at MA Laboratorium Uinsu. This research is a development research with the 4-D model which consists of four stages, namely, define (defining), design (planning), develope (development), and disseminate (dissemination). Data collection was obtained through product feasibility validation results, student and teacher responses, as well as pretest and posttest with N-Gain analysis. The results showed that: (1) Problem Based Learning Learning Worksheets combined with Make A Match to train critical thinking skills is declared feasible to be used by students as learning media with a 99% media validation score, 91% material validation score. (2) The effectiveness of Problem Based Learning Learning Worksheets combined with Make A Match in training students' critical thinking skills based on the results of the N-Gain analysis obtained a result of 0.7 with a high critical thinking level category with the criteria "very effective" problem-based Learning Worksheets is effective in training critical thinking skills. (3) The practicality of Problem Based Learning Learning Worksheets combined with Make a Match in training critical thinking skills based on the results of questionnaire responses by students and teachers shows that student responses obtained a final result of 90% in the "very practical" category and teacher responses obtained a final result of 91% in the very practical category.

Corresponding Author:

Sari Putri Ramadani Tambunan,
Universitas Islam Negeri Sumatera Utara
Email: sariputriramadanitambunan@uinsu.ac.id

Introduction

The higher level of global competition makes every individual must be able to master knowledge and technology that continues to grow faster and more sophisticated, the delivery of knowledge also requires access to arrive at the desired destination. (Masfufah, 2022). To achieve this target, the abilities that must be possessed by students or the school itself must produce graduates who master various 21st Century competencies. One of the competencies in question is Critical Thinking Skills Critical thinking skills.

Learning in the 21st century which involves real-world experiences and the ability to collaborate with others provides opportunities for learners to construct and organize their own knowledge, actively engage in research activities, actively ask questions, write, and analyze, as well as the ability to communicate effectively with others.(Mahrunnisya, 2023).

The ability to think critically is the ability to analyze, measure, evaluate, construct, and convey ideas that influence logical and rational data. In the context of education, this is very important because it allows people to solve problems effectively.(Rahardhian, 2022). The concept of critical thinking skills based on opinions from various experts, namely the habit of analyzing, synthesizing, and evaluating information to solve problems. Furthermore, (Ennis, 2011) defines critical thinking as encouraging self-regulation. Provide simple explanations, build basic skills, draw conclusions, provide further explanations, and organize strategies and tactics. Critical thinking includes activities such as analyzing, synthesizing, creating, reflecting, creating, and applying new knowledge in the real world. (Hamdani et al., 2019)

In the teaching and learning process, biology learning also has problems in general, namely the delivery of material that is still theoretical which should be delivered based on facts or real problems in students' daily lives. Biology learning is closely related to finding out information and developing that information, so that students are expected to be able to overcome the problems that occur. (Farida Kusumawati, 2019).

Other problems faced by the Medan City Private MA school , Based on the results of observations made by researchers at one of the Private MAs in Medan city by conducting interviews with class X biology teachers, it is known that the problems in stating the low learning outcomes of biology due to the lack of critical thinking levels experienced by students and in class assessments there are still some students who have not reached the kkm value. In addition, the teacher also still adheres to a traditional learning system where students tend to only be involved in recording learning material, without providing more stimulation that encourages students to think critically. Furthermore, it is known that this problem occurs because the learning approach taken by the teacher does not involve students in learning activities and has not implemented learning models, which are more likely to be dominated by the teacher (Teacher Center Approach) and learning resources have not used Learning Worksheets. Researchers know that the level of critical thinking of students is still low because at the time of pre-research, researchers tried one of the indicators of critical thinking students could not explain or identify the problems given by researchers. It can be seen from the results of the scores that researchers gave to students when researchers interned at the school which is still fairly low. Based on these problems, the need for Learning Worksheets teaching materials used by applying the PBL learning model. Another problem is the lack of readiness of students to argue and come forward, some students are afraid to express their opinions or come forward. This inhibits critical thinking skills. One of them is because the learning model is still teacher-centered approach. Further analysis of this issue was conducted who concluded that the use of the lecture approach in teaching allows students to be treated as learners and observers, and it also makes them more capable of critical thinking. However, the lecture method is still essentially the main approach in education.

One way that can overcome this and is thought to be able to solve the problem is by applying a learning model that can develop students' critical thinking skills emphasizing the provision of direct learning experiences, students are more active to discuss in improving students' thinking skills including the Problem Based Learning learning model combined with Make a Match.

Problem Based Learning (PBL) is a problem-oriented approach that contains contextual characteristics as one of the contexts for students to learn about critical thinking and problem solving skills aimed at acquiring new knowledge. The make a match learning model is a cooperative learning model by finding the right pair of questions or answers and students who have found their partner before the time limit will be given points.(Purnomo, 2021). According to (Fauhah & Rosy, 2020) In applying the make a match learning model, it is hoped that students will not only listen but students will be active and motivated in the lesson, and students can interact with each other in working with other students so that learning outcomes increase.

Teaching materials are information in the form of systematically arranged texts or tools that cover the competencies that students must master for use in planning and reviewing the implementation of learning. Teaching materials have a very important role in improving the quality of education and its quality. Learner Activity Sheets (Learning Worksheets) are teaching materials that involve the activeness of students during the learning process. This teaching material must be well chosen and in accordance with the material. Learner Activity Sheet (Learning Worksheets) is a form of teaching material with printed media which is expected to be an alternative to support the learning process, especially in learning biology. Learning Worksheets can provide new concepts for students in formulating and solving problems found. The Problem-

Based Learning (PBL) model is one of the interesting and innovative learning models that can involve students in the problem-based learning process (Krisgiyanti, 2023). Practice can be an alternative to support the learning process, especially in learning (Krisgiyanti, 2023).

Research on the development of Problem Based Learning Learning Worksheets on critical thinking has been done a lot. However, the development of Learning Worksheets is still focused on other subjects, such as Abdillah (2020) in mathematics, namely the development of problem-based Learning Worksheets on the topic of angles. Furthermore, Krisgiyanti's research (2023) on the material of the regulatory system is the development of a problem-based learning activity sheet (Learning Worksheets) based on problem-based learning (pbl) on the material of the regulatory system with the orientation of the learning outcomes of high school students n 1 kroya. Furthermore, in the research of Khovivah et al (2022), namely the Development of Problem Based Learning Based Learning Worksheets and its Effect on Students' Critical Thinking Skills.

In connection with the application of the PBL learning model, researchers combine it with Make a Match. The Make a match method is one of the learning methods that uses question and answer cards, related to critical thinking encourages collaboration between students and in-depth discussions by asking students to match cards based on the problems obtained and involves students discussing in groups. the Make a match method in this study serves as a facilitator in solving problems related to students' critical thinking skills. besides students can think critically and actively it also helps students more easily solve problems. So it is suitable to be combined with PBL. The make a match cooperative method is also able to create a non-monotonous atmosphere when asking students to be able to think critically in solving problems.

Therefore, PBL which is only related to critical thinking will be more fun when combined with the cooperative method of Make A Match. Therefore, researchers have the opportunity to develop PBL-based Learning Worksheets combined with Make A Match. This kind of research needs to be done so that teachers can use Learning Worksheets in learning and students are able to think critically in the 21st century, especially in learning Biology, besides that the results of this study can also be used as an example by teachers to choose a learning model so that students are more enthusiastic and interested in participating in learning.

Method

The research method used in this research is Research and Development (R&D). The Research and Development (R&D) method is a research method used to produce certain products. This research and development model is used to develop a product by validating products that will be used in the educational environment (Sugiono., 2013: 297). The research and development model used is using the 4D design (Define, Design, Development, and Disseminate) which is a research and development method in the field of education. Researchers chose to use this development research method because it produces a certain product that has been tested for the effectiveness of the product. And the reason researchers use 4D design is because this design is arranged programmatically with a systematic sequence of activities in an effort to solve learning problems tailored to the needs and characteristics of students.

Research and development procedures The stages of 4D research and development are as follows: 1) Define This stage is a stage to establish and define the requirements needed in learning development. The formulation of learning objectives is useful for summarizing the results of concept analysis and task analysis to determine the behavior of the object of research. Concept analysis produces Competency Achievement Indicators on Basic Competencies for KI 3 and task analysis produces Basic Competency Achievement Indicators for KI 4. Thus producing learning objectives to be achieved. This stage includes 5 main steps, namely: (a) initial and final analysis, (b) student analysis, (c) task analysis, (d) concept analysis and (e) learning objective problems; 2) Design stage At this stage, the preparation of Learning Worksheets based on critical thinking skills will be carried out. The components of the Learning Worksheets developed include: (1) title, (2) identity of learners, (3) Core Competencies, (4) Basic Competencies, (5) indicators of competency achievement, (6) learning objectives, (7) work instructions, (8) learning steps The steps of working on Learning Worksheets are based on the syntax of the problem-based learning model combined with make a macth with critical thinking indicators; 3) Development stage The purpose of this stage is to produce teaching materials that have been revised based on experts, especially the supervisor. This stage includes 3 stages, namely: Learning Worksheets revision under the guidance of supervisors and validation from media experts, material and language experts. After the initial product has been developed, the next step is to validate it. Validation was carried out by media experts and material experts. The data analysis technique to measure the quality of the Learning Worksheets is by converting the data in the form of scores into percentages; 4) At this stage includes teaching materials that have been tested in small groups in the classroom, the teaching materials are ready to be tested in large groups for production, but in this study this

stage was carried out and distributed only on a small scale. The dissemination was carried out at Ma Laboratorium Uinsu, the dissemination was carried out in one class containing 43 students.

The data analysis technique in the study aims to obtain valid, practical and effective Learning Worksheets by using quantitative data (validity, practicality and effectiveness), as well as qualitative data (comments, criticisms and suggestions) and Quantitative Data Analysis. The validity analysis uses the results of validators from media expert validators and material experts. Later the sheet is validated first by the instrument validator. Then validation is carried out by each validator, the validation results are analyzed Likert Scale Rating Guidelines (Sugiyono, 2015) that is Strongly agree, Agree, Disagree, Strongly disagree. Based on the research of Ikhwani & Kuntjoro (2021), explaining the formula 1 used by the percentage of product success as follows. Index $100\% = \frac{\text{skor yang diperoleh}}{\text{Jumlah skor maksimal}} \times 100\%$. From the validation results, the percentage is then calculated based on the criteria Validity Assessment (Sugiyono, 2015), that is 67-100 Very valid, 56-75 Valid, 40-55 Valid Enough, 0-39 invalid. The analysis of the practicality of the Learner Worksheet can be seen based on the results of student and teacher responses regarding the implementation of the learning stage Practicality Criteria (Sugiyono, 2015) that is 81%-100% Very practical, 61%-80% Practical, 41%-60% Practical enough, 21%-40% Very impractical.

The pretest and posttest results and the development of critical thinking are the focus of the effectiveness analysis. If the post-test score is higher than the pre-test score then the Learner Worksheet is said to be effective. This is calculated using the formula for classical student completeness. The data was then converted based on the effectiveness assessment criteria With the formula: $\text{N} - \text{Gain} = \frac{\text{nilai posttest} - \text{nilai preetest}}{\text{Nilai maksimal} - \text{nilai pretest}}$. Effectiveness Criteria (Arifatun et al., 2015), that is G≥0,7 category High criteria Highly Effective, $0{,}3 \leq g < 0{,}7$ category Medium criteria Effective, $G < 0{,}3$ category Low criteria Less Effective.

Results and Discussion

This research is a study that produces a product called Problem Based Learning-based Learning Worksheets combined with Make A Match. This product has the following specifications: The activities carried out in it are carried out in groups, able to create active learning through two-way communication, product design is made as attractive as possible by considering color gradations, images, and writing fonts, and the presentation of questions in the product based on problems relevant to the material. This product is designed so that students are more active in the learning process and can develop their knowledge through Learning Worksheets activities. The activities include problem-based learning steps consisting of problem orientation, organizing investigations, investigating problems, formulating solutions, and evaluating or concluding to train analytical and problem-solving skills to produce the right decision with the final stage combined with Make A Match syntax. Thus through these activities students can train critical thinking skills. The stages that have been carried out by the author include:

Define Stage

At this stage several steps are carried out, the first step is the Final Initial Analysis at this stage an analysis of learning problems in learning is carried out using an interview sheet, and the history of media aspects, learning tools, and the condition of students in participating in biology learning. The results of the interviews conducted are known that teachers use the 2013 curriculum, and the teaching material used by teachers in teaching virus material is the Biology book for high school/MA class X. Then during learning, teachers have never used Learning Worksheets as teaching materials and still use conventional learning methods. The second step is student analysis at this stage is carried out to find out how much students are interested in participating in the Biology learning process on virus material in class. Based on the results of the first analysis, where teachers who still use conventional methods result in students who are less active in learning biology.

The third step is task analysis, at this stage it is carried out to adjust the learning material that will be displayed on the Learning Worksheets with a learning model that matches the syntax of PBL combined with Make A Match. The PBL stages that are the basis for the preparation of this Learning Worksheets are 1) Orient students to problems. 2) Learning organization. 3) Conduct independent and group investigations. 4) Developing and presenting the work. 5) Analyzing and evaluating the problem-solving process in this fifth stage is included in the Make A Match syntax. The stages of Problem Based Learning combined with Make A Match for more details can be seen in the table 1.

Table 1 <Stages of Problem Based Learning>

Phase	Teacher Behavior
Student's orientation to problems	The teacher explained the learning objectives, explained the logistics needed. Motivating students in problem-solving activities problem.
Organize students to learn.	Help students define and organize learning tasks related to the problem.
Guiding individual and group investigations with	Teachers guide investigations and conduct investigations from various sources to answer problem-solving questions in Learning Worksheets.
Developing and presenting the results of the property.	The teacher helps students to plan and prepare appropriate works such as reports, videos, models and helps students to share assignments with their friends.
Analyze and evaluate the problem-solving process. Make A Match Strategy	The teacher reviews the students' understanding of the material that has been learned by holding a game to find the right pair of cards by giving the question and answer cards

The fourth step is Concept analysis, at this stage the researcher presents important concepts that are relevant to the material used. The fifth step is the formulation of learning objectives, researchers can determine the specifications of learning objectives, namely encouraging students to be actively involved in learning biology, so that through challenging biology learning can train students' critical thinking skills.

Design Stage

At this design stage, the components that make up the product start from the appearance of the product, material, image presentation, and implementation instructions.

Product Development Stage

At the preparation stage, researchers began designing Problem Based Learning-based Learning Worksheets combined with Make A Match based on Learning Worksheets components in terms of appearance, content, language, and suitability of Learning Worksheets with problem-based learning models. Product preparation begins with the Learning Worksheets cover, presentation of core competencies, basic competencies, indicators, learning instructions, presentation of material along with relevant image media, learning activities with a group design which includes, orientation to the problem, organizing investigations, investigating problems, formulating solutions, and evaluating combined with Make A Match syntax or concluding and presenting a bibliography.

Learning Worksheets is prepared using Power Point, because it is easy to use and has many features that can be used to design Learning Worksheets. Learning Worksheets is designed with colors that are not too striking and fonts that are normal and do not vary. This is done so that during learning the students' focus is only on the material in the Learning Worksheets. The content of the Learning Worksheets includes: Introduction, Core Competencies, Basic Competencies, Competency Achievement Indicators, Instructions for use, Concept map, Theoretical basis, as well as the syntax of Problem Based Learning and Make A Match. The design of the Learning Worksheets can be seen in Figure 1.

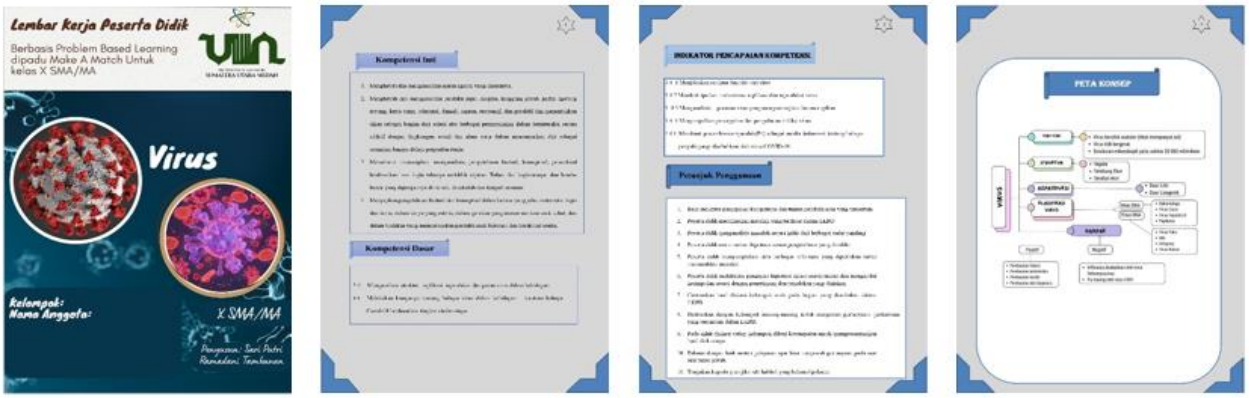

Figure 1 <Cover and Introduction>

Initial Product Design

Problem Based Learning Learning Worksheets combined with Make A Match is the result of integration with a problem-based learning model combined with the Make A Match strategy. Its implementation refers to a series of problem-based learning activities that include orientation towards organizing problem investigation, problems, investigations, formulating solutions, and evaluating or concluding and looking for partner questions from answers that have been learned in Problem Based Learning.

At this stage, this Learning Worksheets is prepared with the Problem Based Learning stage, this is the reason why this Learning Worksheets is called Problem Based Learning. The stages of Problem Based Learning in this Learning Worksheets include: 1) Student orientation to problems, in the Learning Worksheets on page 9 students are asked to pay attention to or read cases of problems around related to the virus material, 2) Learning organization, in Learning Worksheets students define and organize the formulation of problems or temporary hypotheses of those related to the problem. 3) Conduct independent and group investigations, students conduct investigations from various sources to answer problem-solving questions in Learning Worksheets. 4) Developing and presenting the results of the work, in the Learning Worksheets at this stage students to present the works they got. 5) Analyzing and evaluating the problem-solving process, at this stage the teacher gives the Make A Match syntax which reviews the student's understanding of the material that has been learned by playing a game to find the question pair cards and answers that have been given by the teacher.

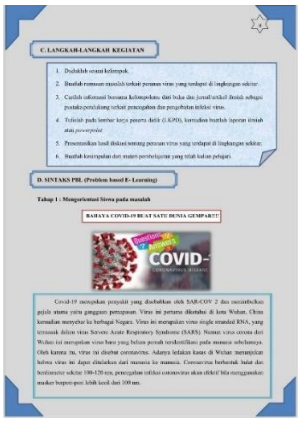

Figure 2 <Student Orientation Stage on the problem>

Figure 3 <Learning Organization Stage>

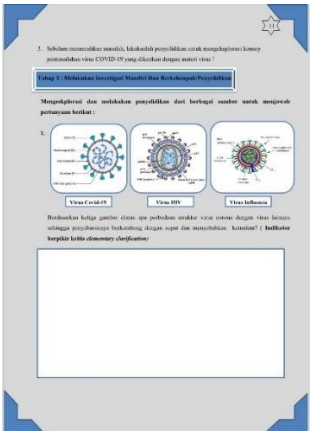

Figure 4 <Independent and group investigation stage>

Figure 5 <Independent and group investigation stage>

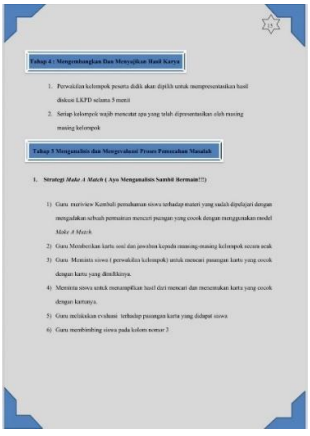

Figure 6 <Stage of Presenting the work and Stage of Analyzing and Evaluating the problem-solving process>

The purpose of developing this Learning Worksheets is to present biology learning that is more challenging through activities that refer to problem-based learning, so that through this activity it is able to train students' critical thinking skills, so that students are able to analyze how the role of beneficial and

harmful viruses appropriately and are able to conclude the prevention and treatment of viral infections appropriately.

Development Stage (Develop)

At the development stage includes validation activities to determine the feasibility of the product by experts when conducting development tests consisting of media validation, material and questions, to determine the validity of Learning Worksheets, through teacher and student responses to determine the practicality of Learning Worksheets students and determine the effectiveness of Learning Worksheets through the N-Gain test. The following is a table of validation results:

Table 2 <Media Expert Validation Results>

Aspects	Total	Maximum Quantity	Percentage (%)	Category
Learning Worksheets Size	8	8	100	Very Valid
Learning Worksheets Cover Design	28	28	100	Very Valid
Appropriateness of Learning Worksheets Content	15	16	94	Very Valid
Learning Worksheets Content Design	64	64	100	Very Valid
Total		**115**		
Maximum Quantity		**116**		
Percentage		**99%**		
Category		**Very Valid**		

It can be seen in table 2 that the results of media expert validation from the Learning Worksheets size aspect show results of 100% with a very valid category, the Learning Worksheets cover design aspect shows results of 100% with a very valid category, the feasibility of Learning Worksheets content shows results of 94% with a very valid caterogy and Learning Worksheets content design shows results of 100% with a very valid category. The overall result is 99% with a very valid category, this shows that Problem Based Learning Learning Worksheets combined with Make A Match is said to be suitable for use in learning biology on virus material.

In line with Humolungo's research (2019) which obtained validation results with a total average percentage of 90% and was categorized as very valid. Then the research conducted by Krismona Arsana & Sujana (2021) obtained results in the validation results of 94% and was said to be very valid. So, it can be concluded that the product that has been developed, namely Learning Worksheets based on Problem Based Learning combined with Make A Match on virus material with the orientation of learning outcomes for MA Laboratorium Uinsu students, is in a very valid category. Therefore, the research can be continued to the practical test stage.

Table 3 <Material Expert Validation Results>

Aspects	Total	Maximum Quantity	Percentage	Category
Suitability of Ki and Kd Material	14	16	88%	Very Valid
Material accuracy	23	24	96%	Very Valid
Material Provenance	3	4	75%	Valid
Encourage Curiosity	8	8	100%	Very Valid
Presentation Technique	3	4	75%	Valid
Presentation Support	9	12	75%	Valid
Learner Engagement	8	8	100%	Very Valid
Coherence and Order of Thought	8	8	100%	Very Valid
The Nature of Contextualization	15	16	94%	Very Valid
Total		**91**		
Maximum Quantity		**100**		
Percentage		**91%**		
Category		**Very Valid**		

It can be seen in table 3 that the results of material expert validation from the aspect of suitability of Ki and Kd material show a result of 88% with a very valid category, the aspect of material accuracy shows a result of 96% with a very valid category, the aspect of material sophistication shows a result of 75% with a valid category, the aspect of encouraging curiosity shows a result of 100% with a very valid category, aspects of presentation techniques show results of 75% with a valid category, supporting aspects of presentation show results of 75% with a valid category, aspects of learner involvement show results of 100% with a very valid category, aspects of coherence and conciseness of thought flow show results of 100% with a very valid category and contextual nature shows results of 94% with a very valid category. The overall result is 91% with a very valid category.

This is in accordance with research conducted by (Dewi et al., 2020) Materials that relate to problems in students' daily lives can improve students' critical thinking skills. While seen from the presentation of the material, it can be seen that the percentage results are 88% "very valid" criteria. The presentation of the material is presented accompanied by the development of students' thinking patterns broadly with "valid" criteria. This is in line with the presentation of material presented with the concept of reasoning so that students can see from various views with a broader perspective and think analytically (Nafisa & Wardono, 2019).

Based on the recapitulation of the assessment and suggestions by the validator, then several improvements were made to the Learning Worksheets, the results of the Learning Worksheets based on Problem Based Learning can be seen in the images below:

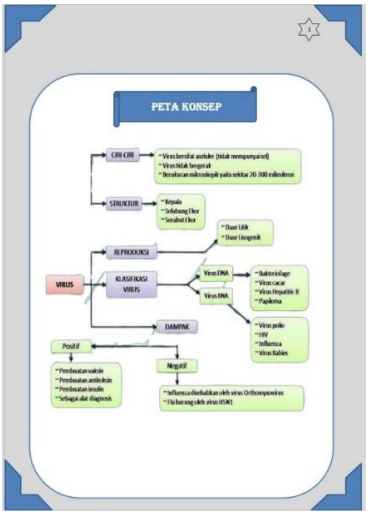

Figure 7 <Concept Map on Learning Worksheets before revision>

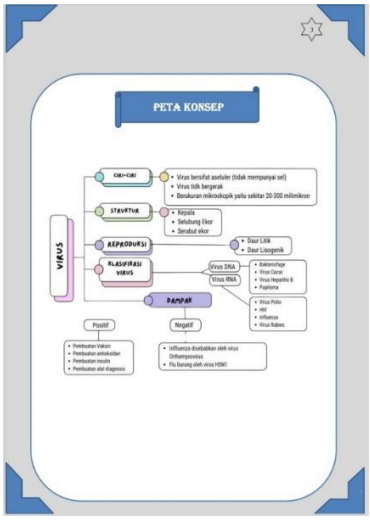

Figure 8 <Concept Map on Learning Worksheets after revision>

Figure 9 <Theoretical Basis in Learning Worksheets before revision>

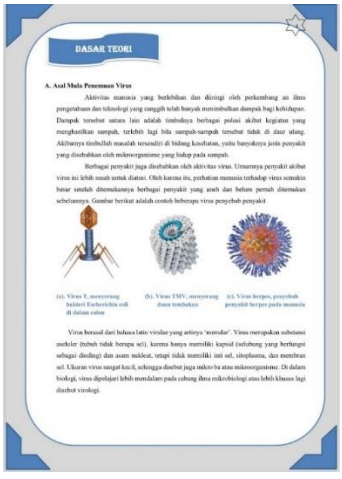

Figure 10 <Theoretical Basis in Learning Worksheets after revision>

Table 4 <Critical Thinking Ability Question Validation Results>

Aspects	Total	Maximum Quantity	Percentage	Category
Material	15	16	94%	Very Valid
Construction	14	16	88%	Very Valid
Language	12	16	75%	Valid
Total		**41**		
Maximum Quantity		**48**		
Percentage		**85%**		
Category		**Very Valid**		

Based on table 4 with the results of question validation carried out aims to determine whether the question is included in the category of hots questions. In the results of the validation of critical thinking skills questions, it can be seen that the material aspect gets a percentage value of 94%, this shows that the material with very valid criteria on critical thinking skills. The second assessment aspect is construction which shows a result of 88% with valid criteria for critical thinking skills. And the last, namely language, shows a result of 75% with valid criteria for critical thinking skills. The overall result is 85% with a very valid category.

Based on the results of research (Munawaroh, N.2022), the assessment of the assessment aspects of the critical thinking ability test shows that the questions presented meet the criteria for critical thinking ability with a high category. This is in line with research with results showing that students' critical thinking skills can make students able to solve problems both in the school environment and in the daily lives of students (Effendi et al., 2021).

Disseminate Stage

The last stage is disseminate or commonly called the stage of disseminating the products that have been produced. In this study, teaching materials that have been tested in small groups in the classroom are ready to be tested in large groups for production, but in this study this stage was carried out and distributed only on a small scale. The dissemination was carried out at Ma Laboratorium Uinsu, the dissemination was carried out in one class containing 43 students.

The practicality of Problem-Based Learning Worksheets can be assessed based on the results of the student and teacher response questionnaires, as well as the effectiveness of Learning Worksheets based on the results of pretest and posttest, the test used is in the form of an essay test. The results of the practicality and effectiveness data can be seen in the tables below.

Table 5 <Results of the Learner Response Questionnaire>

Aspects	Total	Maximum Quantity	Percentage	Category
Material	1079	1204	90%	Very Practical
Language	302	344	88%	Very Practical
Interest	470	516	91%	Very Practical
Total		**1851**		
Maximum Quantity		**2064**		
Percentage		**90%**		
Category		**Very Practical**		

Based on table 5 about the assessment of the results of the learner response questionnaire conducted on several aspects which include Material, Language, and Interest. Based on this table, it can be seen that the results of the assessment of the material aspect on the product development of PBL-based Learning Worksheets combined with Make A Match show results worth 90% with very practical criteria. As for the language aspect, the results show 88% with very practical criteria. And the last is the aspect of interest with very practical criteria showing results of 91%. The overall result is 90% with a very practical category.

Based on table 6 about the assessment of the results of the learner response questionnaire conducted on several aspects which include Material, Language, Presentation, Appropriateness of PBL Stages and Make A Match. Based on this table, it can be seen that the results of the assessment of the material aspect on the product development of PBL-based Learning Worksheets combined with Make A Match show results worth 88% with very practical criteria. As for the language aspect, the results show 83% with very practical criteria. And the last is the aspect of the suitability of the PBL and Make A Match stages with very practical criteria showing results of 95%. The overall result is 91% with a very practical category. So it can be concluded that

the responses given by students and teachers to the development of Problem Based Learning-based Learning Worksheets combined with Make A Match are declared very practical to be used as learning media for students.

Table 6 <Teacher Response Questionnaire Results>

Aspects	Total	Maximum Quantity	Percentage	Category
Material	7	8	88%	Very Practical
Language	10	12	83%	Very Practical
Presentation	22	24	92%	Very Practical
Appropriateness of PBL and Make A Match Stages	19	20	95%	Very Practical
Total		**58**		
Maximum Quantity		**64**		
Percentage		**91%**		
Category		**Very Practical**		

According to Wahab et al. (2021) the practicality category of a product is said to be very practical if it is at the 81% ≤ R level so that the product made is practical and makes it easier for students as a guide to finding information. Like the research conducted by Muslimah et al., (2021) in the Learning Worksheets practicality test made, the average percentage was 85% and was said to be very practical. So it can be concluded that the product that has been developed, namely Learning Worksheets based on Problem Based Learning combined with Make A Match on virus material with the orientation of student learning outcomes Ma Laboratorium Uinsu is in a very practical category.

Table 7 <N-gain Test Results>

Number of Students	Pre-Test	Post-Test	N-Gain	Category
43	46,2	81,0	0,71	High

Based on the N-Gain results in table 7, it can be seen that for the results of the N-Gain score used to analyze the level of thinking of students after using Problem Based Learning-based Learning Worksheets combined with Make A Match shows that the N-gain score is in the high range, namely 0.7. The average pre-test score achieved in this study was 46.2 and the average post-test score was 81.0. The data shows an increase in value of 34.8 from the pre-test value to the post-test value.

In line with the results of research by Dinda et al., (2021) obtained results for the effectiveness test by conducting a pretest and posttest of 0.71 which means it is said to be a high and very effective category. This completeness shows that students can accept the material presented in the Learning Worksheets as meaningful information. The value that students have obtained shows that the usefulness and application of the material to the daily lives of students can provide intrinsic motivation for students (Nova, 2020).

Conclusion

Based on the results of research that has been conducted by researchers on the development of problem-based learning-based Learning Worksheets combined with make a match, the results of the validity test from media validation are 99% with the category "very valid" .The practicality test obtained a result of 90% from the students' response and 91% from the teacher's response with the category "very practical". The effectiveness test obtained a value with the N-gain test of 0.7 with a "high" category and stated with the criteria "very effective". These results indicate that the problem-based learning-based Learning Worksheets combined with make a match developed can be declared feasible for use in learning activities because it has been tested for validity, practicality, and effectiveness.

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