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Student workshet the development based on stem (sciene, technology, engineering and mathematics) based construct 2 assisted lkpd on excretion system materials to improve student's science literature skills in SMA Negeri 1 Kuala T.P. 2021/2022

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ABSTRACT

Abstract The development of STEM-based LKPD (Science, Technology, Engineering and Mathematics) in this study aims to improve students' scientific literacy skills on excretory system material and is distributed through software construct 2 which has the advantage of not using programming languages . (coding) in its design. The research design applied is a research and development type with a 4-D framework model consisting of four stages, namely: 1) Definition, 2) Design, 3) Development (Develop) and 4) Implementation. The subjects in this study included validators of material experts, learning experts, design experts, educators in the field of biology studies and students of class XI MIPA-4 SMA Negeri 1 Kuala. The data collected and analyzed are quantitative data and qualitative data originating from interview observation sheets, validation sheets from the expert team of validators, educators' assessments and student response questionnaires. The results showed that the LKPD which had been validated by material experts obtained results with an average number of 89.58% with the "Very Eligible" category, the validation of learning experts by 84.16% in the "Very Eligible" category, design experts by 83.86 % with the "Very Eligible" category. ". The results of the assessment from educators in the field of biology studies obtained results with an average number of 94.6% in the "Very Eligible" category, and the results of the student questionnaire responses of 91.2% in the "Good" category.

Kata kunci: Sciene, Technology, Engineering and Mathematics, Excretion system materials

INTRODUCTION

Technological developments in the 4.0 era are happening very rapidly. Technological developments that occur are very influential on the global community which is required to be able to provide qualified and skilled human resources . The development of Information and Communication Technology has an important role in various aspects of human life, including in the field of education. Several research studies explain that in the 21st century, education is expected to be able to prepare students to master various skills. Skills in the 21st century are still influential with the four pillars of life, namely learning to do , learning to know, learning to be , and learning to live together . Later, the four pillars contain special skills that are empowered in the teaching and learning process activities, such as literacy skills, communication, critical thinking, problem solving, innovation & creation, metacognition and other skills. Skills in the 21st century are the main focus of education today, especially in science education (Nisrina , et al ., 2017).

Literacy skills need to be integrated and developed in the teaching and learning process in the classroom. Literacy ability is one example that a student must have as a provision to build a nation's civilization. A literate geese is a nation that is able to answer the challenges of the times and conversely a non-literate nation will become a weak nation (Hermanto, et al ., 2017). This skill is one of the basic needs of science learning which is currently not properly taught in schools (Astuti, et al ., 2012). One of the skills that is very important to note so that students are able to apply science appropriately is scientific literacy (Suryani, et al ., 2017). Scientific literacy is a person's ability to apply their knowledge to identify questions, construct new knowledge, provide scientific explanations, draw conclusions based on scientific evidence, and the ability to develop a reflective mindset so that they are able to participate

in issues and ideas related to science (OECD, 2019) . In general, there are four aspects that become the main focus of scientific literacy skills, namely knowledge, attitude, context, and competence. The four aspects that are expected to be possessed by students are obtained through the KBM process in class. Science literacy is one of the main needs of 21st century students (Deming , et al ., 2007).

The Organization for Economic Cooperation and Development (OECD) has announced the PISA (Program for International Student Assessment) scores for Indonesia in 2018 in the fields of literacy, mathematics and science. Measurement PISA aims to evaluate the education system by measuring student performance in secondary education, especially in three main areas, namely mathematics, science, and literacy. Quoted from kompas.com , the submission of the 2018 PISA results for Indonesia was given by Yuri Belfali (Head of Early Childhood and Schools OECD) to the Minister of Education and Culture (Mendikbud) Nadiem Makarim at the Ministry of Education and Culture Building, Jakarta and determined that Indonesia was ranked 70th out of 78 participating countries. . For almost 20 years since PISA released the results of scientific literacy skills of students around the world, the State of Indonesia has always been at the bottom. This shows that the education system in Indonesia has not maximally facilitated the empowerment of students' scientific literacy skills through the KBM process and the low quality of science learning in Indonesia is far below the OECD member countries (Setiadi, 2013).

On October 2, 2021, observations were made in class XI MIPA-4 SMA Negeri 1 Kuala, totaling 35 people. Researchers saw that the biology learning process was still teacher- centered . The teacher as handler of all information and students only listen, record and memorize the concepts given by the teacher. In the learning process, the material obtained is only sourced from textbooks. Thus, learning that should be centered on students has not been fully realized, besides that teachers also do not use LKPD and teachers do not apply scientific steps. So that to achieve learning success, in addition to using the right learning approach, the use of teaching materials must include indicators that include current issues related to material and scientific application so that students' scientific literacy can be increased. Learning obstacles that are often faced by students are difficulties in understanding the material because learning is still teacher-centered and the lack of facilities and learning resources that result in student interest in taking lessons is still lacking and has not placed students to be active because of the lack of direct practical activities carried out by students. During the teaching and learning process, the application of scientific literacy to the cognitive aspects of science was marked by giving questions using C1 (Remembering), C2 (Understanding), C3 (Applying). In the aspect of science learning, there have never been questions about explaining scientific phenomena, analyzing scientific issues, drawing conclusions based on evidence and attitudes towards science showing interest in science and motivation to be responsible for nature. Educators also use LKPD which only contains a summary of material and questions, this is not in accordance with the function of the LKPD as teaching material that can minimize the role of educators, but activates students more and makes it easier for students to understand the material provided. Thus , the development of LKPD that is adapted to the conditions and needs of students is considered necessary and it is necessary to develop LKPD with a STEM approach in growing students' scientific literacy skills at SMA Negeri 1 Kuala. Educators are also not optimal in using learning tools and have never used or developed creative and innovative teaching materials, only use modules and textbooks from the library, and there are laboratories that are incomplete so they are rarely used.

There are ways that educators can do so that students have scientific literacy skills in the world of education, one of which is by using an integrative approach. The integrative approach is an approach that unites several aspects into one learning process, one of which is the STEM (Science, Technology, Engineering, and Mathematics) approach. The STEM approach is learning that links four fields, namely science, technology, engineering and mathematics into an effective unit with the aim that these students have visible technology and science skills. from the process of how to write, read, observe, develop their potential, and perform scientific skills to solve problems encountered in everyday life. The purpose of applying the STEM approach (Scince, Technology, Engineering, and Mathematics) to improve students' literacy skills in the learning process requires educators to think creatively. Educators are required to be creative in developing teaching materials. This teaching material is very influential on the learning outcomes of students. In science learning, later educators will direct and guide students to actively find their own understanding related to learning material. Thus, a teaching material is needed to support the KBM process, one of which is the LKPD (Student Worksheet).

Student Worksheet is a printed teaching material that contains material, summaries and instructions for the implementation of learning tasks that must be done by students to achieve the basic competencies presented (Prastowo, 2012). Educators can develop and design LKPD according to the material to be delivered to help students independently understand the material and as a supporter in the teaching and learning process. The development of STEM-based LKPD to improve scientific literacy skills is one of the right alternative media for biology subjects, because the science that is developed is not only biological knowledge but also other knowledge such as science, technology, engineering and mathematics. The development of LKPD is considered very efficient and effective to overcome students' difficulties in learning because the LKPD is prepared with a very interesting concept that is combined with a STEM approach in each material so that it is hoped that learning will be more meaningful (Fitriyah & Wardana, 2010). 2019).

One of the characteristics of the STEM approach is that it integrates science, technology, engineering, and mathematics in solving real problems so that students are ready to work. The knowledge used in solving the problem is the definition of scientific literacy. Scientific literacy is the individual's scientific knowledge and use of knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena and to draw conclusions based on evidence.

From the background of the above problems, the researchers tried to provide a solution by making LKPD (Student Worksheet) to function as a tool that aims to provide convenience for educators and students in the KBM process. Later, the LKPD was then developed with the help of STEM-based construct 2 software . (Science, Technology, Engineering and Mathematics) to develop the scientific literacy skills of class XI students at SMA Negeri 1 Kuala on the material of the expression system . Furthermore, the purpose of this development research is to produce STEM-based LKPD products that are attractive, effective, and and useful for improving students' scientific literacy skills, especially on the material of the expression system.

RESEARCH METHODS

This research was conducted at SMA Negeri 1 Kuala which is located on Jl. Education No.42 Kuala, Kuala District, Langkat Regency, North Sumatra Province, Postal code 20772. The time of this research will be planned for the even semester of April-May 2021/2022. This type of research is a research and development method **(** *Research and Development* R&D). *Research and Development* (R&D) is a research method used to produce certain products, and to test the effectiveness of these products (Sugiyono, 2011). The population determined in this study were all class XI IPA at SMA Negeri 1 Kuala for the academic year 2020/2021, which consisted of four classes totaling 140 students. The sample in this study was only 1 class that took biology lessons on excretory system material **.** As for The subjects in this study were 36 students of class XI SMA Negeri 1 Kuala, one educator in the field of biology at SMA Negeri 1 Kuala, one lecturer in biology, a subject matter expert, one lecturer in biology, an expert in learning, and one lecturer in biology, an expert in design. Data collection techniques carried out in this study are as follows: 1. Interview : Interview is the first data collection conducted by the researcher. Interviews in the study were carried out to meet the findings in the form of problems and analysis of needs faced by educators and students so that solutions were offered according to the needs of teachers and students. 2.Observation: Observation is carried out as a preliminary study in research to find problems that exist and are experienced directly by educators and students in schools when carrying out the KBM process. 3. Questionnaire: The questionnaire of this study consisted of a list of statement items distributed to respondents and used to collect data. In addition , the questionnaire was used to determine whether the developed LKPD was valid or not and to determine the practicality of the developed LKPD . In this study using a research instrument in the form of a questionnaire. The questionnaire in question is as follows: 1. The validity sheet of teaching materials experts in the form of LKPD to obtain information data from material experts, learning experts, and design experts , 2. Questionnaire sheets for educators in the field of biology studies, 3. Questionnaire sheets for student responses.

The model in this study uses a 4D model to develop learning tools (Thiagarajan, 1979). This development model includes 4 stages, namely stage **1). definition :** This stage consists of 5 parts, namely: A. Front-end analysis, B. Learner analysis, C. Task analysis, D. Concept analysis analysis), E. Analysis of learning objectives (Specifying instructional objectives). **2). Design stage** : Finding a more

effective and efficient way to develop the initial product design (Draft I) based on the data obtained at the definition stage The stages that must be carried out at this design stage are:
A. Determine the learning steps for LKPD development: Determine the title of the LKPD and Determine the LKPD Design, B. Media Selection (Media Selection): The media selection process is adjusted to the results of the initial analysis, analysis of student characteristics, concept analysis, and task analysis, material and learning objectives that have been formulated. It aims to help students achieve the competencies that have been formulated. In this study, Software Construct 2 will be used which aims to make LKPD attractive and effective, **3). Development stage (Develop)** : 1. Initial design, 2. Review of Advisory Lecturers, 3. Preparation of Research Instruments, 4. Validation of Experts and Educators, The components assessed by the expert team of validators at this development stage are 1. Material Validity, 2. Learning Validation, 3. Design Validation, 4. Biology Teacher Assessment, and **4). dissemination stage (*Desseminate*)** : Disseminate stage *:* Trial or implementation of the STEM-based LKPD product assisted by construct 2 was carried out in a limited group in class XI MIPA 4 SMA Negeri 1 Kuala, totaling 36 students. The purpose of this activity is to determine the product's ability to improve scientific literacy skills in the teaching and learning process. Before the teaching materials in the form of LKPD are distributed, the LKPD has gone through revisions according to the guidance of validators of material, learning, design, and educator experts .

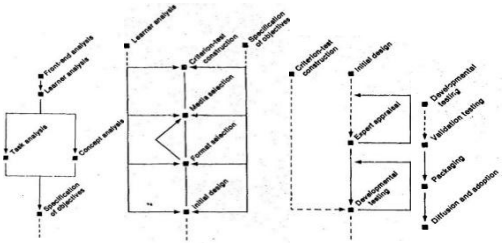


Figure 1. 4-D Development Model Adapted from Thiagarajan and Semmel (1974: 6-9)

To assess the learning media in the form of student worksheets developed in this development research, the following data collection instruments were used : a. Data Collection Instruments Validity of Student Worksheets: The validation sheet used in this study was in the form of a validation sheet to obtain data about the quality of the learning media used and the assessment of the questionnaire used was using a *Likert scale* with a score 1-4. The provisions of the Likert *scale* are as follows: 1) not feasible, 2) not feasible, 3) feasible, 4) very feasible.

The data to be obtained in this research is in the form of quantitative and qualitative data. Quantitative data in the form of score answers to assessment questionnaires from material experts, learning experts, design experts, biology teachers, and student worksheet test results . While qualitative data in the form of responses and suggestions given by material experts, learning experts, design experts, biology teachers and students about LKPD assisted by *Construct* 2 on STEM-based excretory system materials that have been developed. The data analysis carried out in this research is descriptive, where the data analysis technique is divided into two, namely data analysis for the results of the validation questionnaire and the results of the teacher's questionnaire as well as the student responses which are designed and summarized in the form of a Likert scale table for material experts, learning experts, design experts. , biology teacher while the students use the Guttman scale summarized in the form of a Likert scale table for material experts, learning experts, design experts, biology teachers while the students use the Guttman scale.

Calculating the level of validity/feasibility with the formula

$$P = \frac{f}{N} X\ 100\%$$

Information :
P = Category Percentage
f = Total Score of the selected Category
N = Ideal score

From the results of calculations using the formula above, a number is generated in the form of a percent, then interpreted in a qualitative sentence. The interpretation of assessment and feasibility for material experts can be seen in table 1 for learning experts in table 2 for design experts can be seen in

table 3 and for teachers can be seen in table 4 Then draw conclusions from the four tables that the STEM-based worksheets developed are suitable for use on the criteria "Decent" and "Very Eligible".

Table 1. Score

No.	Answer	Score
1	Very Worthy	4
2	Worthy	3
3	less worthy	2
4	Not feasible	1

Table 2. Percentage of LKPD Feasibility Assessment by Material Experts

Score Range	Percentage Interval %	Criteria	Qualification
14≤ X 24	52≤ X 42.85	Not feasible	Revise LKPD by re-examining carefully and looking for product weaknesses to be improved
25≤ X 35	44.64≤ X 62.5	Not worth it	LKPD products can be continued by adding something that is lacking, making certain considerations, the additions made are not too large.
36≤ X 46	64.28≤ X 82.14	Worthy	LKPD products that are used in the field for learning activities and doing some revisions.
47≤ X 56	83.92≤ X 100	Very Worthy	LKPD products are ready to be distributed and used in the field as learning resources, and do not make revisions.

Table 3. Percentage of LKPD Feasibility Assessment by Learning Expert n

Score Range	interval Percentage %	Criteria	Qualification
14≤ X 24	52≤ X 42.85	Not feasible	Revise LKPD by re-examining carefully and looking for product weaknesses to be improved
25≤ X 35	44.64≤ X 62.5	Not worth it	LKPD products can be continued by adding something that is lacking, making certain considerations, the additions made are not too large.
36≤ X 46	64.28≤ X 82.14	Worthy	LKPD products that are used in the field for learning activities and doing some revisions.
47≤ X 56	83.92≤ X 100	Very Worthy	LKPD products are ready to be distributed and used in the field as learning resources, and do not make revisions.

Table 4. Percentage of LKPD Feasibility Assessment by Design Experts

Score Range	Percentage Interval %	Criteria	Qualification
14 X 24	25 X 42	Not feasible	Revise LKPD by re-examining carefully and looking for product weaknesses to be improved
25≤ X 35	43.75≤ X 62.5	Not worth it	LKPD products can be continued by adding something that is lacking, making certain considerations, the additions made are not too large.
36≤ X 46	64.2≤ X 82.1	Worthy	LKPD products that are used in the field for learning activities and doing some revisions.

Score Range	Percentage Interval %	Criteria	Qualification
47≤ X 56	83.9≤ X 100	Very Worthy	LKPD products are ready to be distributed and used in the field as learning resources, and do not make revisions.

Table 5. Percentage of LKPD Feasibility Assessment by Teachers

Score Range	Percentage Interval %	Criteria	Qualification
15≤ X 26.25	25 X 43.75	Not feasible	Revise LKPD by re-examining carefully and looking for product weaknesses to be improved
26.5 X 37.75	44.1≤ X 62.9	Not worth it	LKPD products can be continued by adding something that is lacking, making certain considerations, the additions made are not too large.
38≤ X 49.25	63.3≤ X 82	Worthy	LKPD products that are used in the field for learning activities and doing some revisions.
49.5≤ X 60	82.5≤ X 100	Very Worthy	LKPD products are ready to be distributed and used in the field as learning resources, and do not make revisions.

Analyst of Student Response Results Against LKPD

At this stage, an analysis of student response questionnaires was carried out by : 1) The data was generated in the form of a *check list* which was applied in the form of a Guttman scale table with the provisions of the answer "No" or "Yes". Answers "Not Eligible" are given a score of 0 and answers "Eligible" are given a score of 1

Table 6. Instrument Item Answer Criteria with Guttman . scale

No	Answer	Score
1	Yes	1
2	Not	0

The student response data obtained will be analyzed using descriptive analysis designed to describe the effectiveness of the LKPD. The data is analyzed with the following steps :

(1) Addition of Percentages

$$P = \frac{f}{N} X\ 100\%$$

Information :

P = percentage number

f = frequency achieved by the percentage

N = number of samples

2) From the explanation of the above formula, a number is generated in the form of a percentage which is then applied in the form of a qualitative sentence. Applications can be seen on table 1.7.

Table 7. Percentage of LKPD Effectiveness Indicators for questionnaire responses

Score Range	interval	Criteria	Qualification
0 X 10	0 X 50	Not good	The LKPD product failed,

Score Range	interval	Criteria	Qualification
			massively revised the contents of the product.
11 X 20	50 X 100	Well	LKPD products are said to be effective and ready to be used for learning activities and do not make revisions.

Students' Scientific Literacy Ability

At this stage, a limited field test was conducted to measure students' scientific literacy skills which were analyzed using a STEM approach with a Likert scale . The effectiveness of the student activity sheets was analyzed through learning outcomes data on the implementation of learning . Students are categorized as successful (passed) if they get a value greater than or equal to the KBM value (value > KBM). Learning is successful If students reach 85%.

So in this study, according to KBM biology subjects at SMA Negeri 1 Kuala doing development and research, individual completeness is 75 and classical completeness is 85%.

The assessment used to measure scientific literacy skills is as follows:

$$\text{Rating score} = \frac{\text{Jumlah skor yang dikerjakan}}{\text{Jumlah Nilai skor tertinggi}} \; X \; 100\ \%$$

The calculation results are then applied using a classification using an assessment as shown in the table below.

Table 8. Percentage of classification knowing the Scientific Literacy Ability of Students

Percentage	Classification
81%-100%	Lofty
61%-80%	Tall
41%-60%	Enough
21%-40%	Low
0%-20%	Very low

(Arikunto, 2006)

To determine the effectiveness of LKPD in improving scientific literacy skills, it can be seen from student learning graduation which can be calculated by the formula below.

$$\text{KB} = \frac{\text{T}}{\text{Jumlah Nilai skor tertinggi}} \; X \; 100\ \%$$

Family Planning Description = Complete Learning
T = Total scores obtained by students
T1 = Total score (Trianto, 2017) .

RESULT AND DISCUSSION

Research on the development of LKPD assisted by *Construct* 2 based on STEM on the excretory system material for class XI MIA has been carried out at SMA Negeri 1 Kuala. Data were obtained from four sources, namely validation sheets for material validators, validation sheets for learning validators, validation sheets for design validators, assessment sheets for biology teachers, and student limited group tests. The results of the analysis obtained are the basic reasons for developing the LKPD which aims to improve the scientific literacy skills of students in the MIPA class of SMA Negeri 1 Kuala with the ultimate goal of the LKPD being developed to be able to overcome problems regarding the need for teaching materials and an analysis of these problems.

Table 9. Results of the analysis of the need for teaching materials in the form of LKPD and Situation Analysis in the form of low scientific literacy of students

No.	Results of Analysis of Teaching Material Needs in the form of LKPD and Situation Analysis in the form of Low Science Literacy Skills of Students
1.	Educators do not fully use LKPD on some of the biological materials studied in the teaching and learning process in class
2.	LKPD compiled in biology learning is still in a simple form, which only contains cognitive evaluation questions, so it can be said that the format for preparing LKPD is not good and correct.
3.	The LKPD that is prepared is still limited to the ability of C1 (Remembering), C2 (Understanding), C3 (Applying). In the aspect of science learning, there have never been questions about explaining scientific phenomena, analyzing scientific issues, drawing conclusions based on evidence and attitudes towards science showing interest in science and motivation to be responsible for nature.
4.	Students have difficulty solving a problem when given a reflection of a problem, it shows that the level of students' ability in scientific literacy skills is still low.
5.	Working on evaluation questions in the LKPD has not trained students to maximize in group work, only personal work.

design stage . The design stage is carried out to determine the components of the LKPD writing indicators, the components of scientific literacy indicators on the excretory system material, STEM-based learning writing procedures, and determine the assessment instrument sheet for expert validators, educators and student responses to teaching materials in the form of LKPD assisted by *construct* 2 based on the STEM approach. developed.

The teaching materials in this study were developed according to the components of the LKPD preparation such as: 1) Learning instructions (directions for using LKPD assisted by *construct* 2 based on the STEM approach), 2) Competencies and learning indicators to be achieved (containing basic competencies and learning indicators adapted to the STEM approach to achieve learning objectives. 3) Researcher and lecturer profiles supervisor (short identity of researcher and supervisor), 4) Supporting information (additional information that complements teaching materials so as to increase student knowledge and make it easier for students to understand the material presented), 4) Quiz questions (questions that have been integrated with the STEM approach that In it there are 4 related sciences, namely science, technology, engineering and mathematics). 5).Video learning component (- video which add knowledge and clarify the excretory system material that students learn about), 6) Materials (containing excretory system material in brief relating to evaluation questions and integrating the STEM approach. 7) Activity sheets (instructions for carrying out group work activities that have integrated the STEM approach that students must do with regard to group practice). After that, the researcher determined the format of the LKPD that was developed.

LKPD Validation Results by Material Experts

The results of the feasibility or material validation on the LKPD from the material expert validator were obtained by Mr. Hendro Pranoto, S.Pd, M.Sc. The validator himself validates the excretory system material in class XI MIPA which has been designed by the researcher. Then the data on the percentage of validation results by material expert validators is presented in Table 1.10.

Table 10. Percentage of Validation Results by Material Expert Validators

Rated aspect	Percentage Average (%)	Criteria
Content Eligibility Indicator	93.75	Very Worthy
STEM Components	75	Worthy
Language Usage	100	Very Worthy
Average	**89.58**	**Very Worthy**

From the results of the exposure in Table 10 above, the overall average percentage of assessments from material expert validators is 89.58% for the overall material criteria category, namely "Very Eligible". The explanation of the feasibility percentage by the material expert validator is divided into three aspects, the first is the content feasibility indicator is 93.75% in the "Very Eligible" category, then the STEM component feasibility indicator percentage is 75% in the "Eligible" category, and the percentage indicator for the feasibility of using language by 100% with the "Very Eligible" category, so that the LKPD that has been developed is declared very suitable for use.

LKPD Validation Results by Learning Experts

The results obtained from the feasibility or validation of learning on the LKPD from the learning expert validator conducted by Mr. Dr. Hasrudin, M.Pd. The validator himself validates the excretory system material in class XI MIPA which has been designed by the researcher. Then the data on the percentage of validation results by learning expert validators is presented in Table 11.

Table 11. Percentage of Validation Results by Learning Expert Validators

Rated aspect	Percentage Average (%)	Criteria
Content Eligibility Indicator	90	Very Worthy
STEM Components	75	Worthy
Language Usage	87.5	Very Worthy
Average	**84.16**	**Very Worthy**

From the results of the exposure in Table 1.11 above, it is known that the overall average percentage of assessments from learning expert validators is 84.16% and the overall material criteria category is "Very Eligible". The explanation of the feasibility percentage by the learning expert validator is divided into three aspects, the first is the content feasibility indicator is 90% in the "Very Eligible" category, then the STEM component feasibility indicator percentage is 75% in the "Eligible" category, and the percentage indicator for the feasibility of using language of 87.5% with the category "Very Eligible", so that the LKPD that has been developed is declared very suitable for use.

LKPD Validation Results by Design Experts

The results of the feasibility or design validation on the LKPD were obtained from a design expert validator conducted by Mr. Henry Iskandar S.Pd M.Pd. Q. The validator himself validates the excretory system material in class XI MIPA which has been designed by the researcher. There were 2 revisions given by the validator to the researcher, the results of the revisions are presented in table 4.6. Then the data on the percentage of validation results by design expert validators is presented in Table 12.

Table 12. Percentage of Validation Results by Design Expert Validators

Rated aspect	Percentage Average (%)	Criteria
Content Eligibility Indicator	95	Very Worthy
STEM Components	65	Worthy

Graphics	91.6	Very Worthy
Average	**83.86**	**Worthy**

From the results of the exposure in Table 1.12 above, it is known that the overall average percentage of assessment from design expert validators is 83.86% and the overall material criteria category is "Very Eligible". The explanation of the feasibility percentage by the learning expert validator is divided into three aspects, the first is the content feasibility indicator is 95% in the "Very Eligible" category, then the STEM component feasibility indicator percentage is 65% in the "Eligible" category, and the percentage indicator for the feasibility of using language of 91.6% with the category "Very Eligible", so that the LKPD that has been developed is declared suitable for use.

LKPD Assessment Results by Educators who teach biology

Table 13 presents the results of the percentage of educators who teach biology to the LKPD that has been developed. The educator who assessed the STEM-based LKPD (*Science, Technology, Engineering, and Mathematics*) was Mr. Syahrizal Ginting, S.Pd by providing feedback and suggestions.

Table 13. Percentage of Educator Assessment Results

Rated aspect	Percentage Average %	Criteria
LKPD Display	100%	Very Worthy
Content Eligibility	89.2%	Very Worthy
STEM Components	100%	Very Worthy
language	89.2%	Very Worthy
Average	94.6%	Very Worthy

From the table above, it can be concluded that the results of the STEM-based LKPD assessment (*Science, Technology, Engineering, and Mathematics*) assisted by *construct* 2 on the excretory system material for class XI MIPA are in the "Very Eligible" criteria with an average percentage of 94.6%. The LKPD that has been developed through this research is declared very feasible

Assessment of Student Responses/Responses The results of responses from students in MIPA class 3 to the LKPD were developed and presented in Table 4.9. There were 36 students who gave feedback and suggestions. The results showing data from the analysis of the assessment of student responses to the LKPD can be seen in Appendix 22.

Table 14. Percentage of Student Response Results to LKPD

Rated aspect	Percentage Average(%)	Criteria
LKPD Display	88.8%	Well
Presentation of LKPD	88.8%	Well
Learning Activities	95.8%	Well
Average	91.2%	Well

From the table above, it is the result of the conclusions of the students' responses to the STEM-based LKPD on the excretory system material. The LKPD that was assessed to have been validated was first validated by material experts, learning experts, design experts, and educators who teach the field of biology studies, which were then distributed to 36 students. This is done in order to find out how the response or responses from students to the LKPD product that has been designed by the researcher. The conclusion from the results of the responses or responses of students to the developed LKPD is the average value of the percentage of 36 respondents who chose "he", it shows that the given LKPD is suitable for use in the teaching and learning process, especially on the excretory system material.

Limited Group Trial Assessment Results on Effectiveness in Improving Students' Scientific Literacy Skills

For data on the interpretation of the final grades of LKPD assisted by *construct* 2 based on STEM in improving students' scientific literacy skills, it is described in table 4.10, as well as information on the percentage of completeness data on learning outcomes for MIPA 3 class at SMA Negeri 1 Kuala on the effectiveness of LKPD in improving students' scientific literacy skills. table 15.

Table 15. Interpretation of the Final Score of Students' Science Literacy Skills Test on the Use of LKPD.

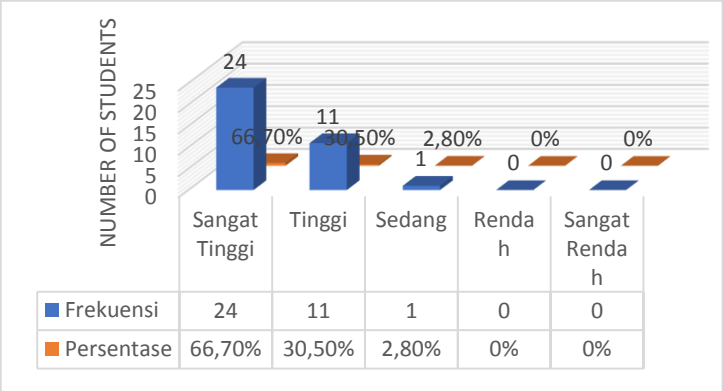
No.	The value of learning outcomes	Category	Frequency	Percentage (%)
1	81 < X 100	Very high	24	66.7
2	< X 80	Tall	11	30.5
3	< X 60	Currently	1	2.8
4	< X 40	Low	0	0
5	< X 20	Very low	0	0
Amount			36	100%

Table 16. Percentage of Graduation Results of Class Students Against LKPD LKPD Effectiveness in Improving Students' Science Skills

No	The value of learning outcomes	Category	Frequency	Percentage (%)
1	66 - 74	Not Complete	5	13.9
2	75 - 90	Complete	31	86.1
Amount			36	100.0

The limited group test was conducted in class XI MIPA-4 SMA Negeri 1 Kuala. The trial was distributed to 36 students with low, medium and high ability levels. From the description of table 4.11, it shows that there are 31 students whose learning outcomes are complete with a passing percentage of 86.1% and there are 5 students who are not complete with a percentage of 13.9%. From the results of the researcher's analysis, many students did not pass the Mathematics activity. From the description of table 4.11 shows that the scientific literacy skills of students are in the medium, high and very high categories with an average score of 83.1% with a total percentage of completeness of 86.1% in the "Very high" category.

From the description above, it shows that the theory that supports that a class is said to be complete in learning (classical completeness) if in one class there are 85 % of students who have completed learning, this concludes that the LKPD developed in this study is effective in improving literacy skills. student science. The data on the interpretation of the final value of the scientific literacy skills test is presented in Figure 4.6.



Sangat Tinggi (81 < X ≤ 100)	Tinggi (61 < X ≤ 80)	Sedang (41 < X ≤ 60)		
Rendah < X ≤ 40)	Sangat Rendah (0 < X ≤ 20)			(21

Figure 2. Bar Diagram of Participants' Science Literacy Skill Test Results Educate

CONCLUSION

From the description of the problem formulation, research objectives, and discussion regarding the development and design of STEM-based construct 2 LKPD on the Excretion System material in the MIPA-4 class of SMA Negeri 1 Kuala which has been described above, it can be concluded The results of the feasibility assessment of the STEM-based LKPD assisted by construct 2 that have been validated by the material expert validator got a total score of 50 with an average percentage of 89.3% declared "Very Eligible". The results of the assessment for the feasibility of LKPD assisted by construct 2 based on STEM which has been validated by a learning expert validator got a total score of 40 with an average percentage of 90.9% declared "Very Eligible". The results of the assessment for the feasibility of LKPD assisted by construct 2 based on STEM which have been validated by design expert validators got a total score of 50 with an average percentage of 89.3% declared "Very Eligible". The results of the assessment for the feasibility of LKPD assisted by construct 2 based on STEM which have been assessed by educators in the field of biology studies got a total score of 56 with an average percentage of 93.3% declared "Very Eligible". The results of responses to the feasibility of LKPD assisted by construct 2 based on STEM which have been assessed by students get a total score with an average percentage of 92.5% declared "good". LKPD assisted by construct 2 based on STEM which was developed to be effective in improving students' scientific literacy skills got an average total score of 83.1 which was in the "very high" category and with a percentage of 86.1% so that the LKPD was declared "good" used in the biology teaching and learning process on the material. excretory system.

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