Partical Test of Steam-Based Learning Devices on The Structure and Function of Network in Plants to Improve Student's Concept Mastery

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PRACTICAL TEST OF STEAM-BASED LEARNING DEVICES ON THE STRUCTURE AND FUNCTION OF NETWORK IN PLANTS TO IMPROVE STUDENT'S CONCEPT MASTERY

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Abstract:
This research is a development research that aims to describe the validity of STEAM-based learning tools in the form of lesson plans, LKPD and concept mastery tests on the structure and function of plant tissue at SMPN 1 Kwandang and SMPN 2 Kwandang. The results showed that the quality of the product produced based on the validity of the lesson plans met the very valid criteria with an average value of 96% validator, LKPD met the very valid criteria with an average value of 97% validator and the concept mastery test met the very valid criteria with an average value. average 97%. Based on the results of the study, it can be concluded that STEAM-based learning tools on the material structure and function of tissues in plants meet the valid criteria to improve students' mastery of concepts.

Keywords: learning tools, STEAM , mastery of concepts

INTRODUCTION

The development of the 21st century globalization era in the field of technology, information and communication is currently very fast, these developments certainly have an impact on human life. The impact is high competition and changes in the order of life both in the field of education and non-education which are different from the previous century as stated by Indriayu (2022:57) that the impact of today's changes include the entry of resources freely and highly competitive (mega-competition) to produce something better.

These shifts and changes make all parties must be able to adapt, including the world of education. Education in schools is expected to produce graduates who can compete, adapt and are needed at this time as stated by Majir (2020:17) that education in schools in the 21st century today must be able to produce "products" (students) that are decent. To compete, schools that provide "products" that can be absorbed in the market share are now considered more feasible to develop, while schools with education that do not sell well in the globalization market will be left behind.

Seeing these developments and shifts, the government made changes to the curriculum whose contents included education to face the 21st century, which required technology, science and could compete or be on par with other nations in all respects, as stated by Hayani (2019: 25) that the government formulated 21st century national education as follows: education that is prepared to face the development of the 21st century which is increasingly required by technology and science in a global society, education must be oriented to science and mathematics, students must be logically critical, analytical, cooperative, creative and able to solve problems independently so that they can compete with other nations globally or have 21st Century skills. The current reality of education in Indonesia is still far from the expectations of 21st century national education, the quality of education in Indonesia is still low marked by the lack of absorption of graduates in the world of work, due to the skills and cognitive competencies required today are not possessed by most graduates, so that quality needs to be improved. our education is oriented to the skills and cognitive expectations that are expected today as stated by Devi et al (2018:8) that the 21st century has changed the order of human life which is linked to science and technology to communication, the impacts of this change include the increasing number of foreign workers from laborers to the executive division while local workers experience a difficult situation to be able to compete and meet industry demands, so there needs to be a change in our world of education where our education must be oriented to 21st century knowledge, namely mathematics and science.

Improving the quality of education is the best way to deal with today's globalization and all parties have a responsibility , especially teachers. Teachers must be able to make changes and improvements continuously which can produce human resources who have science and technology-based competencies. If the teacher does not make changes

and innovations, the teacher will lose his role along with technological developments, changes that can be made are changes in relevant approaches, models and learning methods (Haerullah and Hasan, 2021:15). Furthermore, Lawrence Stenhouse (in Sukidin, 2010: 1) states that professional teachers are teachers who have independence in carrying out their professional duties. The logical consequence of the independence of a professional teacher is to always reflect on what he does and follow up on the results of that reflection to improve and develop quality, from that reflection the teacher can see what is lacking or what problems exist within the scope of work as a teacher or the environment he teaches. school).

Improving learning by science subject teachers in junior high schools in Kwandang North Gorontalo should also be done. The improvement of learning by science teachers includes, among others, the preparation of learning tools that include syllabus, lesson plans, LKPD and learning models using certain approaches to achieve quality education goals and graduates who can adapt in this era. The learning approach that can accommodate the 21st Century learning characteristics mentioned above is the STEAM learning approach (Science, Technology, Engineering, Art and mathematics) (Devi et al, 2018: 23).

The Science, Technology, Engineering, Art and Mathematics (STEAM) approach is a learning approach adopted from America, in 2018 it was introduced to Indonesia and is a learning approach that is foreign to schools, especially at SMPN 1 and 2 Kwandang. According to Widyastuti (2022:111) suggests that STEAM is an approach where science, technology, engineering, and mathematics are used in an integrated manner focusing on the problem solving learning process in real life, showing students how the concepts, principles of science, technology, engineering , and mathematics are applied in an integrated manner to develop products, processes and systems that provide benefits for human life.

The STEAM approach prepares Indonesian students to acquire 21st Century skills and knowledge, namely critical, creative thinking skills, able to solve problems and be precise in making decisions and how to work together through collaboration and communication and students are able to achieve a level of concept mastery (problem solving). STEAM was adopted to strengthen the implementation of the National curriculum (Curriculum 2013).

The Science, Technology, Engineering, Art and Mathematics (STEAM) learning approach is also in line with the 2013 Curriculum. The STEAM approach can be implemented through the use of several learning models, including the PBL model and project-based learning (PjBL) and 5 E (Engagement, Exploration, Explain, Elaboration and Evaluation).

The STEAM approach, which integrates science, technology, engineering, art and mathematics, will be implemented in science learning at SMP N 1 Kwandang and SMP N 2 Kwandang. This is based on the results of initial observations that the level of mastery of students' concepts on the material structure and function of plants is still relatively low.

The implementation of the STEAM approach is expected to increase mastery of the concept of plant structure and function through various sources, using technology in the form of youtube shows or using a microscope. Likewise, the arrangement of tissues that make up organs can be understood as an art and will be further strengthened with the help of mathematics.

Based on this, it is deemed necessary to develop a learning approach, including through the development of STEAM-based devices so that teachers can use them. The solution to the problems described previously, the authors designed a research with the title formulation "Development of Learning Devices Based on Science, Technology, Engineering, Art and Mathematics (STEAM) on Plant Structure and Function Materials to Improve Concept Mastery of Class VIII Students (A Research in SMP N 1 Kwandang and SMP N 2 Kwandang in Kwandang District)" .

METHOD

This research was conducted at SMP N 1 Kwandang and SMP N 2 Kwandang in Kec. Kwandang in the odd semester of the 2021 – 2022 Academic Year. This type of research is development research , in English *Research and Development* (R&D) developed by Sugiyono (2017). Research and development is a research method used to provide certain products, test certain products and test the effectiveness of these products. So to produce a product, it is necessary to do research and development so that the practicality of the product can be tested.The data on potential problems found in SMPN 1 Kwandang and SMP N 2 Kwandang is that students' mastery of concepts is still low as evidenced by the low ability of students to solve questions with high cognitive domains (C1 to C6).

Researchers collected as much data as possible through library research, through previous research journals and data contained in schools at SMPN 1 Kwandang and SMP N 2 Kwandang

The activities carried out were: compiling a draft of learning tools, in the form of lesson plans, LKPD and questions about mastering the concepts of students

The activities carried out are as follows:

a . Validation Stage

In order to produce valid learning tools, therefore the learning tools made need to be validated. The validation of learning tools is carried out by expert lecturers and education practitioners in accordance with their scientific fields. The expert lecturers and practitioners are called validators. Expert lecturers who want to validate learning tools are lecturers and fellow teachers.

b . Product Test

Product test in limited test and broad test, practicality can be seen from the observation of learning implementation, student activity and student response.

c. Revision of Learning Tools

devices that have been completed, are then revised according to the suggestions given by the validator. Research Instruments STEAM Learning Implementation Observation Sheet

Used to determine the implementation of learning by teachers, this sheet is used by 2 science teacher experts. The validation sheets used can be seen in attachments 20, 21 and 22. Student Learning Activity Observation Sheet in STEAM Learning. The validation sheet used can be seen in appendix 19. Questionnaire of students' responses to STEAM learning Used to find out the opinions of students related to learning. The student response questionnaire used can be seen in appendix 20.

Practical analysis can be done through observing the implementation of the learning process carried out by two teachers, student activities and student responses.

a. Implementation of learning

Practical analysis can be done through observing the implementation of the learning process carried out by two teachers. The assessment sheet uses *a Likert scale* with a score of 4 = very good, 3 = good, 2 = poor, 1 = very poor in the assessment column. The assessment criteria are by comparing the average ratings obtained from two observers. The equations used for practicality analysis are:

$$P = \frac{\sum x}{\sum xi} \times 100$$

Information :

P = Average Value
x = Number of Student/Teacher Answer Scores
xi = Total Ideal Score or Highest Answer

Arikunto , 2009

Table 3.2 Criteria for Device Practicality

RPP Practicality Score	RPP Practicality Category
85 - 100	Very Practical
70 - 84	Practical
55 - 69	Practical enough
50 - 54	Less Practical
0 - 49	Not Practical

Arikunto , 2009

b . Student Activities

Student activity sheets are used to determine student activities in the learning process using STEAM-based LKPD. The assessment sheet uses *a Likert scale* with a score of 4 = very good, 3 = good, 2 = poor, 1 = very poor. The results can be analyzed using the practicality formula as above.

c. Student response

Student response questionnaires as users are used to measure students' opinions about the learning process that has been implemented based on the RPP and LKPD developed by the researcher. This questionnaire is given after the students have finished doing all the activities in the learning process, in practice they put a checklist (√) in the assessment column. The results can be analyzed using the practicality formula as above.

RESULTS AND DISCUSSION

Results

Researchers used observations of learning implementation using STEAM-based lesson plans, observation of student activities, student response questionnaires to analyze the practicality of the device.

a . The results of the analysis of the implementation of learning

1. Results of Learning Implementation Analysis on Limited Test

The limited trial was conducted at SMPN 1 Kwandang with 2 science teachers in one class (class 8 b with 15 students). Assessment of the implementation of learning by observers in this limited test is very important for improving the learning process in the subsequent broad test so that in the later broad test the value of the practicality level can get a practical value of better (very practical) greater than or equal to 70. The following is a bar chart showing shows the results of the assessment scores by science teachers on the implementation of the lesson plans in

the classroom with STEAM-based lesson plans on the material structure and function of plant tissues.

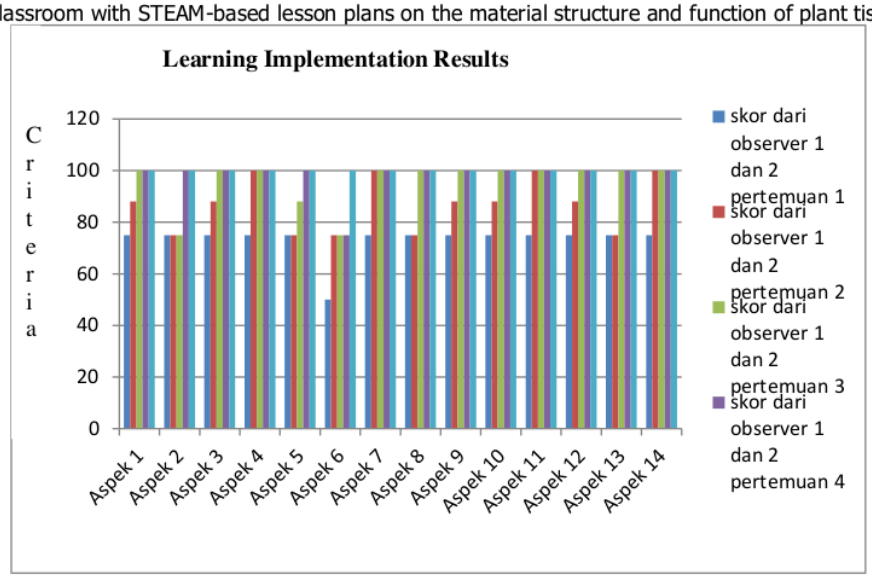

Figure 1 Learning Implementation Results with STEAM-Based RPP on Limited Test

Information :

1. Do apperception
2. Presenting material discussion
3. Basic competence suitability
4. carry out learning according to the competencies to be achieved
5. carry out contextual learning and or performance-based STEAM
6. Carry out learning according to the planned time allocation
7. facilitate learning activities that foster 21st century skills based on STEAM :Creative and innovative
8. Cultivate STEAM-based critical thinking and problem solving skills
9. Cultivate STEAM-based communication and collaboration skills
10. Asking why and how questions provoke students to ask questions.
11. facilitate students to try / observe
12. Carrying out learning the 5 E Learning Cycle model (if at the time of the learning meeting using STEAM-based 5 E Learning Cycle 5 / Implementing learning with the STEAM PjBl model (if at the learning meeting using PjBl)
13. Demonstrate skills in the use of STEAM-based learning resources and media
14. Cover well and smoothly

Figure 4.4 Bar chart shows the results of observing the implementation of learning using STEAM-based lesson plans on plant structure material for a limited test with the number of students 15 people with 5 meetings showing the practical value in each aspect, for example in aspect 1 (appreciating) at the first meeting getting the practicality value is 75, the second meeting gets a practical value of 88, while at the third to fifth meeting the practicality value is 100. Aspect 2 of the first, second and third meetings with a practical value of 75, the fourth and fifth meetings with a value of 100, aspect 3 at the first meeting a practical value of 75, the second meeting a practical value of 88 and the third meeting up to the fifth 100. Aspect 4 at the first meeting scored 75 and the second to fifth meeting the value of practicality is 100, the fifth aspect of the first and second meetings is 75, the third meeting is 88 and the fourth to fifth meeting is 100, aspect 6 at the first meeting is 50, the second to fourth meeting is 75 and the fifth 5 is 100. From all the aspects shown in the bar chart above, the average practicality value for the implementation of learning is 90.75 (very practical).

2. Results of the Analysis of the Implementation of Learning in the Extensive Test

The extensive trial was conducted at SMP N 2 Kwandang with 2 science teachers as observers in two classes, namely class VIII-1 and class VIII-3 with 30 students in each class. Observation of the implementation of learning by the observer in this broad test is expected to get a better score than the limited test because it has gone through the learning process in the limited test and has been revised based on the analysis in the previous test. The following is a bar chart showing the scores of the results of the science teacher's assessment of the implementation of the lesson plan in the STEAM-based broad test class on the structure and function of plant tissue.

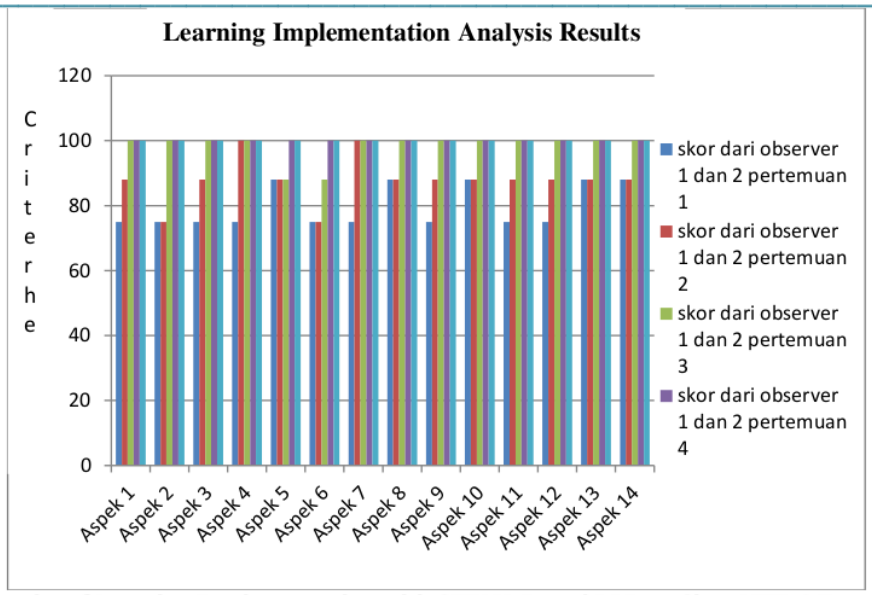

Figure 2 Results of Learning Implementation with STEAM-Based RPP on Class VIII-1 Extensive Tests

Figure 4.5 above can be seen from the results of observing the implementation of learning using STEAM-based RPP on plant structure material for the broad test in class VIII-1 with a total of 30 students with 5 meetings showing the practical value in each aspect, for example in aspect 1 (doing apperception) at the first meeting got a practical value of 75, the second meeting 88 while at the third to fifth meeting 100. Aspect 2 of the first meeting 75, the second meeting 88 and the third meeting up to the fifth the practicality value of 100 .. From all aspects seen in the bar chart above if the average practicality value for the implementation of learning in the broad test for the first class is at a value of 93.15 (very practical).

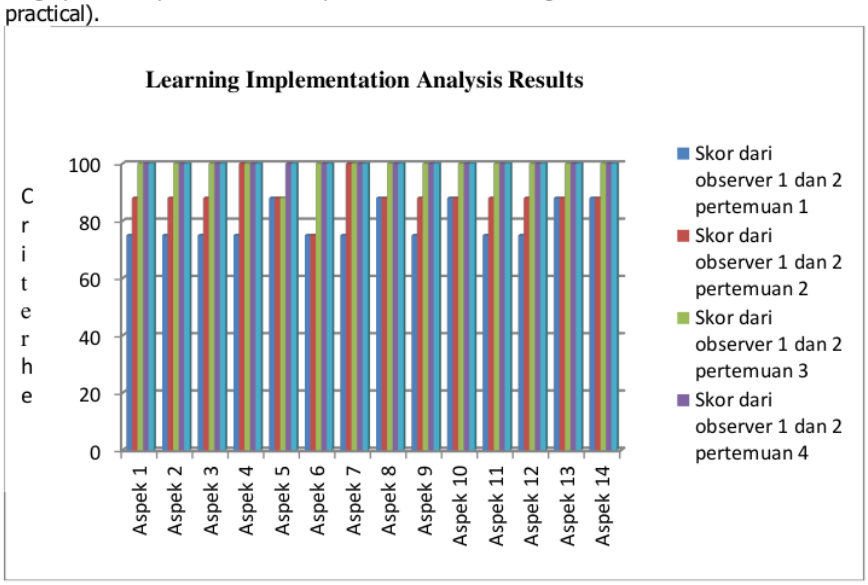

Figure 3. Results of Learning Implementation with STEAM-Based RPP on Class VIII-3 Extensive Test

Diagram 4.6 above can be seen from the results of observing the implementation of learning using STEAM-based RPP on plant structure material for the broad test in class VIII-3 with a total of 30 students with 5 meetings showing the practical value in each aspect, for example in aspect 1 (appreciating) at the first meeting, the practicality value was 75, the second meeting was 88, while at the third to fifth meetings, the score was 100. Aspects of the first 2 meetings showed 75 and the second meeting was 88, the third to fifth meetings the practicality value was 100. From all aspects seen in the The bar chart above when averaged the practicality value for the implementation of learning in the broad test for the first class is at a value of 93.51 (very practical).

b) Results of Student Activity Analysis

1. Results of Student Activity Analysis on Limited Test

The results of the student activity sheet by the observer, then the data processing is presented in the following 4.7 bar chart:

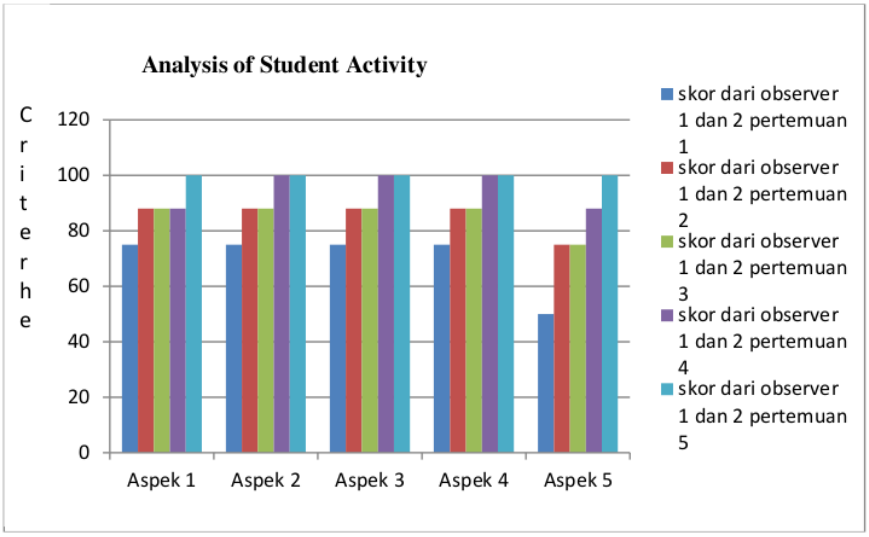

Figure 4. Results of Student Activity Analysis on Limited Test

Information :

1. Aspect 1: Enthusiasm of students in apperception
2. Aspect 2: Attention of students when delivering material / reinforcement / stimulus from the teacher
3. Aspect 3: The activeness of students in answering questions and opinions/criticizing
4. Aspect 4: Cooperation of students in group work
5. Aspect 5: Appearance during presentation

Figure 4.7 student activities assessed by observers shows a range of values from 50 to 100. The final score / average practicality seen from student activities gets a result of 87,2 (very practical).

2. The results of the analysis of student activities on the broad test in the first class

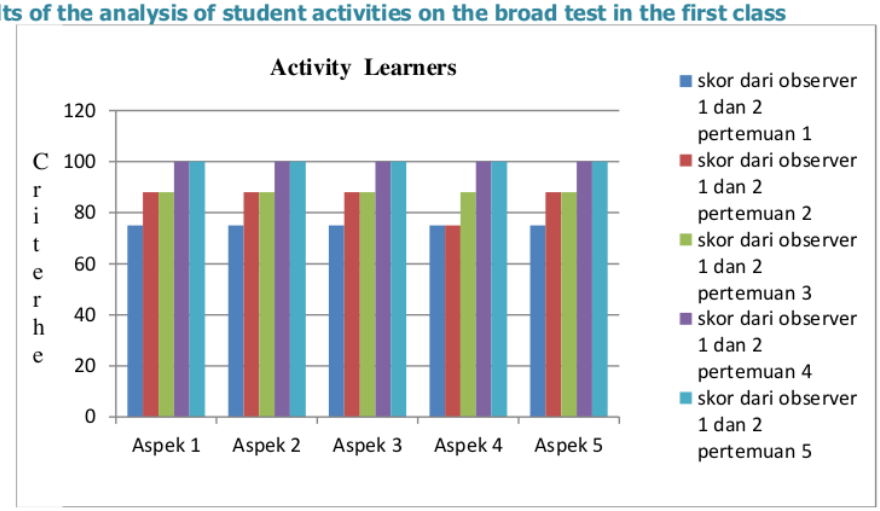

Figure 5 Results of Student Activity Analysis in the First Class Extensive Test (Class VIII-1)

Bar chart 4.8 is the result of assessment by observers on student activities, these results show a range of values obtained from 75 to 100. The average practicality value seen from student activities in the first class area test gets a practical value of 89.68 (very practical).

3. Results of Student Activity Analysis with Extensive Test in Second Class (Class VIII-3)

Bar chart 4.9 of student activity which is the result of an assessment by an observer shows a value range of 75 to 100. The final value / average practicality seen from the activities of students in the second class area test got a practical value of 92.16 (very practical).

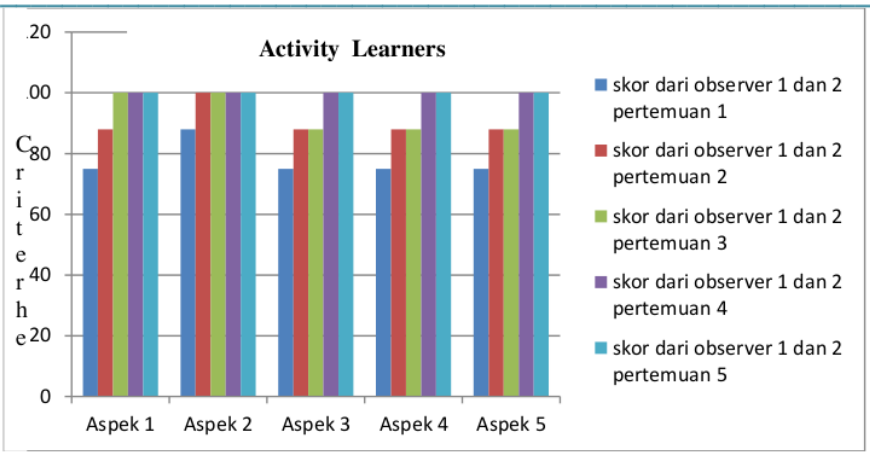

Diagram 6 Results of Student Activity Analysis in the Second Class Area Test (Class VIII-3)

c) Results of Student Response Analysis

Student response to learning is the second component to determine the practicality of the developed device, whether it gets a good response in the limited test class or in the broad test.

1. Results of Student Response Analysis in Limited Test Class

93 while the other aspects showed a practicality value of 100. The data obtained when averaged got a value of 98.83 (very practical). The following is a diagram of the results of student responses in the limited test class:

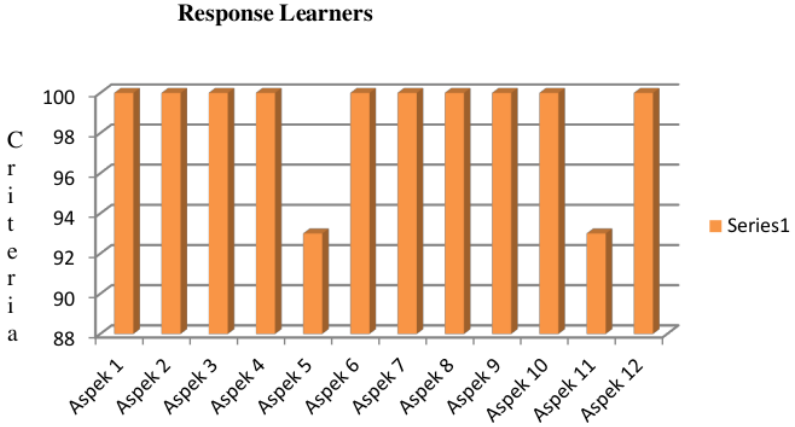

Figure 7 Diagram of Student Response Analysis Results in Limited Test Class

Information :

1. The appearance (pictures, writings, colors) of the teacher's presentation is interesting and fun so I am interested in paying attention to the teacher's explanation
2. The LKPD used by the teacher makes it easier for me to learn
3. This learning approach adds to my STEAM literacy
4. This learning approach increases my learning motivation
5. The learning process by the teacher with the STEAM approach makes it more creative and easier to solve problems in everyday life
6. The learning process by the teacher with the STEAM approach makes it easier for me to do daily assessment questions
7. My level of mastery of the concept of plant structure and function has increased
8. The information provided by the teacher becomes easier to understand
9. With STEAM learning it is easier for me to make decisions and conclusions
10. With STEAM learning I'm easy to work with
11. The teacher gives good instructions or guidance, when I or my group have difficulty finding solutions to problems during the learning process
12. The presentation process made me dare to express my opinion to friends

2. Results of Student Response Analysis in the First Class Extensive Test (Class VIII-1)

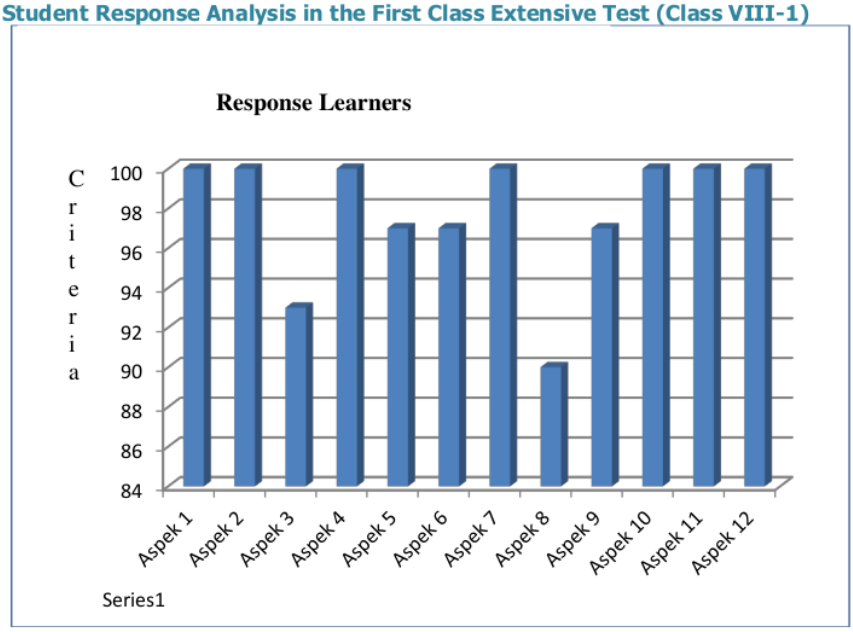

Figure 8 Diagram of Student Response Analysis Results in the First Class Extensive Test Class (VIII-1)

Figure 4.11 shows the practicality value of student responses in the first class of the broad test, most aspects get a score of 100 except for aspects 3, 5, 6, 8 and 9 which score below 100. Aspect 3 scores 93, aspects 5,6 and 9 scores. 97 while aspect 8 scores 90. The data obtained when averaged gets a value of 97.

3. Results of Student Response Analysis in the Second Class Area Test (Class VIII-3)

Figure 4.15 shows the practicality value of student responses in the second class of the broad test, most aspects get a score of 100 except for aspects 3, 8, 10 and 12 which get scores below 100. Aspect 3 scores 97, aspect 8 scores 93, aspect 10 scores 97 while aspect 12 has a value of 93. The data obtained when averaged gets a value of 98.33

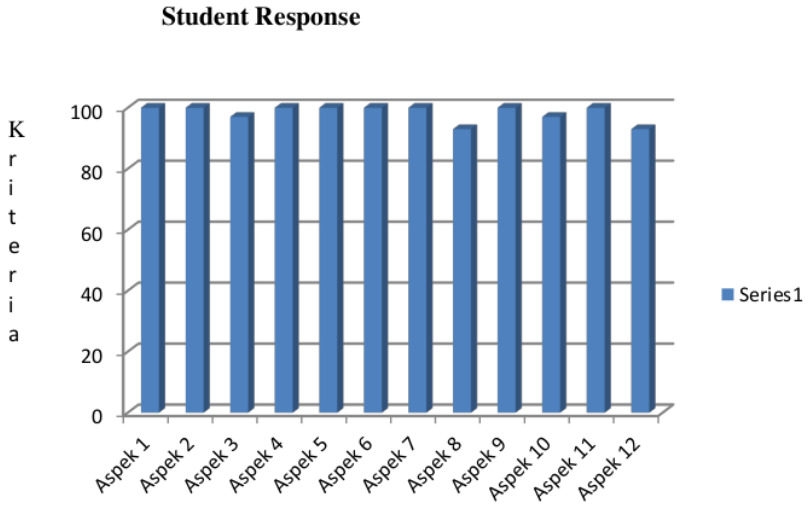

Figure 9 Diagram of Student Response Analysis Results in the Second Class Extensive Test Class (VIII-3)

DISCUSSION

Practicality of STEAM-Based Learning Tools

a . Implementation of RPP

Based on the results of the implementation of STEAM-based lesson plans in the limited test, the average practicality was 89.68 in the broad test in the first class 92.16 in the second class 98.83. The aspects that are considered in the assessment by the observer in the limited test are aspect 5 (implementing contextual learning) and aspect 6 (implementing learning according to the planned time allocation). This can happen because at the beginning of the apperception meeting there was less emphasis on contextuality / connecting the material to be studied to the real life of students, therefore at the next meeting or in the broad test the apperception was revised again to emphasize contextual students.

meeting of apperception was only in the form of the teacher asking about the relation of the material that had been studied by the students so that the apperception was not contextual, and then it was revised to be the teacher showing pictures about the structure of plants, the teacher then asked what if the root part of the plant was lost, what would happen? then shows the picture of the wrong network structure to be studied, explaining to students that in the root there is also a structure that builds the root called a network, this network has each function. The teacher emphasizes the importance of studying the structure of plants so that students can understand that plants in the environment around us cannot grow properly if one of the tissues is not present.

Learning at the next meeting has shown an increase in contextual aspects which can stimulate critical, creative and innovative students. Seen at the 4th meeting the students have been able to create new ideas for the projects they will be working on and these ideas are beyond the teacher's predictions.

The next aspect is where the use of the time allocation that has been planned for implementation is still lacking at the beginning of the meeting so that it gets a score in the range of 50 - 75 because the teacher cannot manage time in exploration activities, students take a long time in collecting data, namely when drawing network structures with bro, the art aspect of STEAM is beautiful.

next meeting the teacher is more time management in exploration activities, students are explained and guided to the maximum so that time is used as effectively and efficiently as possible by the way the teacher familiarizes students with time / time discipline because it is part of the assessment, students maximize themselves and discipline themselves again to do the LKPD. If there is a group that has not finished when the exploration time is over, no more time is given so that students at the next meeting will understand and be more active in working on the LKPD.

b . Student Activities

Assessment of student activities by the observer 5 times in accordance with the number of face-to-face meetings got an average practicality value in the class limited test of 87.2 in the first class area test 89.68 in the second broad test 92.16. In each aspect of the assessment has increased with a range of 88 - 100 in the limited test and broad test. The activities of students who showed low scores at the beginning of the meeting in the limited test were seen in aspects 1 (student enthusiasm in apperception) and 5 (appearance during presentations) and aspects 4 (collaboration / collaboration of students in groups) and 5 (appearance). at presentation) in the broad test with a static increase or tend to stay at meeting 3.

Aspect 4 (collaboration of students in groups), the observer sees the extent of the efforts of all students in the group to complete the work or task that has been given by the teacher and finish on time with good results. This cooperation is a good social attitude which will foster mutual respect and trust among group members. By working together, it can foster an unselfish attitude, willing to accept the opinions of others as stated by Azizah et al (2021: 66) that the attitude of wanting to cooperate between groups is a social relationship where each group member is willing to complete an activity together in one group. to achieve common goals.

Collaboration or collaboration developed through the STEAM approach is a life skill that must be possessed and must continue to be developed at this time, as stated by Sudarmin (2021:10) that the STEAM approach encourages students to communicate and collaborate between friends or learning resources. At meeting 3 in the broad test, the increase in the aspect of cooperation tends to remain due to the boredom factor in the material encountered by students, practicum until the 3rd meeting makes students show an attitude of boredom and results in the attitude of cooperation between group members having the same value or remaining as enthusiastic about the cooperation of students in second meeting.

The next aspect that received a low score at the beginning of the meeting was aspect 5 (appearance during presentation), the appearance during the presentation of several groups at the first meeting showed group members who had not been able to communicate well, were not confident and had not good choice of language and correct and delivery is still staggered due to the passivity of children during the Covid-19 pandemic, where students are not accustomed to doing learning with a percentage in front of the class as stated by Hakim, Rais (2021:407) that the problems encountered by the teacher occurred during a pandemic is passivity, lack of confidence during presentations.

The teacher motivates students to be confident, guides them to communicate well so that at the next meeting students in each group can communicate and the practical value of the presentation performance can increase. As for the teacher's tips by creating a comfortable atmosphere in the classroom, giving applause when students present presentations, always giving assignments related to presentations during the process as explained by Raka et al (2021:62) that if in the learning process a student is given the opportunity to make a presentation. In front of the class, this process indirectly opens up opportunities for students to increase their self-confidence. Self-confidence will also

develop if in the learning process the teacher does not hesitate to give appreciation to students for the good he has done or the progress he has made.

The fifth aspect is that all observations apply the STEAM approach, *science* : can analyze the relationship of network structure and function, for example, students can analyze epidenmal cells which are smaller and denser than other tissues to allow their function as a protective network, *Technology* : miniature fountains, *Engineering* : participants students can design, create and evaluate the results of simple technology work inspired by plant tissue, Art: make beautiful tissue images, make projects/tools with attention to neatness, mathematic: count the number of cells, measure designs with precise measurements.

c . Student Response

The results of the student response analysis resulted in an average practicality value of 98.8 in the limited test in the range of 93 -100 and in the first class area test of 97 and 98.3 in the second class. According to students, the appearance (pictures, writings, colors) of the teacher's presentation is interesting and fun so I am interested in paying attention to the teacher's explanations, making it easier for me to learn, LKPD makes it easier in the learning process, increases my STEAM literacy, increases creativity, cooperation, easily solves problems, mastery concepts improve, decision making and conclusions, the teacher guides to find a good solution, is more courageous or confident in expressing opinions during presentations. Compared to the previous learning processes which made them passive, difficult to cooperate and did not know how to use LKPD.

Effectiveness of Learning Tools.

a . Student Learning Outcomes Test

The reference for the effectiveness of the device developed in this study was first to see the results of the student's concept mastery test . The test results of mastery of concepts given to students are *Pre-test* and *Post-test,* containing questions to measure the mastery of students' concepts on the material structure and function of the network with cognitive domains C1 to C6 . From the learning outcomes of students, the average value of N–Gain for the limited test class is 0.7 (effective) the first class area test is 0.8 (very effective) the second class limited test is 0.8 (very effective). The value of N–Gain is very effective, meaning there is an increase in mastery of concepts, so it can be said that the learning tools developed can be used by teachers at SMP N 1 Kwandang and SMP N 2 Kwandang.

This research is based on the embedded approach , where STEAM emphasizes more on maintaining the authenticity of the subject matter which is the main area, does not focus on embedded subjects, and the material on the embedded approach is not designed to be evaluated or assessed so that the mastery test compiled only consists of only science (Science) material, while the technology, engineering, art and mathematics are not evaluated or assessed.

Performance and Project Results Test on LKPD

The performance value of the second class broad test, the average value of its effectiveness in the limited test was 87,5 , the first class area test was 90 and the second class was 90.5. Learners aspect / indicator of the 1st assessment is a description of the results of observations / conclusions based on STEAM where students can apply STEAM in learning. The following is a picture of the results of student performance.

CONCLUSION

Based on the research data, it can be concluded that:

The practicality of learning devices with very practical criteria based on the results of implementing STEAM-based lesson plans in the limited test got an average practicality of 89.68 % in the broad test in the first class 92.16 % in the second class 98.83 %. Assessment of student activity by the observer 5 times according to the number of face-to-face meetings got an average practicality value in the limited class test of 87.2% in the first class area test 89.68% in the second broad test 92.16%. In each aspect of the assessment there was an increase in the range of 88% - 100% in the limited test and the broad test and the results of the student response analysis resulted in an average practicality value of 98.8% in the limited test in the range of 93% -100% and in the class area test. first 97 and second class 98.3. According to student responses, the appearance (pictures, writing, colors) of the teacher's presentation is interesting and fun so I am interested in paying attention to the teacher's explanations, making it easier for me in learning, LKPD makes it easier in the learning process, increases my STEAM literacy, increases creativity, cooperation, easily solves problems, mastery of concepts increases, decision-making and conclusions, the teacher guides to find a good solution, is more courageous or confident in expressing opinions during presentations.

SUGGESTION

1. The RPP and LKPD that have been developed can be used as comparison materials for science teachers in junior high schools in teaching in front of the class
2. Learning the material on the structure and function of plants with the STEAM approach requires a considerable amount of time and energy, therefore it is recommended for teachers to maximize guidance during PBM in class so that time can be used as effectively as possible.
2. There is a need for research on device development with a STEAM approach on other materials in Integrated Science subjects

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