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The 2nd International Conference on
Life Science and Biology Education

ENGAGING WITH RESEARCH IN LIFE SCIENCE AND BIOLOGY EDUCATION

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PREFACE

Foreword by The Dean of Faculty of Mathematics and Natural Science, Universitas Negeri Makassar (UNM)

Assalamualaikum Wr. Wb.

I would like to take this opportunity to express my sincere appreciation to all keynote speakers and invited speakers for accepting our invitation to share their research findings and best practices here, at the 2nd International Conference on Life Science and Biology Education, organized by Biology Department FMIPA UNM. We do hope that best practices in the field of Biological science and Biology education can be well communicated among researchers, teachers educators, school teachers, and also students joining this conference.

I would also like to take this opportunity to thank the Chair of The 2nd IcoLiBe for organizing this special event as well as for exchanging knowledge and best practices in a platform for networking as the field of Biological science and Biology education.

The 2nd International Conference on Life Science and Biology Education is not only expected to be a forum to disseminate the latest research findings in the field of Biology and Biology Education, but it is also expected to be a networking forum for researchers, teacher educators, and school teachers. We hope that the meeting of researchers and academics from various institutions in this place can be a starting point for more collaborations in the future.

Behind the implementation of these activities, there are hard work, commitment and outstanding cooperation of the executive committee. Therefore, to the whole team of the executive committee, I really thank you for your hard work and enthusiasm for the success of the 2nd International Conference on Life Science and Biology Education.

Finally, as the Dean of The Faculty of Mathematics and Natural

Sciences Universitas Negeri Makassar, I would like to congratulate all participants for joining the 2nd International Conference on Life Science and Biology Education. Hopefully, this conference can bring benefits for all of us.

Wassalamualaikum wr wb.

Makassar, August, 2023
Dean of FMIPA UNM,

Prof. Drs. Suwardi Annas, M.Si., Ph.D

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Analysis of Increased Activity and Scientific Attitudes of Students on Human Excretory System Materials Through Cooperative Jigsaw Types in Class XI Students of MAN Pinrang

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Abstract. This study aims to see the increase in learning activities, and scientific attitudes of students in classXI IPA 3 MAN Pinrang through the Jigsaw type cooperative learning model. This research is a classroom action research. The subject of the research conducted at MAN Pinrang recruited 19 students. The method of data collection is observation using an observation sheet. Classroom actionresearch conducted in class XI IPA 3 MAN Pinrang using quantitative descriptive data analysis andthen stored as a percentage. Based on the research, it showed that there was an increase in learningactivity by 89% (26% very active and 63% active) in the first cycle and by 89% (42% very active and 47% active) in the second cycle. cycle. The results of the data obtained in cycle II showed thatthe score had reached the minimum criteria that had been set at 50% for the number of very active and active categories. There are 7 activity indicators in this study and the seven indicators have reached the minimum specified criteria. As for scientific attitudes, there are 16 indicators that become criteria in classroom action research. In the cycle, the percentage of students' scientific attitudes was 42% (16% very active and 26% active), while the results of the analysis of scientific attitudes in the second cycle showed an increase of 63%. (0% very active and 63% active). These results indicate that the scientific attitude has reached the 50% criteria for the number of very activeand active categories. The conclusion of this study is that through the Jigsaw type cooperative learning model, it can improve learning activities and scientific attitudes of XI IPA 3 MAN Pinrangstudents on the material of the human excretory system.
Keywords: Learning model jigsaw, learning activities, concept understanding, scientific attitude, and MAN Pinrang.

INTRODUCTION

The teacher as a learning agent and facilitator who provides a number of knowledge to students where in one class each student has a different character. For this kind of thing, the teacher is required to provide an approach that is able to make students achieve the goals that have been set. Apart from this, the teacher is also expected to provide convenience in the process of learning activities for students. Many factors can become obstacles why the generalization of each class is different, such as the less conducive classroom atmosphere, then the application of learning models

can be one of the factors that influence students' activity, understanding of concepts, and scientific attitudes.

Several factors can influence learning outcomes, low learning outcomes can be related to students' learning motivation. Having low motivation for a lesson which will cause a decrease in the quality of learning. Therefore, an increase in learning is absolutely necessary, an increase will be more directed and in line if there is student-centered learning where the development of the potential of students is adjusted to the potential, development, and needs, interests of students and the demands of the surrounding environment (Widarta, 2020) .

This research is based on the results of interview observations with the biology teacher MAN Pinrang on February 5 2022, it was found that in class XI IPA 3 the students were less responsive when participating in the teaching and learning process, compared to the other 5 classes so that it also affected the mastery of biology subject matter in that class .

Based on the problems found in class XI IPA 3, the researchers tried to overcome the problems in the form of implementing a learning model that prioritized student activity. In learning biology, it is necessary to create learning conditions that can encourage students to be actively involved during the learning process and generate curiosity in students, and can lead to a process of interaction or reciprocity between teachers and students, as well as students and students in learning activities.

Based on the results of previous research, it was found that the application of the *Jigsaw* was very effective in increasing students' scientific activities and attitudes. This is because the small groups that are formed during the learning process take place making students more productive because the whole series of teaching and learning processes is student-centered (Purba, 2020).

cooperative model *Jigsaw* in this study was based on the results of the research conducted by Johnson and Johnson described in Putra (2014) that the application of the *Jigsaw* can improve learning outcomes; improve memory; can be used to achieve a high level of reasoning; encourage motivation in each individual; improve the relationship between heterogeneous individuals. From the results of the research put forward by Jhonson and Johnson above, it is hoped that by implementing the *Jigsaw* it can increase activity, conceptual understanding, and scientific attitude of students in class XI IPA 3 MAN Pinrang.

RESEACH METHODS

The type of research used in this research is Classroom Action Research with a qualitative approach, because the source of the data is

obtained directly from the problems encountered by describing data, facts, and conditions that exist in the location. This study uses an observation sheet. In the research conducted at XI IPA 3, there were 19 students who were research subjects. The purpose of this study is to improve the quality of learning in class XI IPA 3 MAN Pinrang in order to increase learning activities and scientific attitudes through the application of the *Jigsaw*.

RESEARCH RESULTS

Theresults of research that has been conducted in class XI IPA 3 with 19 subjects. In the form of a descriptive analysis of the data obtained during the research, which consisted of an analysis of the increased activity and scientific attitude of class XI IPA 3 at MAN Pinrang.

A. Statistical Analysis Results Description Activites
1. Cycle I

The results of the descriptive analysis of the activities of the first cycle of students in class XI IPA 3 MAN Pinrang can be seen in the following table.

Table 4.1 Distribution of learning activity scores in cycle I of students XI IPA 3 MAN Pinrang

Interval	Frequency	Percentage %	Category
≤ 7	5	26	Very Active
5 - 6	12	63	Active
3 - 4	0	0	Quite Active
1 - 2	2	11	Not Active
Total	**19**	**100**	

Source: Data obtained by analysis of Microsoft Excel 2010

Based on the data in table 4.2 above, the activity of students in cycle I was dominated at intervals 5-6 with a frequency of 12 students with a percentage of 63%. For Cycle I activities, both the first and second meetings, although the conditions of the students still adjust to the model used. The results shown based on data acquisition show that student activities are categorized into active.

2. Cycle II

Table 4.2 Distribution of learning activity scores in cycle I of students XI IPA 3 MAN Pinrang

Interval	Frequency	Percentage %	Category
≤ 7	8	42	Very Active

Interval	Frequency	Percentage %	Category
5 - 6	9	47	Active
3 - 4	2	11	Quite Active
1 - 2	0	0	Not Active
Total	**19**	**100**	

Source: Data obtained by analysis of Microsoft Excel 2010

Based on the data in table 4.4 above, the activity of students during the teaching and learning process in cycle II was dominated by the active to very active categories. The results of cycle II activities showed an increase in which in cycle I for the very active category it was only 26% while for cycle II it showed 42% based on these data meaning that the learning activities of students increased and were better than the percentage of learning activities in cycle I. This shows that the activities of students have reached the target or indicators of research success have been achieved.

B. Statistical Analisis Results Description Scientific Attitude
1. Cycle I

Table 4.3 Distribution of scientific attitude scores in the cycle II of
class XI IPA 3 MAN Pinrang

Interval	Frequency	Percent %	Category
$\geq 15,86$	2	10	Very High
13.14 – 15.86	6	32	High
10.42 – 13.14	7	37	Currently
7.70 – 10.42	3	16	Low
$\leq 7,70$	1	5	Very Low
Total	**19**	**100**	

Source: Data obtained by analysis of Microsoft Excel 2010

Based on the data in table 4.3 above, the scientific attitude of students during the teaching and learning process in cycle I was dominated at intervals from 10.42 to 13.14 with a frequency of 7 students with a percentage of 37%. Then for the high to very high categories, if both are converted to percentages, 42% will be obtained, this has not yet reached the success indicator, namely 50%. Therefore the scientific attitude for cycle I was continued to cycle II.

1. Cycle II

Table 4.4 Distribution of scientific attitude scores in the cycle II of class
XI IPA 3 MAN Pinrang

Interval	Frequency	Percent %	Kategori
≥ 17,61	0	0	Very High
14.92 – 17.61	12	63	High
12.23 – 14.92	3	16	Currently
9.53 – 12.23	3	16	Low
≤ 9,53	1	5	Very Low
Total	19	100	

Source: Data obtained by analysis of Microsoft Excel 2010

Based on the data in table 4.4 above, the scientific attitudes of students during the teaching and learning process in cycle II were dominated at intervals of 14.92 - 17.61 with a frequency of 12 students. The scientific attitude of students during the teaching and learning process took place during the second cycle of class XI IPA 3 MAN Pinrang in the high category with a percentage of 63%. Based on the acquisition of these data that with a percentage of 63% has achieved a success indicator of 50%. The scientific attitude of the students shown showed an increase in cycle II where in cycle one it was only 42% after reflection and continued to cycle II it was obtained as much as 63%.

CONCLUSION

Based on the results of the research that has been done, it can be concluded as follows. After taking action with the *Jigsaw* activities of students in class XI IPA 3 MAN Pinrang have increased. After taking action with the *Jigsaw* the scientific attitude of students in class XI IPA 3 MAN Pinrang has increased.

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Analysis of Teacher and Student Needs for Development E-Module Based on Project Based Learning Materials of Environmental Change in Class X SMA/MA

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Abstract. This study aims to analyze the needs of students and teachers on the use of environmental change teaching materials. The research used a descriptive method. The subjects in this study were 32 students of class X MIA 2 and 2 biology teachers at SMAN 22 Gowa. Data collection techniques using interviews and questionnaires. Based on the interview results with biology teachers, it was obtained that, (1) the teaching materials used in environmental change was limited quantity and not integrated with technology, (2) teaching materials do not meet all learning indicators, (3) students are less active in learning because teachers use direct learning model. While the information obtained from questionnaires is, (1) as many as 58% of students stated that the teaching materials used in schools were not sufficient for all students, (2) as many as 65% of students stated that the teaching materials used were uninteresting and irrelevant with daily life, (3) as many as 61% of students stated that teaching materials did not increase learning motivation, (4) as many as 90% of students stated that had never been given project based assignments, (5) as many as 100% of students stated that they needed interesting and technology-based teaching materials to study environmental change materials. Therefore, teaching materials are needed that can increase students' motivation and independence in learning, of course with the application of technology, namely e-module based on project based learning (PjBL).
Keywords: E-module, environmental change

INTRODUCTION

Education is the main key in advancing and improving people's lives in a better direction. Therefore, improving the quality of education is important. One of the efforts made by Indonesian is to change curriculum. Kurikulum Tingkat Satuan Pendidikan (KTSP) which was the initial curriculum, has been changed to the Curriculum 2013 (K13), which is designed to enhance the Indonesian educational system. The curriculum 2013 focuses on the activeness, creativity and creating meaningful learning. The teacher's as a motivator and facilitator must manage the class so that students are more proactive. Of course, in the learning process the teacher cannot be separated from the use of teaching materials.

Teaching materials are all materials (information, tools, and tests) that are systematically arranged that fully display the learning competencies that must be mastered by students and used during the learning process with the aim of planning and reviewing the

implementation of learning (Prastowo, 2013). The most important component of the curriculum is the teaching materials. The purpose of instructional materials is to provide exercises for students to practice interactive communication, information referencing, and a source of stimulant (Sukmawati, 2015). So that the learning process may be deemed successful, it is important to use teaching materials that are in line with the needs and personality traits of the pupils.

Based on observations at SMAN 22 Gowa, the learning problems are that students were passive and depended on the teacher's explanation, limited quantity of teaching materials and the teaching materials used did not attract attention because the presentation was still text book. However, giving better teaching materials can help improve the standard of learning.

The advancement of science and technology encourages creativity in the improvement of the educational system, including creativity in the creation of teaching materials that make use of technology. The use of technology in question is by using gadgets. Teachers can more easily transmit information to students because the information can be better represented through visuals that more real. Presentation of material by utilizing technology is also able to overcome the limited number of teaching materials so that all students can have learning materials. In addition, the use of gadgets in the learning process is in accordance with the potential of today's students, almost all of whom have smartphones or laptops, so that there is or is not a teacher directly, the learning process can still be carried out because the teacher is no longer the only source of learning.

Teaching materials that can make students active and independent in the learning process are electronic learning modules (e-module). E-module have several advantages, namely being interactive, easily accessible on smartphone or laptop, and equipped with facilities such as learning videos, animations, images, and audio (Pramana, Jampel & Pudjawan, 2020). In addition to these advantages, e-module is also more environmentally friendly because they do not use paper in their manufacture.

The use of teaching materials certainly cannot be separated from the application of learning models. Based on Permendikbud No. 65 of 2013, one of the suitable learning models to be applied in K13 is project-based learning. The project based learning (PjBL) model is a model that teaches students to think critically and find solutions to real-life problems. The application of project-based learning can provide students with opportunities to understand concepts in depth and improve learning outcomes (Wahyu, 2016). The PjBL model is also very suitable to be

applied to environmental change material because this material is part of biology learning, which is quite interesting and challenging because it is directly related to the realities encountered every day. But this material is often presented with the method of memorizing concepts without involving the active role of students.

Therefore, the current learning process requires the activeness and independence of students in understanding concepts so that learning becomes more meaningful. Therefore, an analysis of the needs of teachers and students was carried out for development of e-module teaching materials based on project based learning materials on environmental changes so that students were more active and independent in the learning process.

RESEARCH METHOD

This research is a descriptive research. The methods used to collect data are distributing non-test questionnaires of 10 items to 32 students in one study group and conducting structured interviews with 2 biology teachers at SMAN 22 Gowa. The data analysis technique is to calculate the percentage of questionaries answers and describe the interview's outcome. The research data obtained are then presented descriptively in order to draw conclusions about the needs of teachers and students for an e-module based on project-based learning on environmental change. The sampling technique uses simple random sampling because we don't know the abilities of all study groups so they are taken randomly.

RESULTS AND DISCUSSION

Data analysis in the study was carried out by outlining the needs of teachers and students for the development of e-module based on project based learning that can support the learning process, especially material for environmental change. The results of interviews with two biology teachers stated that the teaching materials used by students on environmental change materials were textbooks, which were limited in quantity and there were no other teaching materials that could add to learning information. The resumes from the biology teacher interviews are presented in Table 1 below.

No.	Questions	Answer	
		Teacher 1	**Teacher 2**
1.	What teaching materials do you use in class, especially for environmental change?	Books	Books
2.	Have you ever used a project-based learning model on environmental change materials?	No. But using a natural exploration approach.	No. Only use the direct learning model
3.	Are there any shortcomings in the teaching materials that you use?	Yes, the books is very limited and not all indicators are met in the book.	The books can only be used at school, students cannot take them home.
4.	In your opinion, is it important to use teaching materials that are in accordance with current technology ?	It is very important, so as not to be out of date and teaching materials must also be in accordance with the development of students.	It is very important, because teaching materials must also keep up with technological developments.
5.	Have you ever used modules in the learning process? If so, what kind of module is used? If not, what kind of module to expect? a. Electronic module b. Module	Have used electronic modules but not on environmental change materials.	Never been, and wish there was an electronic module.
6.	In your opinion, is the use of electronic modules suitable for use in schools?	Exactly, because it is more practical to use and contains a lot of interactive material.	Exactly, because electronic modules are more practical and can be accessed anywhere.
7.	In your opinion, is the use of electronic modules in environmental change materials appropriate for use in schools?	Exactly.	Exactly.

The results of the analysis of table 1 explain that regarding environmental change material, teachers have never used the PjBL learning model, even though this material is very close to everyday life so that students can be invited to solve problems related to the environment. The PjBL model is very suitable to be applied to environmental change

material because according to Sumarmi (2012), PjBL is contextual learning that prioritizes student activity (student center) and uses problems in the surrounding environment to reconstruct knowledge and learning skills. Wahyu (2016) states that the PjBL learning model can increase students' creativity and learning motivation because it focuses on the core curriculum, facilitates students to investigate, solve problems, give assignments, student centers, and produce real products. The goal is for students to have independence in completing the tasks they face.

The teaching materials used by the teacher are text books which are limited in quantity and cannot be owned by students so that learning becomes less than optimal. Optimal learning requires effective teaching materials which are the main source of information in the learning process. One of the teaching materials that can be used by teachers is modules. According to Prastowo (2013), modules are teaching materials that are arranged systematically using language that is easy to understand and can be studied independently. Along with the times, modules are not only presented in printed form but are also presented in electronic form.

Electronic modules are technology-based teaching materials that teachers want because they look more attractive and interactive than printed books. Based on the analysis of the students' needs questionnaire presented in Table 2, information was obtained that the use of printed books did not increase motivation and independence in learning so that students needed alternative teaching materials to study environmental change material.

Tabel 2. Results of the analysis of students needs

No.	Questions	Persentage	
		Yes	No
1.	Do you like biology lessons?	87%	13%
2.	Do you struggle when studying environmental change material?	52%	48%
3.	Has the teacher ever assigned a project that had to be finished in a specified amount of time?	10%	90%
4.	Are there any teaching materials used at school?	100%	0%
5.	Are the teaching materials only text books?	52%	48%
6.	Are the teaching materials sufficient for all students?	42%	58%
7.	Are the teaching materials interesting and relevant to real life?	35%	65%
8.	Do the teaching materials used help you understand the material and increase your learning motivation?	39%	61%

| 9. | Do you need interesting alternative teaching materials to learn about environmental change? | 100% | 0% |
| 10. | Have you ever used electronic module in the learning process? | 0% | 100% |

Table 2 shows that in general students like biology lessons but still have difficulty learning environmental change material because the content of teaching materials is less interesting and less relevant to everyday life. In addition, the number of printed books used is limited so that learning is less than optimal. Irfan, et al (2019) said that the use of textbooks in learning only develops the ability of students to achieve learning objectives from the product dimension so that the process dimension is forgotten. The process dimension not only develops cognitive aspects but also affective and psychomotor aspects which can be obtained from other teaching materials, such as modules.

Based on Table 2, as many as 61% of students stated that the teaching materials used by the teacher did not increase learning motivation because the material presented in the teaching materials was only in the form of solid writing and did not contain pictures. The use of e-modules as technology-based teaching materials with audio, video and animation presentation facilities can attract attention and increase student learning motivation. Moreover, all students stated that they had never used e-modules in learning and needed supporting teaching materials to study environmental change material.

The results of the analysis of the needs of teachers and students will be developed by e-modules based on project based learning on environmental change materials that are able to increase student learning motivation and independence.

CONCLUSION

Based on the results of the needs analysis, it was found that in the matter enviromental change, teachers and students need technology-based teaching materials that can overcome the problem of quantity of teaching materials, increase motivation and learning independence through based on project activities. Thus, it is necessary to develop an e-module based on project based learning materials environmental change.

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Profile of Student Learning Outcome Using Contextual Teaching and Learning Approach in SMA Negeri 11 Makassar

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Abstract. This study aims to determine the learning outcomes of students who are taught using the Contextual Teaching and Learning (CTL) approach to the respiratory system material at SMA Negeri 11 Makassar and to determine the effect of using the Contextual Teaching and Learning (CTL) approach on student learning outcomes on respiratory system material at SMA Negeri 11 Makassar. This type of research uses a quasi-experimental research design using the Pretest-Postest Compration Group Design research design. In this design, there are two study groups. The XI IPA I study group used the conventional approach and the IPA II study group used the CTL approach. Each study group was first given a pre-test, then learning was carried out, and they were given a post-test. The data analysis technique used in this study is descriptive statistical data analysis to describe the biology learning outcomes obtained by students after being taught using the conventional approach and contextual teaching and learning (CTL) calculated using the SPSS 24.0 application program. And inferential statistical analysis used t-test (t-test) to determine the effect of the CTL approach on student learning outcomes through the SPSS 24.0 application program. The results of this study indicate that the learning outcomes of students who are taught using the Contextual Teaching and Learning (CTL) approach to biology learning outcomes of students at SMA Negeri 11 Makassar improve. There is a significant effect of using the Contextual Teaching And Learning (CTL) approach in learning respiratory system material on student learning outcomes at SMA Negeri 11 Makassar.

Keywords: Contextual Teaching and Learning, Learning Outcomes, SMA Negeri 11 Makassar.

PRELIMINARY

In today's education, teachers are not the only source of learning that exists. The teacher is no longer required to be a transmitter of what is known by the teacher or what is in the book to his students. This allows students as something that must follow the teacher without understanding what the students are thinking. This fact makes students not active in learning, because students only silently accept what the teacher says. This situation is contrary to the theory of Piaget (Mulyani Sumantri and Johan Permana 2001:15) which states that "the child is an active person", therefore the role of the teacher in learning should shift from being a transmitter to being a guide or guide in this case a guide or mentor in teaching and learning. teaching and learning process.

According to Slameto (Djamarah 2008: 13). Changes as a result of the learning process can be shown in various forms such as changes in knowledge, understanding, attitudes and behavior, as well as skills, abilities and abilities, reaction power, acceptance power and various aspects that exist in individuals. Therefore learning is an active process, learning is a process of reacting to all situations that exist around the individual. Based on research conducted (Ritonga, 2016) it is explained that the respiratory system material contains many concepts that students need to understand. The contextual approach (Contextual Teaching and Learning / CTL) is a learning concept that helps teachers relate the material being taught and the relationship between their knowledge and their family and society. With this concept, learning outcomes are expected to be more meaningful for students. That is the role of the teacher in a classroom that is managed using a Contextual Teaching and Learning approach (Aqib, 2009). So it can be concluded that students will learn well if what is learned is related to what has been known and happened in their environment.

The contextual approach (Contextual Teaching and Learning / CTL) is a learning concept that helps teachers link the material being taught and the relationship between their knowledge and their family and society. With this concept, learning outcomes are expected to be more meaningful for students. The teacher's job is to manage the class as a team that works together to find something new and find out on their own, not what the teacher says. That is the role of the teacher in a classroom that is managed using a Contextual Teaching and Learning approach (Aqib, 2009).

A conducive learning environment is very important and very supportive of contextual learning, and the overall success of learning. Therefore, the Contextual Teaching and Learning (CTL) learning model is very suitable to improve student learning outcomes, because in this learning model students will be active and practice directly what they have learned in everyday life, students will feel the importance of learning , and students will get a deep meaning to what they learn.

Based on the facts found in the field when the researchers conducted initial observations at SMA Negeri 11 Makassar, the situation was not as expected. This can be seen from the daily test scores for even semesters. The minimum completeness criteria score (KKM) that has been set by the school is 76. Meanwhile, it was recorded that only 35% scored above the KKM, 15% was limited to the KKM and 50% below the KKM was obtained from interviews with teachers of biology subjects. In the learning process was not optimal, the learning conditions were not conducive. Many students do not pay attention to the teacher and students more often do

things outside of learning activities such as sleepiness and so on. Based on the above background, the researcher proposes a research entitled "The Effect of Contextual Teaching and Learning on Learning Outcomes of Students at SMA Negeri 11 Makassar" with the aim of research to determine the effect of the application of Contextual Teaching and Learning (CTL) learning on student learning outcomes on the respiratory system material at SMA N 11 Makassar.

RESEARCH METHODS

This research is a quasi-experimental quantitative research. Quasi-experimental research is a type of research where not all factors that can theoretically affect the implementation of the experiment (the dependent variable) can be controlled (controlled) by the researcher (Sugiyono, 2010). This research was conducted in the even semester of the 2021/2022 academic year in February-March 2022. This research was conducted in one of the schools in the city of Makassar, precisely at SMA Negeri 11 Makassar. Jl. Andi Mappaodang No. 28, Jongaya, Tamalate Sub-district, Makassar City.

The population in this study was the entire study group for Class XI IPA SMA N. 11 Makassar which consisted of 7 class XI IPA in 1 class consisting of 34-36 students and the research design used in the study was Pretest-Postest Compration Group Design. In this design, there were two groups, all of which were given treatment. Each group was first given a pre-test, then given a post-test treatment. The research design is as follows:

Group	Pre-test	Treatment	Post-test
I	O1	XI	O2
II	O3	X2	O4

Source:Sarwendah (2013)
Description :
I : Groups of students who are taught with the approach *Contextual Teaching And Learning (CTL)*
II : Groups of students who are taught with the approach konvesional
O1 : *Pre-test* group I
O2 : *Pos-test* group I
O3 : *Pre-test* group II
O4 : *Pos-test* group II
X1 : Learning by using approach *Contextual Teaching And Learning (CTL)*
X2 : Learning by using approach konvesioanal.

Data Collection Techniques

The instrument used to obtain the data needed in this study is a test of biology learning outcomes in the form of a written test of 25 multiple choice questions with 5 alternative choices. Learning outcomes test is used as a tool to collect data on learning outcomes of biology subjects. The determination of the score for each item refers to the assessment rubric that has been determined by the researcher. For correct answers, a score of 1 is obtained while for incorrect or unanswered answers, a score of 0 is obtained with a maximum score of 25. The scores obtained are processed to obtain learning outcomes using the following formula:

$$\text{Nilai} = \frac{Skor\ yang\ diperoleh}{\text{Skor maksimum}} \times 100$$

Data Analysis Techniques

The data analysis technique used in this research is data analysis

1. Descriptive statistical analysis

a. Descriptive Statistical Analysis of Student Learning Outcomes

This analysis is intended to describe the learning outcomes of biology obtained by students after being taught using Contextual Teaching and Learning (CTL) and Conventional approaches. The scale of the interval category for the biology learning outcomes of students at SMA Negeri 11 Makassar is as follows.

Table 3. 3 Categories of Student Learning Outcomes Score

Interval Nilai	Category
81-90	Very Good
61-80	Good
41-60	Enough
21-40	Not Enough
0-20	Very Less

2. Inferential Statistical Analysis

Inferential statistical analysis was used to test the research learning outcomes by using the t-test (t-test) through the SPSS application program. Inferential analysis is divided into two, namely parametric analysis and nonparametric analysis, but what is used in this study is parametric analysis because population parameters and population size through sample data will be tested in this study. Parametric analysis has a requirement that the data obtained must be normally distributed and have homogeneous variations and the type of data must be interval and ratio data. This analysis

technique is a statistical technique used to analyze sample data and the results are applied to the population. Prior to the t-test analysis, the prerequisite tests were carried out, namely the normality test and homogeneity test. However, if the data obtained are not normally distributed and have non-homogeneous variations, non-parametric analysis will be used. The use of non-parametric statistics can be tested through nominal and ordinal data types. The method used in processing non-parametric statistical data is the chi-square test.

a.   Normality test
    Normality test is used to determine the sample under study is normally distributed or not. This normality test was carried out on the learning outcomes of students in the class using the CTL approach and the learning outcomes of students in the class using the conventional approach. Testing the normality of learning outcomes data using the SPSS application program, with the test criteria that the data is said to be normally distributed if the Kolmogorov-Smirnov Z (2-tailed) value obtained is > 0.05. On the other hand, if the value of Kolmogorov-Smirnov Z (2-tailed) < 0.05, it can be concluded that the research sample is not normally distributed.

b.   Homogeneity Test
    Testing the homogeneity of the learning outcomes data aims to find out the data in this study has the same variance (homogeneous) or not. Testing the homogeneity of the data on biology learning outcomes using the Statisical Package for Social Science (SPSS) version 24.0 system. The test criteria used with a significance level of $= 0.05$. The decision-making is done by looking at Levene's test of Error Variance, if Levene's test $>$ Hypothesis test $= 0.05$, then the data variation is said to be homogeneous.
        The type of t-test used is the Paired Sample t test using the Statistical Package for Social Science (SPSS) version 24.0 for windows. Paired Sample t test is part of a comparative hypothesis test or comparison test. This test aims to determine whether there is a difference in the average of two samples (two groups) that are paired or related. The test criteria are if Sig. (2-tailed) < 0.05, then the research hypothesis is accepted, meaning that there are differences in student learning outcomes taught by the CTL approach with the conventional approach.

3.   N-Gain Test
    Normalized gain test (N-Gain) was conducted to determine the increase in student learning outcomes after being given treatment. This

increase was taken from the pretest and posttest scores obtained by students. Normalized gain or abbreviated as N-Gain is a comparison of the actual gain score with the maximum gain score. Calculate the normalized Gain score based on the formula

$$N - Gain = \frac{Skor\ Posttest - Skor\ Pretest}{Skor\ Maksimal - Skor\ Pretest} X\ 100$$

The N-Gain criteria are as follows.

Interpretation N-Gain	Range
0,7 < (g) < 1	Heigth
0,3 ≤ (g) ≤ 0,7	Medium
0 < (g) < 0,3	Low

RESEARCH RESULT

Descriptive Statistical Analysis

1. **Descriptive Statistical Analysis of Learning Outcomes**

a. **Descriptive Pretest-Posttest Values of Students Through Contextual Teaching And Learning (CTL) Approach**

Student learning outcomes data obtained from the Pretest and Posttest scores as presented in Table 1.

Statistik	Group CTL		Group Konvensional	
	Pretest	Postest	Pretest	Postest
Highest Score	76	90	70	82
Lowest Score	36	72	36	70
Mean	59.89	82.53	50.89	60.64
Standar Deviasi	12.39	6.07	13.57	9.99
Modus	72	88	44	54
Median	68.00	79.00	50.00	56.00

Source: primary data processed

Table above shows that the average score of students' learning outcomes in the Contextual Teaching and Learning (CTL) group with the Conventional group has increased. In this table, the average value of the posttest in the CTL group was 82.53 and the average value of the posttest in the conventional group was 60.64. However, when viewed from the two study groups, the group that was taught using the Contextual Teaching and

Learning (CTL) approach had a higher improvement value.

Table 2. Distribution of Frequency and Percentage Categories of Students' Pretest-Posttest Learning Outcomes in the CTL Group and the Conventional Group

Category	Group CTL				Group Konvensional			
	Pretest		Postest		Pretest		Postest	
	F	%	F	%	F	%	F	%
Very Good	0.00	0.00	17	47.22	0	0.00	1	2.78
Good	20	55.56	19	52,78	7	19.45	16	44.44
Enough	13	36.11	0.00	0.00	21	58.33	17	47.22
Less	3	8.33	0.00	0.00	8	22.22	8	5.56
Very Less	0.00	0.00	0.00	0.00	0	0.00	0	0.00

Source: primary data processed

The pretest results obtained by the Contextual Teaching and Learning (CTL) group were dominated by the good category with a percentage of 55.56% and the posttest in the CTL group was dominated by the good category with a percentage of 52.78%. Whereas in the pretest and posttest the Conventional group was dominated by the sufficient category. The results of these data indicate that students who are taught with the CTL approach have higher learning outcomes compared to the conventional approach.

2. Inferential Statistical Analysis
a.   Normality Test of Student Learning Outcomes

Table 3. Normality Test Results Against Average Pretest and Posttest Values Using the N-Gain Test are presented in Table 3.

Variable Descriptiont	Sig-(2-tailed)	
Pretest-*CTL*	0.365	Normal
Postest-*CTL*	0.365	Normal
Pretest Konvensional	0.200	Normal
Postest Konvensional	0.200	Normal

Source: primary data processed

The output of SPSS Normality Test for learning outcomes in the CTL group is 0.200 and in the conventional group is 0.365. Data that are

normally distributed have a significant value greater than 0.05 ($\alpha > 0.05$), so it can be concluded that all data for learning outcomes in the CTL and Conventional groups are normally the largest.

b) Homogeneous Test of Student Learning Outcomes

Homogeneity test was conducted to determine whether the data obtained were homogeneous or not for the two treatment groups. The homogeneity test uses Levene Statistics with the criteria that if the leavene statistic is > 0.05, it can be said that the variation of the data is homogeneity. The results of the homogeneity test are shown in table 4.

Table 4. Test Results of Homogeneity of Learning Outcomes Values

Leavene Statistic	df 1	df 2	Sig
Learning Outcomes	0, 366	3	140	0,550

Source: primary data processed

The Levene's Test aims to determine the variance of the data that is the same or different based on the results of data processing according to the test of homogeneity of variances table above, the p-value of learning outcomes is $0.366 = 0.05$ so that it can be concluded that the data comes from the same group. have the same variance (homogeneous).

c. Difference Test

The results of the t-test of the CTL and Conventional approaches to student learning outcomes can be seen in table 5.

Table 5. Paired Samples Test Results

	df	Sig
Learning Outcomes	35	0,00

Source: primary data processed

From the processing results, it can be seen that the significant number for the group variable is 0.00 because the significant value is 0.00 < 0.05, then the hypothesis is accepted. It was concluded that there were differences in the learning outcomes of students who were taught using the conventional CTL approach on the respiratory system material at SMAN 11 Makassar.

3. N-Gain Analysis

Normalized N-Gain analysis was used to find out how much difference there was in the improvement in learning outcomes in the CTL and conventional groups. The data on the average gain value of students'

learning outcomes are then grouped based on the N-gain category which is presented in table 4.3.

Table 6. Average N-gain Results of Student Learning Outcomes.

Group	Mean N-gain	Category
CTL	0 ,56	Medium
Konvensional	0,21	Low

Source: primary data processed

Table 4.3 shows that the average N-gain value for the CTL group of 0.56 is in the medium category, while the average N-gain for the conventional group of 0.21 is in the low category. The results of this data analysis show that the change in the increase in the learning ability of conventional group students is higher than the CTL group.

DISCUSSION

Based on the results of the analysis of the data obtained from the above calculations related to the research that has been done at SMA Negeri 11 Makassar, it can be seen that the results of the research and the treatment that has been given to the sample have an influence on the learning motivation of students. This can be seen from the average value (Mean) obtained by the CTL and conventional groups, it is found that there is a difference between the learning outcomes of students who are taught using Contextual Teaching and Learning (CTL) and conventional approaches.

Improvements and differences in learning outcomes in CTL and conventional classes can be seen in table 4.2. Judging from the pretest and posttest scores in the CTL and conventional groups, the learning outcomes of students in the CTL class have higher learning outcomes compared to conventional classes. After conducting the "t" test which aims to determine how much influence the Contextual Teaching and Learning (CTL) approach has on learning outcomes. Based on the results of data analysis carried out by the "t" test, the data obtained that the significance number for the group variable is, 0.00. because the significance value is 0.00 < 0.05, it means that the hypothesis is accepted. This means that there is an influence between the Contextual Teaching and Learning (CTL) approach to student learning outcomes in biology subjects on the respiratory system material at SMA Negeri 11 Makassar.

This difference is due to the fact that the CTL group experienced an increase in motivation and higher learning outcomes than the conventional group because the acceptance of learning implemented a variety of learning

activities such as at the beginning of learning the teacher gave appreciation and in the form of questions related to the respiratory system material to provoke students' critical thinking patterns so that learning activities not monotonous, then students carry out discussion activities or learning communities, students are directed to find their own problems until students do their own LKPD given by the teacher so that students are more motivated in participating in learning activities. The opinion above is supported by (Arikunto, et al. 2002) who stated that CTL is a holistic education and aims to relate the material to the context of everyday life.

Based on the description above, it shows that different treatments cause different final results between Contextual Teaching and Learning (CTL) classes and conventional classes. Even though it experienced an increase in student learning outcomes, the CTL class experienced a higher increase in learning outcomes. Thus, it is proven that the Contextual Teaching and Learning (CTL) approach can have an effect on improving student learning outcomes. The results of this study have implications that the Contextual Teaching and Learning (CTL) approach can be used as an alternative for creative and innovative learning in an effort to improve the quality of education, especially in learning biology. This is confirmed by the results of research conducted by (Oktaviansa, et al. 2013) it can be concluded that the use of CTL learning in a class has advantages compared to classes that use conventional learning.

CONCLUSION

Based on the results of research and discussion, it can be concluded that there is an effect of applying the Contextual Teaching and Learning (CTL) approach to the respiratory system material on the learning outcomes of students at SMA Negeri 11 Makassar.

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Profile of Learning Critical Thinking Through Strategy Project Based Learning (PJBL) at SMA Negeri Parepare

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Abstract. Learning in the 21st century requires every student to have thinking skills, work habits, and character to achieve an independent and successful life. Learning must equip students with 6 competencies (Communication, Collaborative, Critical thinking, Creative, Compassion, and Computational logic). Learning in schools must be able to develop students' thinking skills, including in learning biology. Empowerment of students' critical thinking skills through integration of learning strategies is one of the efforts to train students' thinking skills. Project Based Learning (PjBL) learning strategies support the empowerment of students' critical thinking skills, needed so that students can become independent learners who can manage their own learning. This survey aims to determine the profile of biology learning that integrates critical thinking skills in senior high schools through PjBL learning strategies. The method used is a survey with a questionnaire technique. The analysis was carried out descriptively using diagrams. The results showed that learning critical thinking through PjBL learning strategies had mostly been implemented, but most of the students had difficulties in using their critical thinking skills (71.4%). In addition, the results of the survey on the implementation of critical thinking skills can be seen from 6 indicators in the form of interpretation skills (100%), analysis (100%), evaluation (100%), inference (28.6%), explication (85.7%), and self-regulation (14.3%). This shows that critical thinking learning for students at SMA Negeri Parepare still needs to be trained and improved through the use of constructivist learning strategies such as PjBL combined with cooperative learning so that all students with different academic abilities can jointly improve their critical thinking skills.
Keywords: Biology learning profile, critical thinking learning, critical thinking skill indicators.

INTRODUCTION

Learning in the 21st century demands the development of students' independence (self-regulated learning). Independent learners can organize and plan, monitor, evaluate, and reflect on their own learning, which is part of higher order thinking skills (HOTS). Learning in schools must be able to develop students' thinking skills and character, including in learning science (biology) (Anazifa and Djukri, 2017). Science education must equip students with learning that goes deeper than simply memorizing facts, students need the ability to apply their scientific knowledge in situations that require problem solving and decision making (Miller & Krajcik, 2019).

Learning is currently undergoing many changes. The empowerment of thinking skills is less than optimal and there is a significant loss of literacy and numeracy learning. The results of previous studies (Nurachima, 2020) and (Muin, 2020), revealed that students' thinking skills and understanding of essential material were low. Learning is more theoretical and individual. Learning does not provide space for students to use experience in constructing their knowledge. Study ideology should empower scientific attitudes and *HOTS* so that learning objectives are in accordance with scientific developments (Setiawati and Corebima, 2018).

This learning loss requires a quick recovery effort. Efforts can be made by selecting the appropriate learning model. Constructivist and contextual learning becomes an effective alternative for empowering HOTS and the character of students, such as the model PjBL learning, The PjBL model activates students through project assignments, can focus on essential materials, deep learning for mastering basic competencies and HOTS, and independence (Barak & Asad, 2012).Thinking skills of students will not develop by themselves in line with the development of their age and if done intentionally (Corebima, 2010).

Learning in schools is generally still conventional, the integration of critical thinking skills in learning is still limited. The results of previous studies show that critical thinking learning in schools has not been maximized. Research by Royani (2021), Nurachima (2020), Setiawati and Corebima (2019), shows that learning in schools still does not empower critical thinking skills.

Critical thinking skills are one of the factors that support successful learning. Critical thinking is an activity that uses thinking skills that involve analyzing, assessing, and creating activities. According to Sadia, (2008), critical thinking is an activity of making questions, gathering information, taking efficient actions, presenting logical arguments and drawing conclusions.

Based on the results of observations at UPT SMA Negeri 2 Parepare about learning critical thinking skills through the use of constructivist strategies, they are still not empowered. This happens because most learning is still centered on educators so that the role of educators in learning is not in accordance with scientific-based learning. Efforts that can be made to find out the level of empowering critical thinking in schools are through learning surveys related to the implementation of empowering critical thinking.

METHOD

This type of research is a descriptive research conducted to find a description of biology learning based on critical thinking skills experienced by students in biology learning at UPT SMA Negeri Parepare. The sample of this study were all educators at UPT SMA Negeri Parepare City. The research instrument was a modified questionnaire from Setiawati's (2017) questionnaire. The questionnaire uses closed and open statements using a Likert scale. The data analysis technique used is descriptive analysis using diagrams.

RESULTS AND DISCUSSION

The results of the survey on the implementation of higher order thinking empowerment (critical thinking) on students with different academic abilities in the group of high school biology subject teachers in the city of Parepare show:

1. Indicators of the use of approaches in learning show that learning using a scientific approach is low compared to contextual and constructivist approaches. These data are shown in Figure 1.
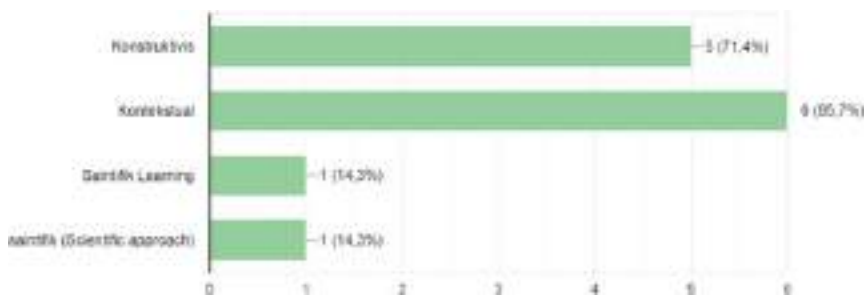
Figure 1. Learning Approach

2. The use of the PjBL learning model has been used by all respondents, but most (71.4%) stated that they found obstacles in implementing it. Generally the methods used by respondents are shown in Figure 2.
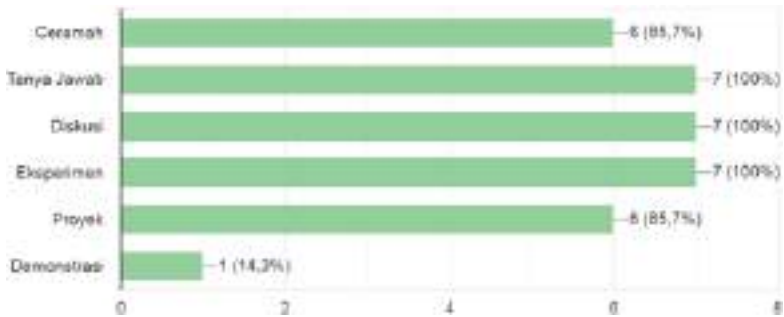
Figure 2. Learning Method

3. Indicators Cooperative learning model as a cooperative learning model has been applied by all respondents in learning (100%). But for the TPS model, it is still limited. Data related to the application of cooperative learning models are shown in Figure 3.
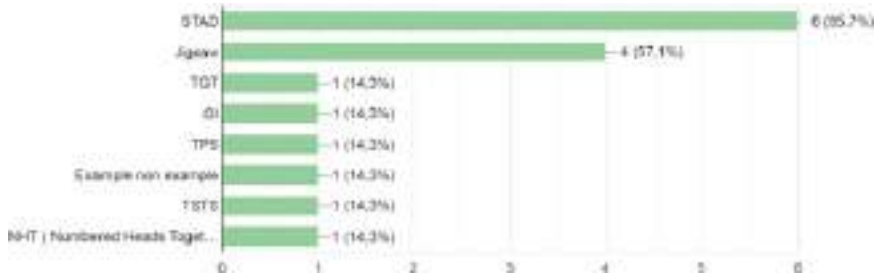
Figure 3. Types of Cooperative Learning

4. Indicators of critical thinking learning. The data shows that most of the respondents (71.4%) stated that students had difficulty using their thinking skills. These data can be seen in Figure 4.
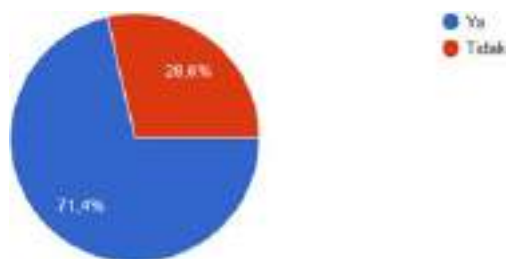
Figure 4. Implementation of Students' Critical Thinking Skills

5. There are six indicators of critical thinking skills applied in schools, consisting of interpretation, analysis, evaluation, inferention, explanation, and self regulation. implementation of indicators of inference and self-regulation is very low. The percentage of each indicator is shown in Figure 5.
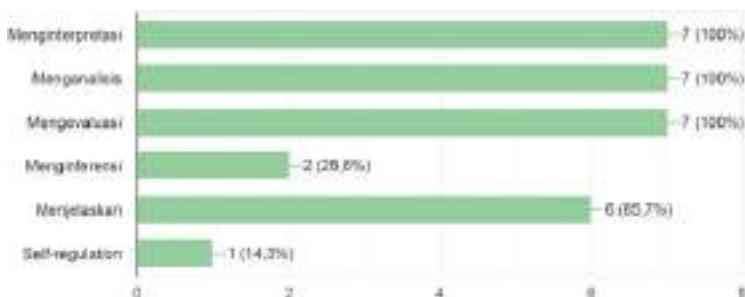
Figure 5. Implementation of indicators of critical thinking skills

The implementation of learning critical thinking skills in all senior high schools in the city of Parepare shows 2 indicators that are very low in implementation, namely indicators of inference and self-regulation. The empowerment of students' critical thinking skills is low. This can be seen in the data that most of the students seem to have difficulty using their thinking skills. According to Corebima (2010), students can only use their thinking skills if they are trained.

Project-based learning is constructive and meaningful, developing maturity, social reinvention, and reconstruction of self-knowledge and

self-esteem (Koutrouba & Karageorgou, 2013). Project-based learning makes students happy and enthusiastic. It also encourages students to have higher cognitive thinking (level of synthesis in Bloom's taxonomy) and builds students' character (Agustina, 2016). The PjBL model has a significant effect on creativity and cognitive (Sakbana, et al., 2021).The stages of PjBL learning strategies provide opportunities for students to practice their critical thinking skills. This stage consists of 6 stages, namely the determination of basic/essential questions, drivers; designing project plans; make schedule; monitor project progress; evaluate results; and evaluate experiences. (Jalaluddin, 2016; Bender, 2012). Critical thinking indicators that can be empowered by students through 6 stages of learning with this PjBL strategy are especially in the aspects of interpreting, analyzing, evaluating, inferring, explaining, and self-regulation skills.

Learning critical thinking is needed in the learning process to create a high curiosity, so that students will continue to seek information and think about how to solve the problems they face. According to Hidayati (2016), teacher learning always involves students to think critically, giving tasks containing critical thinking questions, monitoring students' critical thinking skills by giving critical thinking skills tests, then discussing them with students, so that students are equipped with critical thinking skills.

The results of the study show that the empowerment of critical thinking skills through PjBL strategies has not been maximized. There are still many students who have not been able to understand and develop their skills. Therefore, it is necessary to train on several basic competencies and combine it with a learning strategy that involves more support from friends to build a good concept.

CONCLUSION

Critical thinking learning has not been fully empowered by students. The percentage of understanding and implementation of critical thinking skills is still low, which is implemented through various learning strategies.

SUGGESTION

Empowerment of critical thinking can be trained and provided through the use of appropriate learning strategies. PjBL strategy is one of the learning strategies that has learning stages that support the empowerment of students' critical thinking.

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The Effects of Application of Student Worksheets Based on PITA Questions (Productive, Imaginative, Open, and Analytical) and Local Wisdom on Student Independence

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Abstract. This study aims to see student independence through the provision of student worksheets based on "PITA" questions (Productive, Imaginative, Open, and Analytical) and local wisdom. The research was conducted at the Teacher's Training and Education Faculty Universitas Riau (Biology Education Study Program). The research was conducted in the Invertebrate Systematics course, during March-April 2022. This research is a quantitative descriptive study. Data collection using e-questionnaire (google form) and interview guidelines. The e-questionnaire (google form) is used through a summative response scale, using a modified Likert scale with 4 answer choices. The results of the study explain that the application of LKM based on "PITA" questions (Productive, Imaginative, Open, and Analytical) and local wisdom has an impact on increasing student independence by 88%. The dominant indicator that develops is self-regulation by 93%. The results of the interview also explained that 95% of students were more independent in mastering the concept of Invertebrate Systematics and were able to relate it to local wisdom. The increase in student independence is due to the existence of a question guide that is able to stimulate students to study independently and be able to relate it to local wisdom.
Keywords: Student worksheets based on PITA questions and local wisdom, student independence

INTRODUCTION

21st century learning, technological advances, and the Covid-19 pandemic have further emphasized the importance of learning that leads to hybrid and blended learning. Hybrid and blended learning can be applied in whole or in part. Worksheets can be designed manually or electronically, the most important thing is to help in achieving the goals to be achieved in the learning process. Worksheets are used in learning to have a clear direction, while the accuracy of their design can help students to study individually or in groups actively (Sari and Wulanda, 2019). Worksheets make students understand and solve problems in the surrounding environment scientifically (Trisianawati and Darmawan, 2018).

The Student Worksheet (LKM) is a guide for students to carry out investigations or problem solving activities that can develop process skills so that students are able to find and develop facts, concepts, attitudes and values from the material that has been delivered (Julianti and Sumarmin,

2018). The worksheets used should not only contain material, but also be able to integrate local wisdom or local culture, so that learning is more contextual and culture-based.

Local wisdom is an idea or idea of the local community that has wise and wise values that are still maintained by the community from generation to generation (Ilhami & Riandi, 2018). The purpose of local wisdom is that the learning can be oriented towards increasing the literacy skills of students and maintaining the ideas or ideas of the local community that are wise and wise. Thus, local wisdom can be used as a source of learning for students because it contains knowledge (Ilhami et al, 2018). According to Snively & Corsiglia (2001) that indigenous science has been developing in society for generations. Wijana (2015) in his research explains that the integration of local wisdom-oriented character education in environmental science courses can improve the soft skills of biology students. The local culture that is integrated in the learning model is called the local culture-based learning model. This model is quite effective in improving the basic science skills of junior high school students (Suastra & Tika, 2011).

The availability of worksheets is very helpful in the learning process, especially learning in universities which predominantly use practicum. Especially in the Invertebrate Systematics course. This course is a course that requires practicum (in the room or in the field). This course is also an activity that directs students to learn how to observe species, identify the characteristics and characteristics of each phylum, classify species based on their phylum, explain the different characteristics of each phylum, examine the life of each invertebrate animal, and know the role of each invertebrate. invertebrates for life. Based on the explanation above, it can be concluded that the Invertebrate Systematics lecture has many benefits, is interesting to learn, is very important for the development of other sciences, and is useful for humans in dealing with evolution due to natural changes (R.A. Putra, 2014).

The worksheets used in invertebrate systematics lectures are not only oriented to local wisdom, but are expected to be able to accommodate students' higher-order thinking skills. Thus, the form of questions in electronic worksheets is the main key in the success of a worksheet. Questions that are considered appropriate to the learning needs of students are the "PITA" questions (Productive, Imaginative, Open, and Analytical). PITA questions are included in the types of high-level questions. Sarihat and Munastiwi emphasized in their research that one of the most effective ways to stimulate "experiencing" activities for students is by giving assignments through productive, imaginative, and open-ended questions (Sarihat and Munastiwi, 2021). However, making PITA questions is not

easy. Educators are still difficult in designing PITA questions (Maryono and Budiono, 2021).

Learning today does not only produce students who master various competencies, but more than that. The resulting students must be able to become lifelong students who are competent, have character, and behave according to the values of Pancasila. This is related to two things, namely the competence to become a democratic Indonesian citizen and to become a superior and productive human being in the 21st Century. In this case, Indonesian students are expected to be able to participate in sustainable global development and be resilient in facing various challenges. The explanation formulates a form of students or students that Indonesia expects, namely students who have a Pancasila profile.

The Pancasila Student Profile has six competencies that are formulated as key dimensions, namely: Faith, fear of God Almighty, and noble character; Global diversity; Worked together; Independent; Critical reasoning; and Creative. Specifically in this study, researchers focused on student independence. Learning independence affects a person's learning outcomes (Laksana and Hadijah, 2019). Thus, the researchers measured the independence of students after the implementation of the student worksheet based on the "PITA" (Productive, Imaginative, Open, and Analytical) question and local wisdom.

METHODS

This research is a quantitative descriptive study, which was carried out at the Riau University's FKIP (Biology Education Study Program). Research that uses quantitative is because it uses numbers, starting from data collection, interpretation of the data, and the appearance of the results (Arikunto, 2013). The research was conducted on the Invertebrate Systematics course, during March-April 2022. The data collection used an e-questionnaire (google form) and interview guidelines. e-questionnaire (google form) which is used through a summative response scale, using a modified Likert scale with 4 answer choices. The Likert scale is a way to measure attitudes, opinions, and perceptions of a person or group about social phenomena (Sugiyono, 2014). The data obtained were analyzed by considering the range interval and the interpretation of independence. More clearly can be seen in Table 1.

Table 1. The Range and Interpretation of Independent Learning

Average Score Range	Interpretation
0 - 25	Low / Not Independent
26 - 50	Less / Less Independent
51 - 75	Enough / Self-Sufficient
76 - 100	Tall / Independent

RESULTS AND DISCUSSION

The results of the study explain that the application of LKM based on "PITA" questions (Productive, Imaginative, Open, and Analytical) and local wisdom has an impact on increasing student independence. The dominant indicator developing is self-regulation, more clearly can be seen in Figure 1.
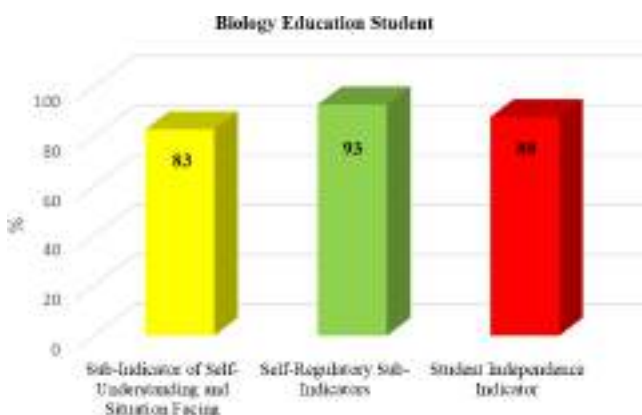
Figure 1. Data on Independence Indicators and Sub-Indicators

Figure 2 is also supported by the results of the interview, which explains that 95% of students are more independent in mastering the concept of Invertebrate Systematics and are able to relate it to local wisdom. The increase in student independence (88%) was due to the existence of a question guide that was able to stimulate students to study independently and be able to relate it to local wisdom. The independence referred to in the dimension of the Pancasila student profile is that Indonesian students have the initiative for their own development which is reflected in the ability to be responsible, have strategic plans, take action and reflect on the process and results of their experiences. For this reason, Indonesian students need to have self-awareness and the situation at hand and have self-regulation. Independence is an activity that is carried out

without depending on others in achieving goals (Suhendri and Mardalena, 2013).

Self-regulation is a very prominent sub-indicator of independence from the research results (93%). Self-regulation is an individual's internal component that raises motivation and moves individuals to be able to design, achieve life goals and evaluate every effort made and involvement in the organization is only one of the factors related to increasing the ability of individual self-regulation (Grahani and Mardiyanti, 2019). Research results R.A. Putra emphasized that the dominant indicator for developing is self-regulation, amounting to 92% (biology study program) and 90% (citizenship education study program) (R.A. Putra et al, 2022). Thus, it is increasingly important for educators to help improve self-regulation in students.

The integration of local wisdom in the worksheet is important and greatly affects the learning process. In addition, exploring local wisdom is a positive study in order to keep local culture from becoming extinct. Student teacher candidates, who will later become teachers, should be able to integrate learning with local wisdom. Teachers also take part in preserving the local potential so that it does not become extinct over time (Pieter, 2016). The use of local wisdom helps students understand the learning process by direct observation of the learning object. In line with the nature of learning which should emphasize process skills so that students are more active in building their knowledge (Ilhami et al, 2018).

The high level of independence and understanding of local culture cannot be separated from the form of the worksheets used. The worksheets used should contain questions that are able to lead students to higher-order thinking. The problems presented on the worksheets can use everyday problems to be solved in groups so as to provide opportunities for students to gain understanding, improve creative thinking skills (Sari and Wulanda, 2019) and improve scientific literacy skills (Rosdiana, et al. 2018).

Based on their nature, advanced questions are divided into 4, namely: productive, imaginative, open, and analytical (PITA). 1) Productive questions are questions that encourage students to make observations, experiments and investigations. The opposite of productive questions are unproductive questions. 2) Imaginative questions are questions that encourage students to imagine. The opposite of imaginative questions are factual questions. 3) Open-ended questions are questions that encourage students to find more than 1 correct answer. The opposite of open questions are closed questions. 4) Analysis questions are questions that direct students to analyze a question, so that a comprehensive answer is produced (Tanoto Foundation Program PINTAR, 2018).

PITA questions are included in the types of high-level questions. Sarihat and Munastiwi emphasized in their research that one of the most effective ways to stimulate "experiencing" activities for students is to give assignments through productive, imaginative, and open-ended questions (Sarihat and Munastiwi, 2021). PITA questions are questions that can improve various competencies and accommodate various types of learning styles.

CONCLUSIONS AND SUGGESTIONS

The application of LKM based on "PITA" questions (Productive, Imaginative, Open, and Analytical) and local wisdom has an impact on increasing student independence by 88%. The dominant indicator that develops is self-regulation by 93%. The results of the interview also explained that 95% of students were more independent in mastering the concept of Invertebrate Systematics and were able to relate it to local wisdom. The increase in student independence is due to the existence of a question guide that is able to stimulate students to study independently and be able to relate it to local wisdom.

It is necessary to conduct research to measure the correlation of self-regulation with students' mastery of concepts in the Invertebrate Systematics course and further analysis related to Indigenous Science related to the concept of invertebrate systematics.

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Development and Validity of Biology Learning Tool Using the Tpack Framework with Guided Inquiry Settings to Improve Student's Science Literacy Skills

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Abstract. This research is a development research that aimed to describe the development and validity of biology learning tool based on guided inquiry integrated TPACK to improve scientific literacy skills in the digestive system material. This research method used a 4D research and development model developed by Thiagarajan. The stages of 4D development consist of the stages of define, design, develop, and disseminate. In this study, the stages of development in sequence have been described, namely the definition, design and development of learning tool products. The instrument used in this research is a validation questionnaire as a measure of the validity of the learning tool product and a response questionnaire as a measure of the practicality of using the learning tool that has been developed. The quality of the developed learning tool products was tested through the validation stage which was carried out with the help of a validation questionnaire for 2 validators, then a practicality test would be carried out by reviewing the responses of teachers and students. Data analysis used quantitative descriptive method. The results showed that the learning tools developed were valid with the validity values obtained for the lesson plans, worksheets and instruments about students' scientific literacy skills, namely 3.7; 3.42; 3.5 with the average of the three components included in the valid category. After the degree of validity was obtained, then an effort was made to determine the degree of practicality and the response scores of teachers and students were 84% and 81.01%, respectively, in the practical category, supported by results classified as classically categorized, it is known that the development and used of biology learning tools based on guided inquiry and integrated TPACK is valid and practical.
Keywords: Development, TPACK, Validty.

INTRODUCTION

21st century learning applies the concept of learning that requires students to be actively involved in learning, but the reality that occurs in schools is basically still applying the concept of teacher-centered learning. The application of 21st century learning culture is expected to replace the role of the teacher as an information center to become a facilitator in the student learning process. Students are expected to be more active through various processes that involve their various senses so that learning materials can be understood properly. Using science and technology advances in learning is the right thing because it can familiarize students to adapt to the surrounding environment so that later they are ready to serve the community. Meaningful learning will be useful for students in the future because the times are growing, technology is advancing rapidly,

information in every place flows quickly and is no longer constrained by places so that information is very easy to spread, for this reason, high student curiosity is needed for various phenomena that occur. is around. This is closely related to the essence of learning biology, which is often the object of study of living things and the surrounding environment. Biology learning is an interaction between students and the object they are studying, so to be able to understand, communicate and apply biological concepts in real life, the ability in the form of scientific literacy is needed.

The right learning model to be adapted to the hope of forming a scientific literacy-oriented character that is oriented to 21st century learning is guided inquiry. one of the inquiry learning models that requires students to investigate based on the problems posed by the teacher, but the students themselves determine the investigation procedure. Meanwhile, the teacher facilitates and guides students in the investigation activities they design (Sofiani, 2011). Efforts to improve scientific literacy through the development of learning tools have been carried out by several researchers, including (Azmah, 2020; Fahmiati, Susantini, & Rachmadianti, 2017; Latip & Permanasari, 2015; Muasik, 2017; Putranta & Supahar, 2019; Yuniarti, Ni Wayan; Sadia, 2018). Menurut penelitian yang dilakukan oleh Purnawati, Maison, & Haryanto (2020); Suyamto (2020); Oktasari & Jumadi, (2019) it is known that the development of the resulting TPACK-based E-LKPD is categorized as very feasible to be used in physics learning for class X material on Temperature and Heat. Likewise with the results of research proposed by (Ayuningtyas, W, and Supardi, 2015). Another similar study conducted by (Apriliani, 2017) showed that the application of TPACK-based learning tools could improve students' understanding of concepts in the relationship diagram material between entities and students' responses to the learning media used got a positive response.

Therefore, it is important to conduct research on the development of learning tools using the TPACK framework with guided inquiry settings to improve students' scientific literacy skills. It aims to stimulate students' desire to find out the object being studied. To realize this, learning devices that meet the valid category are needed which can later be used if they have gone through the validation stage. Based on this, this study aims to determine the validity of learning tools using the TPACK framework with guided inquiry settings to improve students' scientific literacy skills that have been developed in the hope that in the future it can help the student's observation and learning process.

RESEARCH METHOD
    Types of Research
    This research is a research and development research using the 4D development research model developed by S. Thiagarajan Dorothy S. Sammel and Melvyn I. Semmel consisting of four stages namely define (definition), design (design), development (development). and disseminate. The stages of development in this research include define, design and development.
    Research Subject
    The research subjects were 2 experts validator lecturers. The research instruments were in the form of product validation questionnaires and teacher response questionnaires and student response questionnaires to review the practicality of using learning tools that had been developed and went through the validation stage.
    Data Collection Technique
    The data collection technique used in this research is a questionnaire. The questionnaire used is a validation questionnaire. The data analysis used is validity data analysis.
    The validity degree is determined through a validation formula referring to the research of Hobri, 2010. The data will be analyzed through the following stages:
    Validity Analized
  a. Data recapitulation
    Recapitulating the data on the results of the assessment of the validity of the devices and instruments into a table which includes: aspects (Ai), Criteria (Ki) and the results of the validator assessment (Va) through predetermined scoring guidelines (Likert scale).

  b. Scoring
    Determining the score of the validation results is carried out in stages through determining the average assessment results of all validators for each criterion using the formula:

$$\overline{K} = \frac{\sum_{j=1}^{n} Vij}{n} \tag{2.1}$$

Description:
$\overline{K}$: mean criteria of i
Vij : the score of j validator's assessment of the criteria -i
n : number of validators

Determine the average of each aspect using the formula:

$$\bar{A}i = \frac{\sum_{j=1}^{n} \bar{K}ij}{n} \qquad (2.2)$$

Description:
$\bar{A}i$: mean criteria of i
Kij : the mean for the I aspect of the j criteria
n : the number of criteria in the i-th aspect

Next, determine the mean by the total formula:

$$Va = \frac{\sum_{j=1}^{n} \bar{A}i}{n} \qquad (2.3)$$

Description:
Va : total mean
$\bar{A}i$: the mean aspect of i
n : the number of aspects
c. Analysis of the validity of the product of biology learning tools

The validity of the learning device product is determined by the percentage value for each validator. Furthermore, the percentage value from the validator is then matched with the assessment category of the validation results in Table 1 as follows:

Table 1. Category of Validation Achievement Assessment

No.	Value	description
1.	$3,51 \leq Va = 4,0$	Very valid
2.	$2,91 \leq Va < 3,50$	Valid
3.	$1,91 \leq Va < 2,90$	Unvalid
4.	$1,0 \leq Va < 1,90$	Very unvalid

The category used to conclude that the developed learning device has a degree of validity with the total mean value for all aspects is at least in the valid category and the value for each aspect is at least in the valid category. If this is not the case, it is necessary to make revisions based on suggestions from the validator or by reviewing aspects that have less value. Furthermore, it is re-validated and then re-analyzed. And so on until it meets the valid category (Nurdin, 2007).

To measure the level of practicality of product development, the following analytical techniques are used:

a. Data tabulation

The tabulation of data obtained from the response of teachers in the field on the use of biology learning tools was recapitulated so that a total score could later be obtained.

b. Scoring

The average value of the score is converted into a qualitative value, but before that it is necessary to use the formula:

$$P = \frac{\sum_{i=1}^{5} Xi}{\sum_{j=1}^{5} Xj} \times 100\% \tag{2.4}$$

Information:

Q: percentage of choice

Xi: score of answers assessed by experts (teachers and students)

Xj : total score of the highest answer

After calculating the percentage of the teacher's assessment, then determining the response criteria that have been given to the percentage of practicality analysis results based on the practicality assessment guideline for product development according to Arikunto, 2009 as shown in Table 2.

Table 2. Guidelines for Practical Product Development Assessment

Persentase(%)	Category	Description
80-100	Very practical	No revision
66-79	Praktical	No revision
55-65	Practical enough	No revision
40-54	Less practical	Revision
30-39	unpractical	Revision

The practicality analysis refers to the results of the evaluation of teacher and student response questionnaires. If a positive response of 80% is found, the learning device can be categorized as practical to apply (Arikunto, 2009).

RESULTS AND DISCUSSION
Define
The definition stage is carried out through several analytical activities to determine the learning profile by conducting an initial analysis, students from material constraints at the beginning. The purpose of this stage is to determine the learning requirements by analyzing the objectives of the material constraints at the beginning. This stage includes: First, the initial analysis which aims to determine the basic problems faced by students in the subject. The results of the analysis show that learning in schools is still teacher centered so that students are passive in the learning process. Second, the results of student analysis show that students' academic abilities are categorized as low because students do not play an active role in learning. Third, task analysis includes content structure analysis and procedural analysis. Fourth, concept analysis includes the formulation of learning objectives and identification of learning materials.

Design
The second stage of the 4D development research model is design. The design of learning device development is made at this stage. The design consists of several stages, namely the preparation of the test, the selection of the design format, the design of the learning device and the creation of the design document. The design stage consists of a more mature preparation composition to facilitate the development stage later.

Development
The results from the definition stage and design stage will then be compiled into a development product in the form of lesson plans, LKPD, and guided inquiry-based Science Literacy questions using the TPACK framework on digestive system materials. At this stage, it also includes guaranteeing the quality of learning device products through the results of validity and practicality tests.

1.   Validation
Validation is carried out on learning tools such as the Learning Implementation Plan (RPP) and LKPD with a focus on different aspects of the assessment. In RPP validation there are 6 aspects of assessment while in LKPD validation there are 5 aspects of assessment. The result of this research is the product of developing biology learning tools using the TPACK framework with guided inquiry settings to improve students' scientific literacy skills that are valid. This product was designed by the researcher himself based on the student's learning needs that had been analyzed beforehand, none other than to obtain appropriate learning tools for use in the classroom to help realize a fun learning process and all

student-centered learning. Validation activities are carried out by two expert validators who provide an assessment of the learning device products developed. The learning device developed using the TPACK framework with guided inquiry settings and specifically on the instrument for evaluating scientific literacy abilities contains scientific literacy indicators in it so that students are indeed required to be proficient in responding to the given learning situation.

a.   **RPP Validity**
The validity of the RPP is viewed from 6 aspects of the assessment, namely the completeness of the identity format, the formulation of Competency Achievement Indicators and learning objectives, Approaches, Models, Methods, Media and Learning Resources, learning steps, language, and the TPACK Framework (Technological Pedagogical Content and Knowledge). The initial stage of the validity of the RPP is declared not yet valid. This is because the indicators of competency achievement and learning objectives need to be harmonized, the selection of operational verbs (KKO) is expected to be HOTS (High Order Thinking Skills) oriented. Input from the expert validator, the RPP is revised and developed according to the advice of the expert validator. After passing the revision stage, this RPP was re-validated and declared valid. Validity analysis that has been done is known to the degree of validity of each product.

Table 3. RPP validation results

No.	Rated aspect	Validator Score $(V_{Ki})$of-		$\bar{A}$
		1	2	
A.	Completeness of RPP Format and Identity	4.00	4.00	4.00
B.	Formulation of IPK and Learning Objectives	3.62	3.25	3.43
C.	Approaches, Models, Methods, Media and Learning Resources	3.78	3.33	3.55
D.	Learning Steps	3.89	3.78	3.84
E.	language	3.14	3.57	3.36
F.	TPACK framework (*Technological pedagogical Content and Knowledge*)	4.00	4.00	4.00
Rata-rata (V_a)				3.7

RPP with a degree of validity of 3.70 is in the very valid category. The lesson plans were developed using a guided inquiry model. Guided

inquiry is a way of teaching and learning that is intentionally designed to direct students to gain an in-depth understanding of a content that can later be used to develop literacy and social skills (Kuhlthau, Maniotes, & Caspari, 2015). There are various inputs given by the validator during the validation period and have been considered as a form of revision to obtain a truly valid degree of validity.

RPP with a degree of validity of 3.70 is in the very valid category. The lesson plans were developed using a guided inquiry model. Guided inquiry is a way of teaching and learning that is intentionally designed to direct students to gain an in-depth understanding of a content that can later be used to develop literacy and social skills (Kuhlthau, Maniotes, & Caspari, 2015). There are various inputs given by the validator during the validation period and have been considered as a form of revision to obtain a truly valid degree of validity.

b.   LKPD Validity

The right step in realizing conditions that are in accordance with learning objectives is to develop LKPD which is a manifestation of the stages of guided inquiry learning such as orientation, formulating problems, formulating hypotheses, collecting data, testing hypotheses and making conclusions, the guided inquiry process is carried out under the guidance of the teacher. Guided inquiry is also known to value the process of student discovery to define what they have learned in understanding information. In cognitive theory, the learning process begins when the stimulus activates the sensory domain and the sensor activates sensory memory. The sensory memory will be processed into short term memory and long term memory. Jean Piaget suggested three main principles of cognitive learning, namely 1) active learning, 2) learning through social interaction, 3) learning through his own experience (Lailiah, Wardani, & Edi Sutanto, 2021). The following aspects are assessed in the LKPD validation process

Table 4. LKPD validation results

No.	Rated aspect	Validator Score (V_{Ki}) of-		$\bar{A}$
		1	2	
A.	Presentation Aspect	3.80	3.80	3.80
B.	Content Aspect	3.38	3.13	3.26
C.	Display Aspect	3.22	3.67	3.45
D.	Language Aspect	3.13	3.50	3.32

No.	Rated aspect	Validator Score (V_{Ki}) of-		$\bar{A}$
		1	2	
E.	TPACK framework aspect (*Technological pedagogical Content and Knowledge*)	3.50	3.00	3.25
Rata-rata (V_a)				3.42

In the LKPD validity process, there are several things that become the focus of attention in the validation process, namely the LKPD it is necessary to pay attention to the size of the use of letters, the selection of colors and the layout used. In line with research conducted by (Herawati & Muhtadi, 2018) (Ricu Sidiq & Najuah, 2020) which states that the selection of appropriate colors is an attraction for learning products developed, for example, the selection of varied colors can increase enthusiasm and high graphic value in learning. the presentation.

c. Instrument Validity of Scientific Literacy Ability Evaluation Questions

Scientific literacy is a multidimensional aspect that does not only affect the understanding of sans knowledge, but can improve higher-order thinking skills and increase the understanding of the knowledge gained in everyday life, as well as understanding the relationship between sans and other disciplines. Scientific literacy skills can cover all areas of life so that they are categorized as multidimensional. The scientific literacy category is the basis for various disciplines, namely science as the mother of science, science as an investigation, science as a way of thinking and the interaction of science, technology and society (Harahap, Syafi'I and Wulandari, 2020).

Based on this, it is important to integrate scientific literacy into the learning stage and also become an ability that is expected to be possessed by students, so that in the development of learning tools, efforts are made to cover the essence of scientific literacy. The learning material that is closely related to everyday life is the digestive system. In the development of all learning devices, it is based on KD. 3.7 regarding the digestive system. In the question instrument there are some words that are not used correctly so it is recommended to use other words with more or less the same meaning. Based on the suggestions received by the author by the validator, it has been considered and implemented through revisions so that it can achieve an average value with a valid category and the validation results state that the product is feasible to use.

Product development in the form of an instrument for evaluating students' scientific literacy abilities is also interesting because it is

necessary to integrate aspects of scientific literacy into the questions so that the questions that have been developed are expected to represent every aspect of scientific literacy so that students' scientific literacy skills can be measured. The following aspects are assessed in the instrument validation process for evaluating students' scientific literacy:

Table 5. Results of the Validation of Scientific Literacy Question Instruments

No.	Indicator	Validator score (V_{Ki}) of-		
		1	2	$\bar{A}$
A.	Material Aspect	3.75	2.50	3.13
B.	Construction Aspect	4.00	4.00	4.00
C.	Aspects of Compatibility with Scientific Literacy	3.67	3.00	3.34
D.	Language Aspect	3.00	4.00	3.50
	Rata-rata (V_a)			3.5

Based on this, the results of the validation of the learning tools in terms of the results of the validation of the RPP, LKPD and instruments of scientific literacy questions, the following results are obtained:

Table 6. Results of Validation of All Components of Learning Devices

No.	Product development	Degree of validity	Description
1.	RPP (6 items)	3.70	Very valid
2.	LKPD (5 items)	3.42	Valid
3.	Instruments for evaluating scientific literacy skills (4 items)	3.50	Valid
	Average (V_a)	3.54	Valid

2. Prakticality

The assessment of the learning tools that have been developed will then be reviewed in terms of practicality after going through the validation and application stages in learning. The value of practicality is obtained from the teacher's response and the student's response by filling out the assessment sheet for the overall learning device, namely RPP, LKPD, and instruments about students' scientific literacy abilities. The results of practicality are obtained from the total score of all aspects assessed. The total score is then adjusted according to a predetermined formula, here is the number of participants for the practicality test.

Table 7. Number of Practicality Test Participants

No.	Informant	Amount
1.	Biology teacher	7
2.	Student	72

The results of the practicality assessment through the teacher's response questionnaire obtained an average value of the practitioner validator, namely 84%. The value obtained is classified as high because in terms of the percentage criteria it is in the 80-100% category with the information "very practical" referring to Arikunto (2009), when described it will appear as follows:

Table 8. Teacher's Assessment of Learning Devices

No.	Rated aspects	Total number	Percentage of teacher responses	Practical criteria	description
1.	Prsentation	12	75%	Praktical	No revision
2.	Use	33	75%	Praktical	No revision
3.	Legibility	7	87.5%	Very practical	No revision
4.	Time	4	100%	Very practical	No revision
	Persentage averasge		84%	Very practical	No revision

The practicality assessment is also viewed from the aspect of student responses during learning activities using the TPACK framework learning device using the guided inquiry setting. The results of practicality are obtained from the total number of scores obtained compared to the maximum score and then multiplied by 100%. The results of student responses are in the following table:

Table 9. Student Assessment of Learning Devices

No.	Class	Total Value	Total students	Average of P (Percentage of Practicality)	Practical Criteria	Description
1.	XI IPA 2	2932.895	36	81.46 %	Very practical	No revision
2.	XI IPA 3	2900	36	80.55 %	Very practical	No revision
	The total average			81.01 %	Very practical	No revision

The results of the practicality assessment through student response questionnaires were then analyzed so that an average value of 81.01% was obtained. Based on the practicality table criteria, the percentage of all equipment with this value is classified into the percentage criteria at 80-100% with the category "very practical" with the description "not revised".

The results of the practicality test that have been carried out have obtained a very practical category for both respondents from both teachers and students. So that it can be said that the learning tools, namely RPP, LKPD, and instruments about scientific literacy skills can be well received. This is in accordance with the results of research (Irmita & Atun, 2017) which states that combining learning tools with the TPACK approach with an appropriate learning model encourages students to find solutions to the challenges that students receive in their learning process.

The learning tools developed are expected to trigger an increase in students' scientific literacy scores as one aspect that is loved in the era of 21st century learning. Scientific literacy is recognized as one of the keys in facing various challenges of the 21st century. 21st century learning encourages students to be able to construct the knowledge they have acquired and solve scientific problems independently. Scientific literacy is not only about scientific skills but in a broad sense can penetrate the individual, national and even global spheres because it is related to things as simple as communication, it sounds simple but is quite crucial in its role in everyday life, especially in the academic sphere which is expected to be active in interacting. to support the advancement of knowledge. Learning carried out in the classroom generally uses the lecture method, the source of information is only based on the knowledge of the teacher, so that students do not dare to explore further their understanding through their own search process so that the value of students' scientific literacy is low because of the monotonous activity. Learning that is carried out with proper planning, such as using models and methods that follow the characteristics of the material to be delivered can have a positive impact on students (Wardani and Djukri, 2019).

CONCLUSION

To support fun learning for students, learning tools need to be developed, before they can be used on a limited or wide scale, it is necessary to test product feasibility through validity testing. The value of the validity of the product RPP, LKPD, Science Literacy evaluation questions are 3.70; 3.42; and 3.50 with very valid category; valid; and valid with an average value of 3.54 validation results with a valid category. it can be concluded that the development of biology learning tools using the

TPACK framework with guided inquiry settings has met the valid requirements. In addition to validity, also in terms of the practicality of the learning tools that have been developed, the percentages are 84% (teachers' responses) and 81.01% (students' responses). The two percentages can be categorized as high because they are in the 80-100% range so it can be emphasized that the biology learning tools developed are valid and practical, then the learning tools can be widely used on condition that they need to go through an effectiveness test.

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The Relationship Between Knowledge about Viruses with Healthy Behavior of Students Class X MAN 2 Kota Makassar

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Abstract. This study is a correlational quantitative study that aims to explain the level of knowledge about viruses, explain students' healthy behavior, and analyze the relationship between knowledge of class X MIPA students about viruses and healthy behavior related to preventing the spread of COVID-19. Class X students for the 2022/2023 academic year who have been equipped with knowledge about viruses in odd semesters are expected to have better awareness and understanding than the general public about the dangers of the corona virus and the importance of implementing health protocols to prevent the spread of COVID-19. The variables of this study consisted of the independent variable, namely the level of knowledge about viruses and the dependent variable, namely the healthy behavior of students. The sampling technique in this study used a probability sampling technique with simple random sampling. The population in this study were all students of class X MAN 2 Kota Makassar with a total sample of 165 people based on sample calculations using the slovin formula. The research instrument used in this study was in the form of questions about viruses and questionnaires related to students' healthy behavior. The data obtained were then analyzed using descriptive analysis and inferential analysis using a simple regression test. Based on the research conducted, the level of knowledge about viruses and healthy behavior of class X students is included in the high category. The results of the calculation of the Pearson product moment correlation analysis using SPSS obtained the value of Sig. 0.501. Value of Sig. obtained > 0.05 so that Ho is accepted and Hi is rejected, then there is no relationship between knowledge about the virus and the healthy behavior of class X MIPA MAN 2 Kota Makassar.
Keywords: COVID-19, Health Behavior, Knowledge.

INTRODUCTION

Viruses are very small organisms and have nucleic acid molecules, DNA (Deoxyribonucleic Acid) or RNA (Ribonucleic Acid) wrapped in a protective protein coat (capsid). These tissues are known to carry genetic information and carry out replication so that they are infectious. After the virus enters the cells or tissues of living organisms, the movement process will disrupt metabolism or even damage cells or tissues, causing disease. Biological scientists continue to reveal the nature of this virus so that finally the particles are grouped as living things in their own world, namely viruses (Garry, 2002). Some other viruses, such as the dengue virus, are transmitted by blood-sucking insects. Various viruses can infect animals and humans, for example HIV and Ebolavirus. Diseases that can pass from animals to humans are called zoonoses (PDPI, 2020).

Various viruses can infect animals and humans, for example HIV and Ebolavirus. Diseases that can pass from animals to humans are called zoonoses. Viruses can undergo genetic mutations. RNA viruses mutate more rapidly than DNA viruses, giving rise to new types that their host's immune system can't handle quickly. The type of virus that often mutates and requires a new vaccine every year is none other than a new type of virus known as Coronavirus Disease 2019 (COVID-19). The emergence of new strains that have never been encountered before can result in a pandemic (Singhal, 2020).

Coronavirus Disease 2019 (COVID-19) is a disease that is currently being faced by various countries and even all over the world. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV2) is a new variant virus discovered in December 2019 in Wuhan China which was detected in the human body and causes Coronavirus Disease 2019 (COVID-19). The world health organization, namely the World Health Organization (WHO) reported on March 11, 2020 the COVID-19 virus outbreak as a pandemic. The reason is because the process of spreading this virus spreads very quickly to reach areas far from the center of the outbreak. A pandemic is an epidemic of a disease that spreads to a very wide area, including across continents or globally. There are three criteria in determining a pandemic, namely: (1) the emergence of new diseases in the population and death, (2) infecting humans and causing dangerous diseases, (3) the disease can spread easily and sustainably between humans (Bajema et al., 2020) .   The spread of a new virus known as the corona virus is currently increasing the alertness of the world community. Corona virus (CoV) is still listed as part of a family of viruses that cause various types of diseases ranging from flu to more severe diseases, such as the latest virus currently called Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome. syndrome (SARS-CoV). The disease which was originally caused by the corona virus, otherwise known as COVID-19, is a new type of virus that was discovered in 2019 and so far has never been identified to attack humans before (WHO, 2020).

Indonesia itself is one of the countries that has been exposed to the COVID-19 virus. Indonesia first contracted the COVID-19 case on March 1, 2020, which was initially caused by a patient from Depok, West Java who interacted with Japanese citizens, thereby increasing their status as a patient infected with COVID-19. The rate of spread of COVID-19 spread very quickly throughout Indonesia, until it was discovered that on April 9, 2020 there were 3,293 Indonesian citizens who were positive for COVID-19. The number of victims who died reached a total of 280 people, while the number of patients who were declared cured was around 252 people.

The human mortality rate caused by the latest COVID-19 currently stands at around 8.5% (WHO, 2020).

The efforts to minimize various kinds of problems caused by the COVID-19 infectious disease, one of which can be done by instilling various knowledge about the prevention of COVID-19 disease, which is important so as not to cause an increase in the number of cases of COVID-19 disease too quickly. Students' knowledge of COVID-19 can be interpreted as the result of knowing about this disease, understanding this disease, and how to prevent it. The existence of student knowledge about COVID-19 has an important effect on the phenomenon of preventing COVID-19 disease. Students' knowledge about COVID-19 can be obtained by studying virus material.

Class X high school students for the 2021/2022 academic year who have taken biology subjects in the odd semester have been provided with knowledge about viruses, especially those related to COVID-19, because COVID-19 is included in one of the indicators in KD 3.4 and 4.4, namely the role of viruses. detrimental in real life. With the knowledge gained by these students, it is hoped that students will have better awareness and understanding from the general public about the dangers of COVID-19 and the importance of implementing health protocols to prevent the spread of COVID-19, as well as being able to develop and foster positive behavior, so that students can interact with each other. remind and serve as a good example for the surrounding community to participate in breaking the chain of the spread of the corona virus. Therefore, the results of this study are expected to be used as material for evaluation and health promotion related to preventing the spread of COVID-19. Based on the urgency related to the issues that occur in this pandemic situation, the authors decided to conduct more research in a form of research entitled "The Relationship Between Knowledge About Viruses and Health Behavior of Class X Students of MAN 2 Kota Makassar " (Kurniawati, 2019).

RESEARCH METHOD
Types of Research

This research is a type of quantitative research using a survey method with correlational analysis, by collecting data on behavior towards health through a questionnaire. Knowledge of the virus is obtained through the presence of virological tests. The variables of this study consisted of one independent variable (X) namely knowledge about viruses and one dependent variable (Y) namely student behavior towards health.

Place and time of research

The research was conducted at the MAN 2 Makassar City school, which is located on Jl. A. P. Pettarani No.1, Mannuruki, Kec. Tamalate, Makassar City, South Sulawesi in August-September 2022.

Research Design

The design of this study used a correlation research design, because in this study the aim of this study was to find out whether there was a relationship between virus learning outcomes and the health attitudes of class X MAN 2 Makassar City students. According to Sukardi (2009) correlation research is a research. which involves the act of collecting data to determine whether there is a relationship between two or more variables.

Population and sampel

The population in this study were students of class X MAN 2 Makassar City in the academic year 2021/2022. The total population according to data on the Dapodikbud website is 280 students. The reason for choosing the research population was because the material about viruses had been discussed in biology class X MIPA during the odd semester. Determination of the number of samples in this study using the Slovin formula with an error tolerance limit of 5% and a confidence value of 95%, so that a total sample of 165 respondents was obtained.

Research Instrument

The test instrument was used to measure the level of knowledge of class X students of MAN 2 Makassar City about viruses, the form of the test used was multiple choice consisting of 20 items. In addition, a questionnaire was also used to determine the healthy behavior of class X MAN 2 Makassar City students towards preventing the spread of COVID-19 which consisted of 18 questions regarding practices related to COVID-19 that could be used as a measure of student attitudes in preventing the spread of COVID-19.

Data Analysis Technique

1. Students' Knowledge Level About Viruses

The instrument used is a test, so the appropriate data analysis technique is provided that the correct answer is given a score of 1, the wrong answer is given a score of -1, and no answer is given a score of 0. Furthermore, the data will be analyzed using descriptive data analysis techniques.

2. Student's Healthy Behavior

The instrument used is a questionnaire, then it is measured using a Likert scale with the provision of scoring 1 for strongly disagreeing answers, 2 for disagreeing answers, 3 for agreeing answers and 4 for strongly agreeing answers.

3. The Relationship Between Students' Knowledge Level about Viruses and Students' Health Behavior

Data analysis that will be used in this aspect is inferential data analysis in the form of product moment correlation data analysis. The aim is to analyze whether there is a relationship between knowledge about the virus and the health behavior of class X MAN 2 Makassar City students through data analysis prerequisite tests such as normality test, linearity test, and hypothesis testing (correlation test) with the basis of the decision, namely, if the value of Sig. <0.05, then Ho is rejected and Ha is accepted, meaning that there is a relationship between the variables X and Y. The second possibility is if the value of Sig. > 0.05, then Ho is accepted and Ha is rejected, meaning that there is no relationship between X and Y variables (Arifin, 2017).

THE RESEARCH RESULTS AND DISCUSSION

The research data consisted of the independent variable, namely the level of knowledge of class X MIPA students about viruses (X) and the dependent variable, namely the health behavior of students in class X MIPA MAN 2 Makassar City. The purpose of this study was to analyze the relationship between the level of knowledge about the virus and health behavior in the realm of preventing the spread of COVID-19 for class X MIPA MAN 2 Makassar City. The following is a description of each variable in this study:

Data description of X variable (Knowledge about Viruses)

Data obtained through a questionnaire containing 18 questions distributed to 165 respondents showed that in the variable knowledge of class X MIPA students about COVID-19, the highest raw score was 17 and the lowest was 6, with the following frequency distribution:

Table 1. Frequency Distribution of Knowledge about Viruses for Class X Students

No.	Interval	Frequency
1.	30-39	4
2.	40-48	4
3.	49-57	14

No.	Interval	Frequency
4.	58-66	16
5.	67-75	53
6.	76-84	52
7.	85-93	19
8.	94-102	3
	Amount	165
	The skor average	71.68

Based on Table 1. above, it is known that the frequency of class X MIPA MAN 2 Makassar City students to determine the quality of the variable level of virus knowledge for Class X students, it is necessary to categorize the variables that will be classified into the following categories:

Table 2. Categorization of Virus Knowledge Levels for Class X Students

Interval	Frekuensi	Description
81-100	46	Very high
61-80	97	high
41-60	18	enough
21-40	4	low
0-20	0	Very low
Amount	165	

From Table 2. it is known that the knowledge level of students related to viruses is included in the high category with a frequency of 103 students out of 165 total students.

Data description of variable Y (Covid-19 prevention behavior)

Data to measure the behavior of preventing the spread of COVID-19 was obtained through a questionnaire containing 18 questions distributed to 165 respondents. By using a 3-point Likert scale, it is known that the highest score is 100 and the lowest score is 39. Based on these data, the frequency distribution table is obtained as follows:

Table 3. Frequency Distribution of Health Behavior of Class X Students

No.	Interval	Frequency
1.	30-39	0
2.	40-48	0
3.	49-57	1
4.	58-66	17
5.	67-75	63
6.	76-84	53
7.	85-93	21
8.	94-102	10
	Amount	165
	The score average	76.51

Based on Table 3. above, it is known that the frequency of class X MIPA MAN 2 Makassar City students to determine the quality of the variable level of virus knowledge of Class X students, it is necessary to categorize the variables that will be classified into the following categories:

Table 4. Categorization of Healthy Behavior of Class X Students

Interval nilai	Frekuensi	Description
81-100	53	Very high
61-80	110	high
41-60	2	enough
21-40	0	low
0-20	0	Very low
Jumlah	`165	

The Relationship between Virus Knowledge and Students' Healthy Behavior

To determine the relationship between the two variables through a series of statistical tests with the help of SPSS 24.0 software for windows.

Normality test

The results of the normality test using the Kolmogorov-Smirnov test obtained a significance value of 0.025. These results indicate that the data is normally distributed because the significance value is > 0.05.

Linearity Test

The results of the linearity test obtained a significance value of deviation from linearity of 0.102. These results indicate that there is a linear relationship between the two variables because the significance value of deviation from linearity is > 0.05. The linearity test table can be seen in the appendix. 0.115>0.005.

Hypothesis test

Hypothesis testing in this study was analyzed through the product moment correlation test with the basis for making decisions if the value of Sig. < 0.05, then Ha is accepted, meaning that there is a relationship between the variables X and Y and if the value of Sig. > 0.05, then Ho is accepted, meaning that there is no relationship between X and Y variables (Arifin, 2017). With the following results:

Tabel 5. X and Y Variable Correlation Test

Correlations

		Pengetahuan Virus Siswa	Sikap Kesehatan Siswa
Pengetahuan Virus Siswa	Pearson Correlation	1	-.053
	Sig. (2-tailed)		.501
	N	165	165
Sikap Kesehatan Siswa	Pearson Correlation	-.053	1
	Sig. (2-tailed)	.501	
	N	165	165

Table 5. shows that the results of the correlation between variables X and Y obtained a value of 0.501 > 0.05 so that Ho is accepted, so there is no relationship between knowledge about the virus and the health behavior of class X MAN 2 Kota Makassar students.

This study shows that the higher the student's knowledge, the better the behavior in preventing the spread of COVID-19. Circumstances that influence student behavior are not determined by knowledge alone. In accordance with the theory of Lawrence Green (1980) in the description of the theory, that knowledge is included in the predisposing factors that trigger student behavior in preventing the spread of COVID-19. However, keep in mind that there are other factors such as enabling and reinforcing factors that influence an individual's behavior (Triwibowo, 2015), including:

1. Predisposing factors, namely factors that come from within that facilitate the implementation of the practice. An example is the knowledge that students have regarding viruses, especially COVID-19. In addition, there are also beliefs, beliefs, and perceptions of students about COVID-19 that trigger the behavior shown by students.
2. Supporting factors, namely facilities and infrastructure that help the realization of an ideal physical environment. Examples are the availability of a place to wash hands with soap in every public place, the need for masks and vitamins is fulfilled.
3. Reinforcing factors, namely factors that encourage behavior, are usually manifested in the attitudes of community leaders who can be used as role models for community behavior. For example, teachers as role models for students at school and parents as role models for students at home always show good behavior to prevent the spread of COVID-19.

In the results of this research, it is known that most students have good knowledge. A person's knowledge of certain information is influenced by several factors, including: type of work, education, age, experience, culture and information (Sundari, 2018). Learning that produces good knowledge does not necessarily produce changes in behavior, this is what happened in this study. Good student knowledge that comes from learning from various media about how to prevent the transmission of Covid-19 does not necessarily result in behavior to prevent the transmission of Covid-19. The process of forming behavior through social learning theory will basically pass through several stages, namely: the stage of paying attention, the stage of remembering, showing resistance and finally motivation. Motivation is important because it becomes the driving force for someone to keep doing something. Thus, one must be motivated to imitate the behavior that has been learned from modeling.

Knowledge is the result of knowing and occurs after a person contacts an object through the five senses, in the form of hearing, smelling, seeing, feeling and touching. The senses that are often used to produce knowledge are sight in the form of the eyes and the sense of hearing, not only that information received through the five senses about certain topics is understood and maintained for further use according to needs. The knowledge that a person has mostly comes from the educational process, both formal and informal education. Apart from the education process, one can also get knowledge from experience, both personal experience and the experiences of other people being studied. In addition, knowledge can be sourced from the mass media and the results of interactions with the environment (Siltrakool, 2018).

In the results of the research that I obtained regarding the relationship between the level of knowledge about the virus and the health behavior of class X MAN 2 Makassar City students, there is no relationship, this is in line with the results of previous research conducted by Patimah, Yekti W, Alfiansyah, Ratnasari, Taobah and Nugraha (2021) that there is no relationship between knowledge and behavior to prevent the spread of Covid-19. Possibly there are several other factors that are very strong to shape a person's behavior, one of which is reinforcement both from within and from outside. Based on the results of this study, other studies are still needed to assess other factors that influence a person's behavior, especially regarding health behavior in terms of preventing the spread of Covid-19.

The COVID-19 pandemic has had a tremendous impact on people's lives with changes both socially and culturally (Stevany Afrixal, Septi Kuntari, Rizki Setiawan, Wika Hardika Legian, 2020). Since the COVID-

19 pandemic, there has been a change in habits that eventually become new habits, including: (1) Shaking hands, usually a common thing to do when meeting other people; (2) Washing hands, before the outbreak, washing hands is a natural thing to do but not as much as it has to be done since the COVID-19 pandemic; (3) use a mask, if previously the use of masks was only done when driving or when you were sick, but with the COVID-19 pandemic the use of masks is a must because it is to reduce the spread of the virus. Of these many changes, one of the habit changes that is a way to prevent the transmission of the COVID-19 virus is not shaking hands.

According to Notoatmodjo (2012), behavior can be considered as a person's action in responding to something. In this case what is meant is the student response in terms of preventing the spread of COVID-19. It can be seen from the results of the study that students who have various health behaviors, both positive and negative. This happens because students already have knowledge about viruses in general and the COVID-19 outbreak in particular. The positive behavior carried out by students in this study was shown by their attitude of always following the development of information about COVID-19, always wearing a mask when meeting other people, always washing hands with soap after traveling, always keeping a distance from other people when in a crowd, always Take care of your health and get enough rest. The most negative behaviors that students do are not keeping their distance when in a crowd, never exercising, and not taking vitamins to increase endurance.

Currently, various media are used as educational media to shape people's behavior through knowledge. Media is one of the supporting sources in the transfer of knowledge or vice versa can be an obstacle in the realization of effective communication. In addition, the formation of behavior is also influenced by the existence of stimulation from the outside, namely by the presence of reinforcement and punishment. Reinforcement is the process by which the effects or changes that occur in a circle reinforce certain behaviors in the future. External causes can also explain the reasons for a behavior. There are three types of stimuli that occur after a behavior. There is a neutral stimulus, reinforcement or reinforcement, and punishment or law (Mcleod Soul, 2018). Behavior that is followed by reinforcement tends to be repeated while on the contrary punishment refers to any event that weakens or reduces the likelihood of a behavior being carried out (Patimah et al, 2021).

Based on the results of this study, in general, knowledge about viruses and health behavior of class X MIPA MAN 2 Makassar Model can be said to be good, but based on statistical data analysis tests in this study, there is no significant relationship. For the formation of behavior is

influenced by various factors and also required reinforcement to be able to familiarize behavior, this strengthening can be with external encouragement from the government in the form of strengthening in the form of strict punishments for people who violate the Covid-19 health protocol. So that knowledge does not appear to be adopted only but also appears with good behavior.

CONCLUSION

Based on the results of research on the relationship between the level of knowledge about the virus with the health behavior of class X MAN 2 Makassar City students, the following conclusions can be drawn:

1. The knowledge of class X MIPA MAN 2 Makassar City about viruses is included in the interval 67-75 in the frequency distribution table with an average score of 71.68. Once categorized, it can be classified at a high level.
2. Health behavior of students of class X MIPA MAN 2 Makassar City about viruses is included in the interval 67-75 in the frequency distribution table with an average score of 76.51. Once categorized, it can be classified at a high level.
3. There is no relationship between the level of knowledge of students about the virus (X) with the health behavior of students in Class X MAN 2 Makassar City.

Future research can plan more mature research by making changes or adding other variables and a wider range of research populations.

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Profile of Students' Problem Solving Ability Through the Application of Problem Based Learning Model on Environmental Change Material

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Abstract. This research aims to determine the problem solving ability of students through the application of the Problem Based Learning Model on the material of environmental change at the Semen Tonasa Senior High School. This type of research is descriptive quantitative. The subjects in this research were all students of class X SMA Semen Tonasa with a research sample consisting of one study group. The data collection technique used the test method with the type of essay questions. The data analysis technique used is descriptive statistical analysis by categorizing the value of each sample. The results showed that the student's problem solving ability on environmental change material at the SMA Semen Tonasa by applying the PBL model obtained an average score of 82.7 with a good category.
Keywords: Problem Solving Ability, Environmental Change Material

INTRODUCTION

National education functions to develop abilities and shape the character and civilization of a dignified nation in order to educate the nation's life, develop the potential of students to become human beings who are faithful and devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens (National Education System No. 20 of 2003). The government also issued Minister of National Education Regulation No. 16/2007 on teacher qualification standards. In realizing good learning, teachers are required to be able to develop learning that is in line and in accordance with the times in order to achieve the expected learning objectives.

In accordance with Permendiknas Number 22 of 2006, in high school education units in learning biology has several objectives, among others: (1) fostering the scientific attitude of students; (2) students are able to develop experience in proposing and testing hypotheses through experiments; (3) students are able to develop the ability to think analytically, inductively, deductively and use biological concepts and principles; (4) students are able to develop the ability to master concepts and knowledge; (5) students are able to produce simple technological works; and (6) students play a role in preserving the environment. Based on some of these biology learning objectives, it can be interpreted that each

learner must be able to improve the ability in the knowledge aspect to develop the ability in the skills aspect including problem solving skills.

The problem-solving ability of students is influenced by an ineffective learning process that makes students passive. Students' learning behavior is strongly influenced by their learning motivation which also comes from the learning process built by the teacher in the classroom. Therefore, teachers are expected to be able to build an effective and conducive learning atmosphere by applying learning models and methods that are appropriate to the learning material. In addition to the use of inappropriate learning models and methods, teachers who have not been able to apply models and methods properly are also the cause of students' inactivity in learning. This is in accordance with the statement of Endang, Sari & Pratiwi (2021) that increasing the role and activeness of students and the ability to solve problems in teaching and learning activities is also influenced by the role of the teacher in applying the right learning model.

Problem Based learning (PBL) Model is a learning model that uses problems and issues in the form of facts which then students are directed to solve these problems and issues with the principle of cooperation (Rusman, 2014). Furthermore, Trianto (2014) explains that the PBL model facilitates the ability of students in various skills including problem solving, communication, cooperation and interpersonal skills. According to Maspupah, Alwahdah & Sa'adah (2020), the implementation of learning with the principle of daily life problem solving which emphasizes the ability of students to solve problems related to everyday life is needed. Furthermore, Afifah & Putra in Maspupah, Alwahdah & Sa'adah (2020), explained that the application of the PBL Model in biology learning makes students more active in teaching and learning activities

RESEARCH METHOD

This type of research is quantitative descriptive research. The subjects in this study were students of class X IPA SMA Swasta Semen Tonasa and the sample used was Class X IPA 2 obtained from random sampling. Collecting research data is done by giving written tests containing questions that have been prepared based on problem solving indicators. The question items used were 16 questions with essay type questions as shown in Table 1.

Table 1. Indicators of Students' Problem Solving Ability

No	Problem Solving Aspects	Indicator
1.	Defining the Problem	Finding facts related to the problem
		Determine the details of the problem including place, time and actors
2.	Examining the Problem	Identifying the problem
		Examine the causal relationship of the problem
3.	Plan Solution	Develop a problem-solving plan based on the problem
		Mapping sub-problems and sub-solutions
		Determine strategies to solve related problems
4.	Implementing the Plan	Making a list of problems to be solved
		Sequencing work steps related to the solution that has been made
5.	Evaluate	Estimating the results that will be obtained through the solution that has been made

The data that has been collected in the form of answers of each sample, then assessed by referring to the assessment guidelines, as presented in Table 2.

Tabel 2. Guidelines for Assessing Problem Solving Ability Using the PBL Model

No	Problem Solving Aspects	Indicator	Score	Description
1.	Defining the Problem	Mentioning facts related to the problem	3	If you write more than 1 fact correctly
			2	If you write 1 fact correctly
			1	If you write inaccurate facts
		Determining problem details including place, time and actors	3	If you write the right problem details
			2	f you write the details of the problem that are less precise
			1	If writing inaccurate problem details
2.	Examining the Problem	Identifying the problem	3	If you write the right subject matter
			2	If writing the main problem that is less precise
			1	If writing the main problem that is not correct
		Checking the causal	3	If you write the right causal relationship

No	Problem Solving Aspects	Indicator	Score	Description
		relationship of the problem	2	If you write the causal relationship that is less precise
			1	If writing the causal relationship that is not correct
3.	Planning the Solution	Developing a problem solving plan based on the problem	3	If you elaborate the problem solving plan coherently and correctly
			2	If describing the problem solving plan coherently and less precise
			1	If describing the problem solving plan coherently and incorrectly
		Mapping sub-problems	3	If you write the right sub-problems
			2	If writing sub-problems that are less precise
			1	If writing sub-problems that are not appropriate
4.	Implementing the Plan	Sequencing work steps related to the solution that has been made	3	If you make the steps correctly and coherently
			2	If you make the steps less precise and coherent
			1	If you make the steps incorrectly and incoherently
5.	Evaluate	Estimating the results that will be obtained through the solution that has been made	3	If you can estimate the results obtained logically based on the actions of the perpetrators
			2	If you can estimate the results obtained less logically based on the actions of the perpetrator
			1	If you can estimate the results obtained illogically based on the actions of the perpetrator

After the assessment, the data was then analyzed using descriptive analysis techniques. The analysis was carried out in the form of categorizing the data found based on the Wankat and Oreovocz Theory cited by Sari, 'Adna & Mardhiyana (2020) which is presented in Table 3.

Table 3. Categories of Problem Solving Ability

Score Range	Category
$N \geq 86{,}3$	Very Good
$72{,}6 < N < 85{,}3$	Good
$59 < N < 71{,}6$	Enough
$45{,}3 < N < 5\,8$	Deficient
$N \leq 44{,}3$	Very Deficient

RESULTS AND DESCRIPTION

Based on the research that has been done, the data is found as in Table 4 below

Table 4. Problem Solving Ability of Learners

No.	Statistics	Pretest Sample	Posttest
1.	Number of Samples	21	21
2.	Highest Score	67	89
3.	Lowest Score	25	75
4.	Mean	45,8	82,7
5.	Mode	44	83
6.	Standard Deviation	11,6	3,7

Based on this table, it can be seen that the pretest mean score of 45.8 is in the very poor category while the posttest mean score of 82.7 is in the good category. The highest achievement on the prestest was 67 in the moderate category while on the posttest it was 89 in the very good category, then the lowest achievement on the prestest was 25 in the very poor category while on the posttest it was 75 in the good category.

The frequency distribution and percentage of problem solving skills on the pretest and posttest are presented in Table 5.

Table 5. Frequency and Percentage Distribution of Problem Solving Ability

Score	Category	Pretest		Posttest	
		F	%	F	%
85-100	Very Good	0	0%	8	38,09%
75-84	Good	0	0%	13	61,90%

Score	Category	*Pretest*		*Posttest*	
		F	%	F	%
65-74	Enough	2	9,52%	0	0%
55-64	Deficient	2	9,52%	0	0%
0-54	Very Deficient	17	80,95%	0	0%
	Total	21	100%	21	100%

Based on this table, it can be seen that the acquisition of students' problem solving skills on the pretest, the highest category achieved was the good enough category as many as 2 people, while the acquisition of students' problem solving skills on the posttest, as many as 8 people occupied the highest category, namely the very good category. It can also be seen that in the pretest students dominate the very poor category while in the posttest students dominate the good category as many as 13 people.

Based on the frequency distribution and percentage of students' problem solving ability, it can be seen that there is a difference in acquisition between pretest and posttest. The distribution of the acquisition of students' scores on the pretest is in the good enough to very bad category, while on the posttest the acquisition has increased to be in the good and very good categories.

The acquisition of pretest and posttest scores shows the difference in problem solving skills after and before learning using the PBL Model. The stage in PBL Model learning that most affects students' problem solving skills is the first stage, namely orienting students to the problem. At this stage the teacher orientates learning to students by proposing a problem or environmental phenomenon that is closely related to the lives of students, so as to increase the enthusiasm of students in participating in learning and stimulate students to think about the problems or phenomena proposed. In addition, another stage that affects the problem solving ability of students is group investigation. In small group discussions, students will more easily express their respective opinions to find solutions to the problems discussed, in this case students become more active in thinking and processing and analyzing information from group colleagues. In line with research conducted by Maspupah, Alwahdah & Sa'adah (2020) it was found that the PBL Model can help improve students' problem solving skills, due to the enthusiasm of students to take an active part in the learning process.

To find out the percentage of students' abilities based on each aspect of problem solving, it can be seen in table 6 below

Table 6. Problem Solving Ability of Learners Based on Problem Solving Aspects

No.	Aspects of Problem Solving	Percentage
1.	Identifying the problem	80%
2.	Checking the problem	96%
3.	Planning the solution	70%
4.	Implementing the plan	72%
5.	Evaluate	60%

Based on this table, it can be seen the largest percentage of students answering questions correctly is in the aspect of examining the problem of 96%. In this aspect there are 5 question items. While the lowest percentage is in the aspect of evaluating at 60%, with 2 questions. When averaged, the percentage of students' problem solving ability in all aspects is 76%.

The application of the PBL Model, involves students actively in understanding the concepts and principles of a material. This has an impact on the participation of students in learning so as to increase thinking activities. Learners are encouraged to understand a problem and find solutions by looking for additional information that can be obtained through reading activities, group discussions and also questions and answers that occur between teachers and students. The same thing was stated in the research of Supiandi & Julung (2016), that learning with the PBL Model provides flexibility for students to interact with teachers and fellow students. This has an impact on a better learning atmosphere because learning in the classroom is not fully controlled by the teacher so that students feel they have the responsibility to learn.

CONCLUSIONS AND SUGGESTIONS

Based on the research that has been done, it can be concluded that the problem solving ability of students before learning dominates the very poor category, but after learning has increased by dominating the good category.

Students' problem solving skills can develop with the help of the teacher's role in the teaching and learning process. Selection of the right learning model that is in accordance with the teaching material significantly affects the ability of students to think, especially in solving problems. Teachers are expected to be able to apply learning models and methods that can increase students' activeness in learning, so that students get a memorable learning experience and increase learning motivation.

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The Effect of Self-Efficacy and Self-Regulated Learning on Biology Learning Outcomes in Online Learning of State High School Students in Pangkajene District

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Abstract. This research is an ex post facto study that aims to describe self-efficacy, self-regulated learning, and biology learning outcomes of students on online learning, to determine the effect of self-efficacy and self-regulated learning biology learning outcomes on online learning partially and simultaneously. The population in this study were all students of class XI SMAN in Pangkajene District, Pangkep Regency, namely SMAN 1 Pangkep, SMAN 11 Pangkep, and SMAN 20 Pangkep. The total population is 556 people and based on the sample calculation using the Slovin formula, a sample of 361 people is obtained. The sampling technique used was the Cluster Random Sampling technique. The variables of this study consist of the independent variables, namely self-efficacy, and self-regulated learning, and the dependent variable, namely biology learning outcomes. The data analysis technique is descriptive and inferential analysis. Based on the results of inferential data analysis, it's found that (i) there is a partial effect of self-efficacy on biology learning outcomes, (ii) there is a partial effect of self-regulated learning on biology learning outcomes, (iii) there is an effect of self-efficacy and the simultaneous self-regulated learning on biology learning outcomes
Keywords: SeSelf-efficacyself regulated learning, biology learning outcomes.

INTRODUCTION

A successful learning process can be seen from the learning outcomes obtained by students. Learning through a quality process is able to improve the learning outcomes obtained. The implementation of learning which is actually carried out in the classroom is made as innovative as possible so that the formulated learning objectives are achieved, various methods and learning models are used to support the learning process. In an effort to achieve this goal, the learning process in Indonesia has changed since the beginning of 2020 with the emergence of a virus that can spread very quickly, namely the corona virus or Covid-19.

Based on the circular issued by the Minister of Education and Culture Number 36962/MPK.A/HK/2020 regarding online learning for the prevention and handling of Covid-19. St learnin usually done face-to-face has turned into online toning (in the network) both at the school and college level to to prevent the spread of Covid-19 (Fadila, et al, 2021).

The implementation of online learning cannot be separated from several obstacles experienced by students such as internet network problems that cannot be accessed in certain areas, the habit of interacting directly with teachers at school, as well as difficulties in doing the tasks given by the teacher because they cannot understand the lessons provided and the limited information obtained (Tamba, et al, 2021).

Students who have low self-efficacy with low self-efficacy during online learning during the Covid-19 pandemic will find it difficult to face pressure in learning, leading In line with research conducted by Kurniawati (2022) if self-efficacy has a positive relationship for learning outcomes .

Furtherwithe, online learning makes high school students required to be able to study independently . In other words, online learning requires students to be able to create and build their own knowledge independently or tve independent learning. Online learning can create flexibility in the implementation of learning activities and can encourage the emergence of student independence in learning (Sadikin, 2020) . Research conducted by Triansari (2019) states that self-regulated learning has an effect on learning motivationaffects is in line with Setiaji 's (2021) research which also states that self-regulated learning has an effect on learning motivation.

The holding of online learning also has an impact on learning carried out at SMA Pangkajene District, Pangkep Regency, which is one of the regencies included in the level 1 area of the imposition of restrictions on community activities since February 2022 based on the South Sulawesi governor's circular No. 443.2/1367/DISKES. The entry of Pangkep Regency, especially Pangkajene Sub-district, resulted in re-learning being carried out online after previously having conducted offline learning in the last few months.

Based on the description above, the author is interested in conducting research to see the effecresearchingand self-regulated learning on biology learning outcomes motivation in online learning for State Senior High School students in the district of Pangkajene .

METHOD

This research is an *ex post facto research* which is correlational. *Ex post facto* research is research that is carried out to examine variables that have occurred without the need to give treatment to the variables studied (Sugiyono, 2010). This research was conducted in the even semester, academic year 2021/2022 from January 2022 during October 2022. The research location was at SMAN 1 Pangkep, SMAN 11 Pangkep, and SMAN 20 Pangkep, Pangkajene District, Pangkep Regency. The population in this study were all students of SMAN 1 Pangkep, SMAN 11 Pangkep, and SMAN 20 Pangkep, for the academic year 2021/2022 consisting of 16 study groups with a total of 556 students. The variables in this study consisted of independent variables, namely self-efficacy (X1) and self-regulated learning (X2) and the dependent variable was learning outcomes (Y).

The instrument used in this study is a test instrument to obtain data on student learning outcomes, and non test by using a questionnaire to obtain data on self-effnontestd f-regulated learning as independent variables. This study uses a closed questionnaire with a *Likert scale* whose answers have been provided by the researcher, namely strongly agree, agree, disagree and strongly disagree. so that the respondent only has to choos,e the appropriate or appropriate statement . The research instrument used in this study was first tested for validity and reliability

Data which has obtained analyzed by descriptive, inferential , and test hypothesis. Analysis descriptive which used that is distribution frequency data. Whereas analysis inferential consist on test assumption base and 4 test assumption classic . Test assumption base consist on test normality, while test assumption classic consist on test linearity, test multicollinearity, and test heteroscedasticity. If test assumption the fulfilled, then next with for testing hypothesis. Test hypothesis conducted with test regression simple and regression multiple .

RESULTS
1.   Descriptive Analysis

Table 1. Descriptive Analysis Results

Variable	interval	Percentage (%)	Category
Self Efficacy	62-77	50.1	Currently
Self-regulated learning	74-88	50	Tall
Learning outcomes	38-52	30	Currently

Based on the table above, self-efficacy and learning outcomes are in the medium category, and self-regulated learning is in the high category. So that self-efficacy and self-regulated learning still need to be improved, considering that online learning is not an easy thing to do which certainly greatly affects student learning outcomes.

2. Inferential Analysis
a. Basic Assumption Test
1) Normality Test

Kolmogorov Smirnov . Test Normality Results

	N	Sig. (2-tailed)	Information
Unstandardized Residual	361	0.20	Normal Distributed

Based on the basis for making these decisions, the data is normally distributed because the value of Sig. $(0, 20) > 0.05$

b. Classic assumption test
1) Multicollinearity Test

Table 2. Multicollinearity Test Results

Variable	Collinearity Statistics		Information
	Tolerance	VIF	
Self Efficacy	0.46	2.15	There is no multicollinearity
Independent Learning	0.46	2.15	There is no multicollinearity

Based on the table above, it is known that the *tolerance value is* > 0.10 and the VIF value is < 10.00 so that there is no deviation in the relationship between the independent variables and the regression model, or there are no symptoms of multicollinearity.

2) Heteroscedasticity Test

Table 3. Glejser Test Results

Variable	Sig.	Information
Self Efficacy	0.15	There is no heteroscedasticity
Independent Learning	0.07	There is no heteroscedasticity

Based on the heteroscedasticity test table above, the value of Sig. 0.15 on the self-efficacy variable ($X1$) and the value of Sig. 0.07 on the variable of self-regulated learning (X_2). Therefore the value of Sig. > 0.05 so there is no heteroscedasticity.

3) Linearity Test

Table 4. Linearity Test Results

	Sig.	Information
Learning Outcomes*Self-Efficacy Sig. *deviation from linearity*	0.15	linear
Learning Outcomes*Study Independence Sig. *deviation from linearity*	0.28	linear

The basis of decision making for linearity test is if the value of Sig . *deviation from linearity* > 0.05 then there is a linear relationship between the independent variable and the dependent variable, and if the value of Sig. *deviation from linearity* <0.05 then there is no linear relationship between the independent variable and the dependent variable. Based on the table above, it is known that the value of Sig. *linearity* > 0.05 so there is a linear relationship.

3. Hypothesis Testing
1. Influence Efficacy Self By Partial To Results Study

Table 5. Results t test

Model	Sig.	t count	Information
Self Efficacy	0.03	2.98	Take effect

Significance value on self-efficacy variable ($X1$) of 0.03 < (0.05). In addition, the value of t count (2.98) > t table (1.64) which means that the self-efficacy variable has an influence on the learning outcome variable. It is concluded that there is an effect of self-efficacy on learning outcomes.

2. Influence Independence Study By Partial To Independence Study

Table 6. Results t test

Model	Sig.	t count	Information
Independent Learning	0.02	2.62	Take effect

The significance value of the self-regulated learning variable (X_2) of 0.02 < (0.05). In addition, the value of t arithmetic (2.62) > t table (1.64) which means that the self-regulated learning variable has an influence on the learning outcome variable. It is concluded that there is an influence of independent learning on learning outcomes.

3. Influence Efficacy Self and Independence Study By Simultaneous To Results Study Biology Participant Educate

Table 7. Results Test Anova

Independent Variable	Dependent variable	Sig.	F Count	Information
Efficacy self and Self-regulated learning	Learning outcomes	0.02	2.84	Take effect

X1 and X2 on Z simultaneously or together with learning outcomes variables, obtained score Sig. 0.02 < 0.05. In addition, the calculated F value (2.84) > F table (2.62). So concluded that there is an effect of self-efficacy and independent learning together on learning outcomes .

DISCUSSION

1) Description Efficacy Self Participant Educate Class XI SMAN in all districts Pangkajene

Based on analysis descriptive is known that highest frequency related efficacy self participant educate class XI SMAN in the District Pangkajene Regency Pangkep is at on category currently with value interval between 62 and 77. Category obtained show belief that you have participant educate will ability for reach and complete tasks study on online learning .

On context online learning , participants educate need for have efficacy self height that can be help participant educate succeed in online learning . Efficacy self on participant educate important owned in order to have confidence will ability herself alone when confronted with Duty nor situation full learning _ pressure on time covid-19 pandemic so could succeed for reach what is desired (Tamba et al , 2021).

2) Description Independence Study Participant Educate Class XI SMAN in all districts Pangkajene

Analysis self- descriptive data study state that participant teach the most is at at intervals of 74 and 88 with amount participant educate which is 180 people, so that independence study participant educate on online

learning is on category high. Based on analysis answer participant educate on questionnaire independence learn , participant educate already have ability management time , arrangement environment study , and determination good cause _ in by online learning . However , on indicator capable complete strategy Duty still many participant students who choose answer no agree , so show if independence study not yet fully owned by participant educate .

The higher the level of education, the higher the level of student self-regulated learning. For students who are still in high school, they still have to hone the level of independence in their learning by doing full control both from inside and outside. Students still need to be controlled and reminded of the tasks and obligations given by the school (Sangsawang, 2015).

Increase independence Learning is very important for every educator. The importance of *self-regulation learning* (self-regulated learning) has a significant impact on students' cognitive abilities, students who are more independent with an active attitude towards the use of technology will be more motivated to participate in online learning and achieve learning goals (Geng et al , 2019).

3) Description Learning Outcomes Participant Educate Class XI SMAN in all districts Pangkajene

Descriptive analysis of learning outcomes data states that most students are in the intervals of 38 and 52 with a total of 110 participants. So it can be said that the learning outcomes of students in online learning are in the medium category. Even though they are in the medium category, the scores obtained by students do not reach the KKM score of 75.

The cause of the low learning outcomes of students can be caused because the provision of this material takes place online (in the network) with the most dominant media used is whatsapp group (WAG) . Teachers are less able to control students' understanding so that the transfer of material is not optimal and meaningful learning is not built.

4) The effect of Self Efficacy By Partial To Learning Outcomes

Based on the analysis obtained, it is known that the significance value of the partial test is 0.03 <0.05 so that there is a direct effect of self-efficacy on learning outcomes. The magnitude of the effect of self-efficacy on learning outcomes is known from the path coefficient value (β) of 0.076 which indicates a positive effect. The value of means that if the increase in self-efficacy is 1%, it will also be followed by an increase in learning

motivation of 7.6%. So it can be concluded that the higher the self-efficacy, the higher the learning outcomes.

The results obtained are in line with Chairunnisa (2021) which states that partial self-efficacy has a significant effect on cognitive learning outcomes. Students who have higher self-efficacy will increasingly affect their learning outcomes. In line with Hasanah (2019), if students who have high self-efficacy during online learning during the Covid-19 pandemic will be able to deal with the learning process and tasks given by the teacher well, so that students have confidence in their abilities to try their best. power to get the desired result. When faced with pressure or difficult situations, students will tend to find a way out to deal with it.

On the other hand, students who have low self-efficacy during online learning during the Covid-19 pandemic will find it difficult to deal with pressure in learning as a result of changing learning methods from face to face to online which can make students tend to fail in online learning and complete assigned tasks. by the teacher. Students will think negatively about their abilities so that they easily give up in achieving the desired results. So the need for self-efficacy for students to have confidence in their own abilities when faced with stressful tasks and learning situations so that they can succeed in achieving what they want, in addition to reducing situations that make students experience academic stress during online learning during the Covid-19 pandemic. 19. (Chairunnisa, 2021).

5) The Effect of Self-Regulated Learning By Partial To Learning Outcomes

Based on data analysis, there is a direct influence of self-regulated learning on learning outcomes obtained from the significance value of the partial test of 0.002 <0.05 so that there is an influence of self-regulated learning on learning motivation. The magnitude of the effect of self-efficacy on learning motivation is known from the path coefficient value (β) of 0.113 which shows a positive effect. The value of means that if the increase in self-regulated learning is 1%, it will also be followed by an increase in learning motivation of 11.3%. So it can be concluded that the higher the self-regulated learning, the higher the learning outcomes.

The results obtained are strengthened by research (Sari, 2019) which explains that self-regulated learning is significantly correlated with learning outcomes. Based on the research findings, it was found that the self-regulated learning of students during online learning during the Covid-19 pandemic affected student learning outcomes. The low influence of self-regulated learning on the learning outcomes obtained can be caused by the

pandemic conditions that make changes to online learning methods that make students unable to get used to independent learning. In addition, Suwarni (2021) also revealed that in addition to independence, other factors that can affect learning outcomes include student learning readiness, student intelligence level, environmental atmosphere around students, learning facilities obtained by students, school quality, teachers and teaching abilities. teacher.

However, self-regulated learning still needs to play an important role in learning during the pandemic because of the lack of interaction and supervision from teachers who are only done online so they cannot directly control learning activities. Students who study independently will be able to control their learning activities during online learning and can improve their learning outcomes. Students with good self-regulated learning will be able to obtain high learning outcomes, and vice versa students with low levels of self-regulated learning will get low learning outcomes.

6) The effect of Self Efficacy and Self Regulated Learning By Simultaneous To Learning Outcomes

Based on data analysis, it is known that there is a simultaneous influence of self-efficacy and self-regulated learning on learning outcomes which can be seen from the value of Sig. $0.029 < 0.05$. The magnitude of the contribution of self-efficacy with self-regulated learning simultaneously on learning outcomes is 29.3% while the rest is influenced by other factors that are not controlled in this study. The effective contribution of self-efficacy to learning outcomes is 5.54% and the effective contribution to self-regulated learning is 8.2%, so it can be concluded that in this study the independent learning variable has a dominant influence on biology learning outcomes in online learning.

Learning outcomes are a reflection of the learning effort, the better the learning effort, the better the results achieved. One of the factors that influence learning outcomes is internal factors including self-efficacy and self-regulated learning simultaneously or together. Students with a high level of self-efficacy must be supported by high self-regulated learning so that the learning outcomes obtained are also high, and vice versa. Someone who has high self-efficacy believes that he is able to carry out the activities he will do amid the pressure of online learning during the pandemic (Saputra, et al 2021).

The online learning process carried out by students is strongly influenced by the existence of independent learning, because online learning makes it difficult for teachers to monitor student learning one by

one. Therefore, to achieve an understanding of the material in order to get good learning outcomes, students are expected not to depend on the material provided by the teacher and are required to study independently with or without direction from the teacher. In line with Suwarni's research (2021) independent learning is able to make someone plan their own learning, how to learn, and learning activities so as to optimize learning outcomes to be achieved.

CONCLUSION

Based on results analysis in study this, then there is a number of conclusion as following .

1. Self efficacy participant educate on online learning at SMANs in all districts Pangkajene Regency Pangkep is at on category medium .
2. Self-regulated learning participant educate on online learning at SMANs in all districts Pangkajene Regency Pangkep is at on category high .3. Learning Outcomes participant educate on online learning classes at SMANs in all districts Pangkajene Regency Pangkep is at on category medium .
4. There is an effect self efficacy by Partial to biology learning outcomes participant educate
5. There is an effect self-regulated learning by Partial to biology learning outcomes participant educate
6. There is an effect self efficacy and self regulated learning by simultaneous to biology learning outcomes participant educate on online learning in high schools in Pangkajene District.

SUGGESTION

Based on conclusion results research , then researcher try give advice as following.

1. To the teacher, it is hoped capable carry out a learning process that can increase efficacy self , independence study , and motivation study participant educate on online learning so that participant educate could get results good study.
2. To participant educate, needed awareness in increase efficacy self , independence study , and motivation learn it on online learning to get results good study.
3. To researcher and observer education , based on findings study wish there is study advanced related with study this is tracing pattern connection between variable specifically election intervening variables built in study this , because in many study about various influencing factors results study on online learning that involves

intervening variables, then between researcher one with other researchers are different in Thing set or choose intervention variable.

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The Use of Digital Learning Media by Undergraduate Students in Presentations and Discussions on Genetics Courses: A Qualitative Study

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Abstract. Genetics is compulsory in all biology and biology education curricula in Indonesia - and even the world. Understanding genetic concepts is essential in understanding and underpinning understanding in other branches of biology. So, the success of genetics learning becomes crucial to the success of the Biology and Biology Education undergraduate curriculum. There are many methods applied in genetics courses, and all use learning media to carry out their activities. This study revealed the PowerPoint-based presentation used by students in the Department of Biology, Universitas Negeri Malang, in Genetics 1st Course, the academic year 2022/2023. The analysis was carried out qualitatively on all digital learning media presented by students in presentations and group discussions. From the results of the analysis, it was found that the entire group of students gave their presentations using Microsoft's PowerPoint application. However, during the presentation, there are variations; some students present it with a slide show (including transitions and animations), and some only show the primary PowerPoint display (not in a slide show). While some others display a PDF version of PowerPoint. Based on the content of the PowerPoint presented, almost all groups of students put very long descriptions in their PowerPoint slides; only one group presented their power points systematically, balanced between facts and pictures or schematics. Further investigation showed that the group of students who presented their PowerPoint with long descriptions raised questions already contained in the PowerPoint itself. This study concludes that the preparation of PowerPoint, which is not good, is proven to be less able to deliver messages accurately, which raises questions from the audience (which is substantially already mentioned in the PowerPoint). On the other hand, using pictures and schematics in slides is beneficial for the recipient of the message in understanding the concepts explained through PowerPoint.
Keywords: genetics courses, digital learning media, presentation and discussion.

INTRODUCTION

Genetics is a very important knowledge to understand currently. Understanding genetics is important for both consumers and producers of science (Mussard and Reiss 2022). Understanding genetics becomes even more important for students majoring in biology or biology education. Duncan et al. (2011) exemplify that understanding genetics allows young people to make informed decisions about contemporary scientific issues such as genetic screening and genetically modified foods. Also, Mussard

and Reiss (2022) added that understanding genetics allows biologists to understand fundamental ideas like biological inheritance and evolution. An understanding of genetics plays a substantial role in explaining phenomena in students' lives and facilitates progression onto university courses.

The increasing importance of genetics in our daily lives requires greater attention to the study of genetics in our educational system (Hott, et al., 2002). Genetics is a subject that is inseparable from the biology curriculum. Genetics is compulsory in all biology and biology education curricula in Indonesia - and even the world. Understanding genetic concepts is essential in understanding and underpinning understanding in other branches of Biology. So, the success of genetics learning becomes crucial to the success of the Biology and Biology Education undergraduate curriculum.

However, studies suggest genetics is difficult to learn (Duncan and Reiser, 2007; Nursantari, 2012; Osman, BouJaoude, and Hamdan, 2017; Choden and Kijkuakul, 2020; Mussard and Reiss, 2022). From the results of these studies, to maximize the learning of genetics, especially with the difficulties involved, every step of genetics learning needs to be best prepared, including the use of learning media and discussion processes that follow every genetic learning activity.

Learning genetics, especially in undergraduate (S1) has the characteristics of a more abstract discussion, so this material becomes difficult to understand (Sumampouw and Rengkuan, 2018). This is in line with the report of Nursantari (2012) that genetics experiences high problems and even ranks first in conceptual errors in students. Therefore, the study of genetic material is an excellent study or research. Problems arise because learning about genetics uses more printed books or teaching materials while printed books or teaching materials only present still mages. Students have difficulty learning the concepts in this course, such as the Structure and Reproduction of Genetic Material. Indeed, in the teaching materials when explaining the concept of Reproduction of Genetic Material there is a picture with arrow directions on its components, and the process is depicted through still images so that it seems as if the process machine is running according to its stages. However, students still find it difficult to understand genetic concepts in these teaching materials.

Sumampouw and Rengkuan (2018) suggest that reviewing the learning process for genetics courses is still felt that there is a deficiency in terms of the learning media used by lecturers. It is a fact that until now genetics lecturers still use printed books or teaching materials in genetics learning. Even though in learning genetics several important competencies must be mastered by students. If the learning media (printed books and

teaching materials) do not support and are not able to convey information properly, students will have difficulty following the lesson and have difficulty understanding the concepts conveyed by the lecturer.

Changes and developments that occurred during this period where there were major changes in various fields including the field of information and technology had a significant influence on the field of education including higher education. This influence can be seen in the application of technology in learning. Advances in technology allow today's lecturers to provide various kinds of learning media that facilitate and motivate students in learning. Learning media in the form of multimedia is one of the products of technological progress that has a high potential to increase effectiveness and innovation in the learning process. Some research results report that there are special characteristics that are more effective in learning multimedia designs so that they can suit the needs of students. Several characteristics of learning multimedia designs have been formulated and proven to be successful in demonstrating the superiority of multimedia in improving learning outcomes (Butcher, 2006; Mayer, 2005).

In 2018, APJII (Association of Indonesian Internet Service Providers) released the results of its survey which explained that the penetration of internet users in Indonesia reached 64.8%. That is a high number as a basis for student media literacy. Buckingham (2005) defines media literacy as "the ability to access, understand, and create communications in a variety of contexts". Media literacy in this study refers to the ability of audiences who are literate about the media and mass media messages in the context of mass communication" (Tamburaka, 2013). Media literacy is a series of perspectives that we actively use to expose ourselves to the media to interpret the meaning of the messages (media) we encounter. We construct our perspective from knowledge structures. To build knowledge structures, we need tools and raw materials. Meanwhile, the raw material is information that we get from the media and from the real world (Potter, 2001). Taking control is at the heart of media literacy. Becoming media literate gives us a clearer perspective on the boundaries between the real world and the world generated by the media (Potter 2001).

Students through the media can learn to recognize outside life as well as get socialization of sovereign values in society according to the reality photographed by the media. When teenagers deal with the media, they show their dynamic character. Teenagers are basically always curious, easily influenced, and tend to take media content for granted (The Habibie Center, 2008).

On the other hand, teenagers are familiar with technology, are not afraid of dealing with new things, and tend to be idealistic (Sheila, 2010). Adolescents are a culturally distinct and significant group, as a market segment, as a sub-culture, and who are leading the way in the use of new media. Adolescence is the point where an individual tries to build an identity, form a social group, and negotiate the cultural meaning that they have. Among all, the media is the central part (Osgerby, 2004). From this statement, it can be said that youth are potential commodification objects for media producers who have intergenerational marketing objectives.

The purpose of each learning activity is to help achieve educational goals. Learning is a process of teaching and learning activities, in which two parties are involved with each other, namely the teacher as an educator and students as students. Hamalik (2011) adds that learning is the process of guiding student learning activities. Learning means renewal towards individual development so that life becomes better. Learning is the modification or reinforcement of behavior through experience.

Yuliansih et al. (2011), explained that the learning process is the core of the process of formal and informal education, in which interactions occur between various learning components. These components are teachers, content or subject matter, and students. The interaction between the three components includes facilities and infrastructure, learning methods, learning media, learning models, and structuring the learning environment so that it can support the achievement of the planned learning process. Surachmad (2003), argues that "Teaching and learning activities require appropriate methods and have tools in the teaching and learning process. The use of tools in the teaching and learning process aims to improve learning achievement. So, to improve student learning outcomes need support from learning tools or media.

The importance of learning media is directly felt by teachers and students. This is reinforced by the study of Soebroto, et al. (2009), which states that learning with visual media in the classroom influences student interest and learning outcomes. Therefore, this study wants to see how the use of learning media in students participating in the Genetics 1 course at the Department of Biology, State University of Malang, and what is the relationship between the use of this media and student learning performance, which in this case is measured from discussion activities.

RESEARCH METHOD

The study was conducted with 37 second-year Biology Department students enrolled in the Genetics 1 course at Universitas Negeri Malang (UM), Indonesia. The module consisted of 16 weeks total, 9 weeks of

presentations and discussion sessions with daily lectures followed by a Mid-semester written exam, 4 weeks of project-based learning activity, and a Final Exam. The study in this research was carried out in 9 weeks of presentation and discussion sessions consisting of 18 groups of presenters.

A qualitative method explanatory design was employed to study the use of learning media by undergraduate students in presentations and discussions. The analysis was carried out qualitatively on all digital learning media presented by students in presentations and group discussions. The type and the quality of presentation media are then identified, classified, and analyzed before being presented (desk evaluation). Further analysis was also carried out at the time of the presentation. This analysis includes the suitability of the presentation method and how students optimize their presentation material to deliver the concept of genetics in front of the class. This analysis is carried out through direct observation in class when students are making presentations. Finally, a short classical interview was conducted regarding the selection of presentation media and its presentation performance.

The next step of this study is to analyze the post-presentation discussion. We limit the discussion analysis to post-presentation discussions to see how the choice of instructional media and presentation performance relates to the quality of class discussions. There were two discussion sessions, which were held right after the presentation and discussion after the explanation from the lecturer. The second discussion was intentionally not included in the analysis of this study because it was considered to have no direct relationship with the quality of the learning media chosen by students. As the first step, a short classical interview was conducted regarding the performance of the post-presentation classical discussion. The type and the quality of presentation media are then linked to the questions asked by the audience in the courses.

The following is a sequential qualitative method explanatory research design that describes the steps in this study.
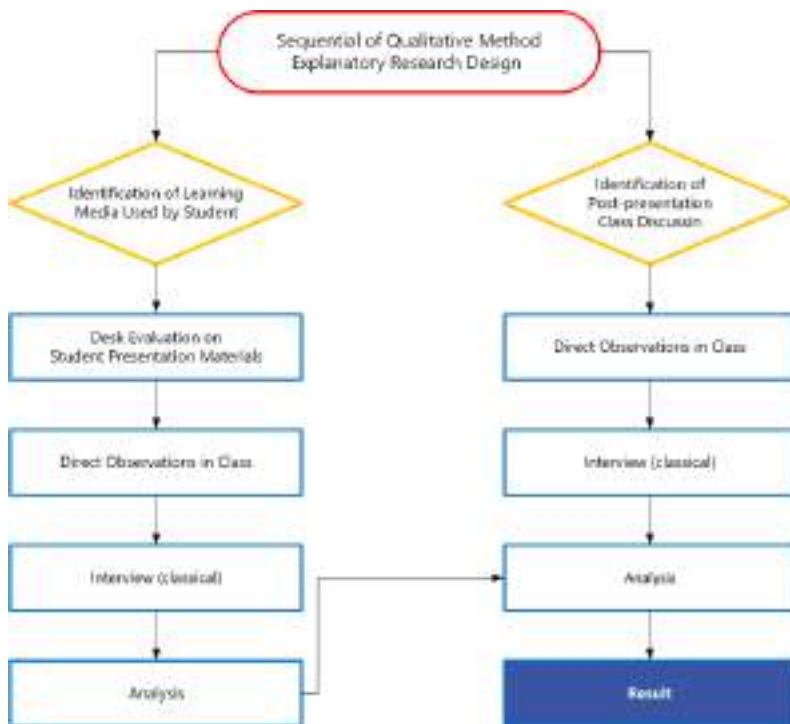
Figure 1. The Sequential Flowchart of The Qualitative Method
Explanatory Research Design used in This Study

RESULT

Based on the results of the learning media evaluation desk submitted by students before the presentation, it was found that all student groups used the PowerPoint platform in developing their presentation media. There are a total of 18 PowerPoint-based media presentations that have been developed by students. However, during the presentation, there are variations; some students present it with a slide show (including transitions and animations), and some only show the primary PowerPoint display (not in a slide show). Based on the content of the PowerPoint presented, almost all groups of students put very long descriptions in their PowerPoint slides. Only several groups presented their PowerPoint systematically, balanced between facts and pictures or schematics, adding context to each explanation. Some other presentation lack context. The presenter too focuses on delivering points in their presentations so that sometimes they forget to convey the context of the material presented. While some others

display a PDF version of PowerPoint. The details of the data obtained are presented in the following charts 1-4.
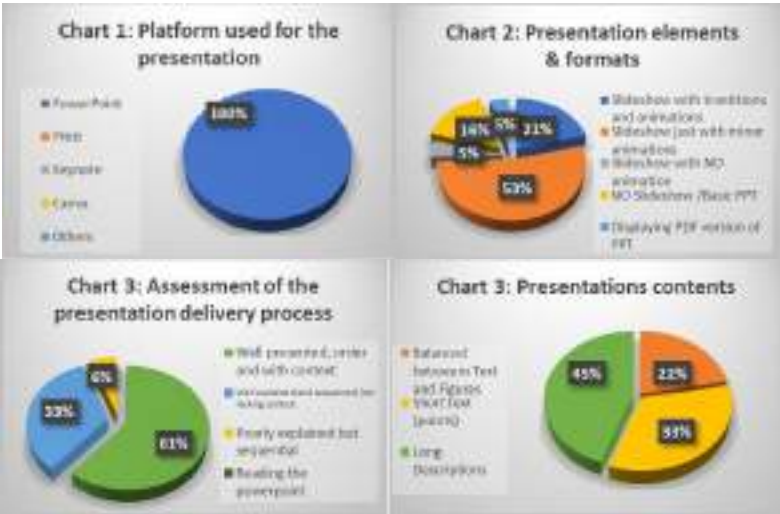
Figure 2. Data on Learning Media Used in Student Presentations

Based on the results of direct observations in class, during the 18 presentations, 108 questions were raised during the post-presentation group discussion sessions. Occurs between 5-8 initial questions in each meeting with an average of 6 questions per topic. The questions that arise are varied. Starting from questions that reconfirm what the presenter has said, to substantive questions that ask for the application or context of the material presented. Even though there were also questions that only asked for explanations because the questioner did not clearly receive the information during the presentation.

Further investigation showed that the group of students who presented their PowerPoint with long descriptions raised questions already contained in the PowerPoint itself. Often the information conveyed in the form of a long description is received incompletely by the audience. This then resulted in the emergence of questions that only asked back the material that had actually been presented in the presentation. Sometimes the presenter responds to this question by showing the slide again and re-reading the explanation given. It is less efficient. Some others responded by answering with a brief explanation, which was then followed by further, more substantive questions. These findings indicate that the quality of instructional media directly influences the learning process (discussion) in

class. In some cases, the lecturer must intervene, to promote a better discussion.

While the group of students who presented quality PowerPoints showed that the questions that emerged were more substantive and meaningful. Presentations that present context well, are delivered in a good sequence, and contain clear and substantial information are responded to by questions that are substantive and applicable. In its continuation, the discussion became livelier, and more material was discussed, and students' understanding of genetics concepts was also better.

Below are some screenshots of student presentations. It can be seen that there are differences in the screenshots, where some contain full text, and others contain pictures and schematics.
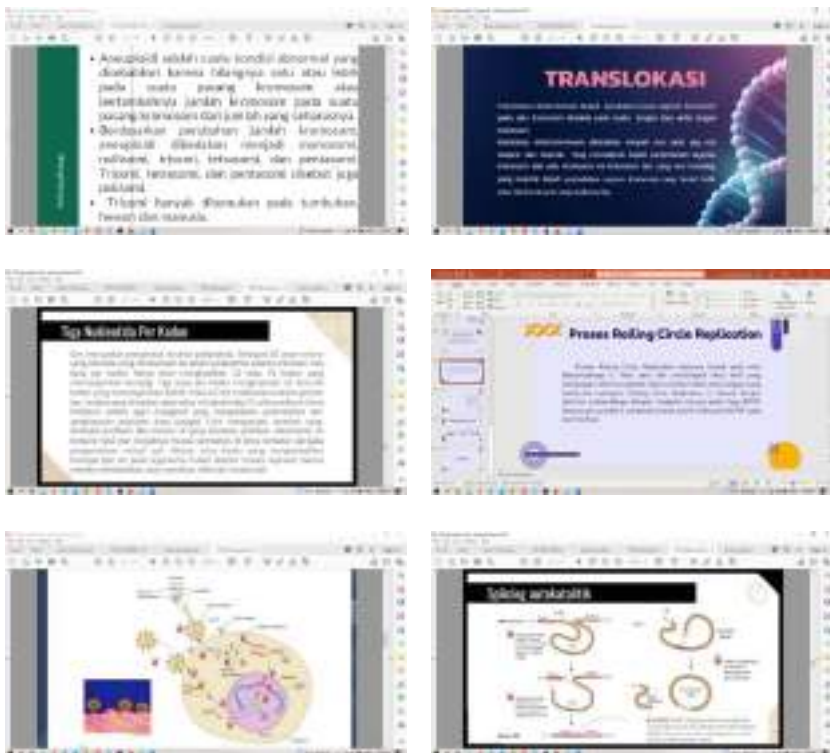
Figure 3. Some Sample Screenshots of The Presentations Presented by Students

DISCUSSION AND REFLECTION
Digital Learning Media Selection and Implementation

The use of learning media in the learning process in this modern era is a necessity. It can be said that all learning models involve learning media in their presentations. Furthermore, learning media is also used in pre-learning and as an evaluation tool. The position of learning media is getting bigger in proportion, especially in today's digital era. Currently, a teacher has a lot of options for the learning media that will be used. Research on the development of instructional media is still being carried out in educational institutions, starting from offline-based to very advanced and online-based. The problem is not how to make instructional media, but how to choose and implement it.

Learning media is an integral part of the learning process. Especially in the 21st Century, where the integration of technology and easy access to information is so high in the world of education, many learning media are available in the most efficient format, namely digital format. Learning media has a very important role in ensuring an optimal learning process and ultimately ensuring the achievement of learning objectives. The role of ICT-based learning media in the learning process is very large and important to be implemented by teaching staff, because it has an impact on increasing student learning motivation and as a teacher's assisting tool in explaining the subject matter to students. Using innovative ICT-based learning media teachers can communicate better and clearer, and the learning atmosphere is more enthusiastic, and the interactions that occur are multidirectional. (Wibisono & Yulianto, 2010) argues that learning media contain messages that can stimulate student learning and foster learning motivation so that students do not feel bored in participating in the learning process. Therefore, the role of learning media cannot be separated and becomes a unit in the teaching and learning process.

As the name implies, media means an intermediary, and in the context of learning, the selection of the right intermediary will greatly affect the process and results of the learning carried out. Furthermore, Silahuddin (2015) added that the media is a tool or means used to channel messages or information that the message's source wants to convey to the target or recipient of the message. Learning media is anything that can be used to channel messages from senders to recipients so that they can stimulate students' thoughts, feelings, concerns, and interests to learn (Baharun, 2016). In line with what was said, Rambe (2020) mentions that learning media is a teaching aid for teachers to convey teaching material, increase student creativity and increase student attention in the learning process. So that the selection and implementation of learning media are

vital to the success of the learning process, which will ultimately ensure the achievement of learning objectives.

The selection of the right learning media will support the learning process that is conducted. Lenggono (2019) emphasized that learning media has an important role in supporting the quality of the teaching and learning process. Especially in this 21st-century era, selecting media that is suitable for the character of students and using technology that is family to their life will very much help the effectiveness of the learning process. Added by Irsan et al. (2021) that the use of technology in learning can make it easier for students to understand study materials and improve the character of student discipline. The use of this kind of learning media has a positive impact on improving student learning outcomes.

How Learning Media Influence Student Discussion

From the presentation of the data above, it can be seen how the quality of the PowerPoint presented by the group of presenters during the presentation affects the performance of the discussion. This can be explained by the fact that learning media influences student learning interests. In this case, an interesting PowerPoint makes students focus more on their friends' presentations so that during the question-and-answer session they are more enthusiastic about submitting questions and discussions. Nugrahani & Rupa (2007) revealed that the use of learning media at the teaching orientation stage will greatly help the effectiveness of the learning process and the delivery of messages and lesson content at that time. This is supported by Satria & Egok's (2020) statement that the use of instructional media in the learning process has an impact on increasing the interest and curiosity of students and arousing student learning motivation which has an impact on the stimulation of learning media applied by the teacher in class so that it has an impact on psychological development student learning. The use of learning media in the learning process is very important because learning media is a tool used by teachers to convey learning material that can make it easier for students to understand it quickly and well (Muhson, 2010). Learning media has a position as a vehicle for conveying information or messages by teachers to their students. Therefore, learning media in use has a role in streamlining and streamlining the implementation of learning.

Learning media can be interpreted as a communication tool teachers use in the learning process. Learning media has several functions including; a) educational function, learning media as a communication tool contains educational properties that affect the development of students, b) social function, learning media can provide information and experience of

social life to students, c) economic function, learning media has an economic value which is very effective in its application in the learning process, d) political function, learning media functions to build material and spiritual students, e) the function of art and culture, learning media provide information to students about developments in the arts and culture (Khalilullah, 2012). The functions of learning media as mentioned earlier certainly affect the interest and understanding of the students participating in Genetics 1 in participating in presentations and discussions. When students are interested, that's when the starting point for questions or discussions appears. And when students better understand the context and material presented in the presentation, it will increasingly encourage the emergence of substantive questions (not questions that are only confirmation).

Based on the previous description, it is very important to control the quality of student presentation media in presentation and discussion sessions. The quality of student presentations, not only the suitability of the presented concepts but also the format of delivery and attraction of the presentations- are the initial initiators for the next learning step, especially questions and discussion. A good presentation, substantive discussion, and well-guided, will produce a quality learning process which will finally encourage the maximum learning objectives.

CONCLUSION

The result of this study suggests that the preparation of PowerPoint, which is not good, is proven to be less able to deliver messages accurately, which raises questions from the audience (which is substantially already mentioned in the PowerPoint). On the other hand, using pictures and schematics in slides is beneficial for the recipient of the message in understanding the concepts explained through PowerPoint. Indeed, many other factors can also contribute to determining the quality of student discussions, but in this study, it appears that the quality of the presentation of the material as indicated by the quality of the learning media has a strong relationship with the quality of the discussion. We suggest lecturers pay more attention to how their students choose and develop instructional media used as presentation material in classical discussions. Good presentation material will lead to quality discussions and ultimately lead to a better understanding of the material and achievement of learning objectives.

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Analysis of the Science Literacy Ability in Biology Learning at SMAN 1 BonE

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Abstract. This study aims to determine the scientific literacy ability of students in biology learning at SMAN 1 Bone. The research method used is descriptive quantitative research method. The population of this research is all students of MIPA class at SMAN 1 Bone. The research sample was 102 class XII students with jenuh sampling technique of determining the sample. The data collection technique was in the form of multiple choice test questions for students' scientific literacy skills with a total of 30 questions. Based on the research that has been carried out on SMAN 1 Bone students, it can be concluded that the highest scientific literacy ability of SMAN 1 Bone students is in the medium category with the correct percentage of 77.4%. This means that some students in Bone Regency are able to think rationally and scientifically to solve a problem at hand. Following the results of other students' scientific literacy skills, it is known that there are 7.9% of students whose scientific literacy skills are in the low category, which means students have not been able to use scientific data and evidence to evaluate the quality of scientific information and arguments. Furthermore, there are 14.7% of students whose scientific literacy skills are in the high category. This indicates that some students have understood in managing their knowledge to solve various problems by making decisions based on scientific considerations.

Keywords : Science Literacy Ability, Biology Learning

INTRODUCTION

The 21st century is described as a century full of changes, challenges and hopes. Richard Crawfod (1991) in his book *"In the Era of Human Capital"* states that the 21st century is the *"Era of Human Capital"*, which is at the heart of large-scale global change, an era in which science and technology, especially communication technology, develops. day by day, impacting the world at breakneck speed. Free competition is so tight in every aspect of human life, including in the field of education. Humans are required to have scientific expertise and high professional skills. The tough challenges faced by society demand a paradigm shift in the education system that can give birth to a set of 21st century skills that must be faced by students in all matters of global life.

One of the 21st century skills that is very important to note so that students are able to apply science appropriately is scientific literacy. Scientific literacy is a person's ability to apply his 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 he is able to participate in overcoming issues and ideas related to science (OECD, 2019). Scientific literacy is one of the skills needed in the 21st century among 16 skills identified by the *World Economic Forum (2015)*. Given the importance of scientific literacy, educating the public to have scientific literacy is the main goal in every science education reform. In the nearly 20 years since PISA released the results of students' scientific literacy skills around the world, Indonesia has always been at the bottom. This shows that the quality of science learning in Indonesia is far below OECD member countries. On that basis, it is necessary to make efforts to improve the educational attainment and scientific literacy skills of students so that they are able to compete in the 21st century (Setiadi, 2013).

Measurement of scientific literacy is important to determine the level of scientific literacy of students in order to achieve high or good scientific literacy so that the quality of education in Indonesia can improve and be able to compete with other countries. Efforts to improve the quality of learning in schools to improve scientific literacy skills must of course be supported by accurate information about the extent to which students achieve scientific literacy. However, the level of scientific literacy ability is still rarely analyzed for several regions in Indonesia, such as in Bone Regency.

Based on pre-research observations from teachers and students, in this case the student council committee at a school in Bone Regency, namely SMAN 1 Bone, through telephone interviews on December 14, 2021, stated that SMAN 1 Bone already has a lot of science books. Apart from that, there is also a school literacy movement initiated by the Intra-School Student Organization (OSIS), although the orientation is still in the general field, so that scientific literacy is not yet clear. Students also do not know their scientific literacy abilities, because previously there was no specific measurement of students' scientific literacy in Biology learning.

The Biology teacher at SMA Negeri 1 Bone also said that the implementation of a literacy culture already existed in the 2013 curriculum, where students were given the opportunity to read 15 minutes before biology lessons started, but there was no specific measurement of whether scientific literacy was achieved or just reading. This condition indicates that it is necessary to make efforts to improve science learning in schools, especially in the field of biology gradually and continuously. Efforts to improve the quality of learning at the school level need to be supported by accurate information about the extent to which students' scientific literacy achievements are viewed from its aspects. Therefore scientific literacy tests need to be carried out to find out the extent to which students'

scientific literacy achievements are viewed from aspects of scientific literacy. Therefore, by looking at the exposure of the problem, the researchers took the initiative to study scientifically about "Analysis of Science Literacy Ability of Biology Learning Students at SMAN 1 Bone".

RESEARCH METHOD

This study aims to determine students' scientific literacy abilities in biology learning at SMAN 1 Bone. The research method used is a quantitative descriptive research method. The population of this study were all students of MIPA class at SMAN 1 Bone. The research sample consisted of 102 students of class XII MIPA SMAN 1 Bone with a saturation sampling technique, namely the technique of determining a sample when all members of the population are used as samples. The data collection technique was in the form of multiple choice test questions for students' scientific literacy abilities with a total of 30 questions.

Data analysis techniques in this study used descriptive statistical analysis. This descriptive statistical analysis aims to find out students' scientific literacy abilities by analyzing the data on the answers to the questions that have been given by giving a score of correct answers will get a score of 1, if wrong or not the answer is given a score of 0. The results of the calculation of the score are then categorized based on scientific literacy categories as follows:

Table 1. Science Literacy Category

Student scores > x + SD	High
x – SD ≤ Student scores ≤ x + SD	Moderate
Student scores < x - SD	Low

(Toharuddin, 2011)

RESULTS AND DISCUSSION
Results

Analysis Descriptive Science Literacy Ability of SMAN 1 Bone Students.

Based on the results of the descriptive analysis, the results of the statistical summary of the scientific literacy ability scores of the students of SMAN 1 Bone are as follows:

Table 2. Categorization of the Scientific Literacy Ability of Students of
SMAN 1 Bone

Category	Interval	Frequency	Percent (%)
High	N > 58	15	14.7
Moderate	$33 \leq N \leq 58$	79	77.4
Low	N < 33	8	7.9
Total		102	100.0

Based on Table 2, it was found that the Science Literacy ability of SMAN 1 Bone students as a whole is in the highest category moderate, with a frequency of 79 people and a percentage of 77.4%.
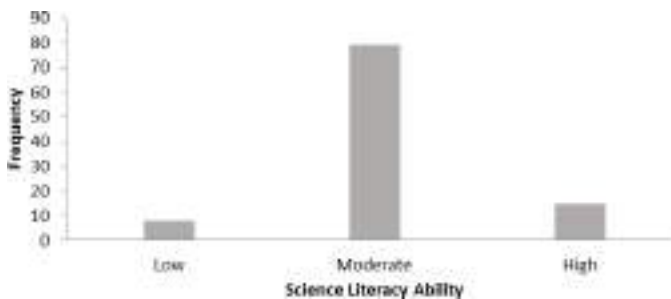
Figure 1. Diagram of Science Literacy Ability of SMAN 1 Bone Students

DISCUSSION

The highest scientific literacy ability of SMAN 1 Bone students is in the medium category with a correct percentage of 77.4%. This states that some students in Bone Regency are able to think rationally and scientifically to solve a problem they are facing. Following the results of other students' scientific literacy abilities, it is known that there are 7.9% of students whose scientific literacy abilities are in the low category, which means that students have not been able to use data and scientific evidence to evaluate the quality of information and scientific arguments. Furthermore, there are 14.7% of students whose scientific literacy skills are already in the high category. This indicates that some students understand how to manage their knowledge to solve various problems by making decisions based on scientific considerations.

Based on these data it can be seen that most students of SMAN 1 Bone have used their scientific thinking skills in making decisions. But on the other hand there are still students who do not have a good understanding of science concepts and processes. Based on these facts,

according to Panjaitan (2016) an understanding of science and technology is central to young people's readiness to live in modern society. This allows one to participate fully in a society where science and technology play an important role. An understanding of science and technology can also make a significant contribution to everyone's personal, social, professional and cultural life.

In line with that, according to research conducted by Rohman, Rusilowati, and Sulhadi (2017), the scientific literacy skills of high school students who are at moderate literacy ability indicate that students can already be prepared to take part in science learning in which there is a process of solving problems and the interaction of science with progress. technology and society. This certainly shows that even though the results of the scientific literacy skills of State High School students in Bone Regency are in the moderate category, it still needs to be improved further.

In general, learning biology in schools has directed students to be active in learning, but not optimally in improving students' scientific literacy abilities. Learning which is generally carried out in the classroom still applies the teacher center learning system. Teachers are more inclined to aim at completing material in accordance with curriculum objectives than mastering students' concepts with basic competencies that students must have. However, on the other hand, teachers at school have fulfilled their role as educators, namely they have been able to compile and develop learning tools as guidelines in implementing the learning process at school. This is one of the several roles of the teacher besides teaching which is also very important, especially in managing the teaching and learning process.

This is in line with Buchari's study (2018) which states that with regard to learning management, the teacher in his position as educator, teacher, and trainer is basically a manager. The teacher is the class manager. The success of learning depends on the teacher's ability to manage teaching and learning activities and interactions. Furthermore, based on Vygotsky's Zone of Proximal Development theory, as educators, teachers have a very strategic role in helping students to the fullest. Teacher assistance that is given appropriately and appropriately will really help the cognitive development and abilities of students (Saomah, 2017).

Furthermore, it is believed that the level of scientific literacy of students, who are on average in the medium category, is believed to be influenced by the learning model applied during learning. This is reinforced by the argument by Pratiwi, Cari and Aminah (2019), that in the 2013 curriculum it is clear that scientific literacy through scientific inquiry learning involves scientific processes and attitudes so that students are able to construct their own knowledge. The use of appropriate learning models

in accordance with the characteristics of teaching materials has also been recommended in the 2013 curriculum revision whose aim is to support learning that empowers scientific literacy skills.

CONCLUSION

Based on research that has been carried out on students of SMAN 1 Bone, it can be concluded that the scientific literacy ability of students of SMAN 1 Bone is at the highest in the medium category with a correct percentage of 77.4%. This states that some students in Bone Regency are able to think rationally and scientifically to solve a problem they are facing. Following the results of other students' scientific literacy abilities, it is known that there are 7.9% of students whose scientific literacy abilities are in the low category, which means that students have not been able to use data and scientific evidence to evaluate the quality of information and scientific arguments. Furthermore, there are 14.7% of students whose scientific literacy skills are already in the high category. This indicates that some students understand how to manage their knowledge to solve various problems by making decisions based on scientific considerations.

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Analysis of Coliform *Escherichia coli* Contamination on Single and Mixed Fruit of Apple *(Malus Domestica)* and Grape *(Vitis Vinifera)* from the Traditional Market and Fruit Stores in Makassar

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Abstract. This research is an descriptive study aimed at knowing if there is any coliform Escherichia coli on single and mixed fruit of apple (Malus domestica) and grapes (Vitis vinifera) from the traditional market and fruit stores in Makassar by using Most Probable Number (MPN) method with a three-tube retail series dan three replication. The result of the positive tubes were then matched by the MPN chart according to the SNI 2897:2008. The result of the research were samples on the single and mixed fruit of apple and grapes positive were contamination by Escherichia coli. The value of the MPN obtained at assessments > $1,1 \times 10^5$ MPN/mL on defined affirmation test have higher MPN value is $1,1 \times 10^5$ MPN/mL. The value of MPN produced does not qualify bacteriological requirement according to SNI 7388: 2009, where the maximum extent of microbial contamination in food is <20/g. Single fruit samples of apples and grapes from traditional markets had the same accumulation of 89% while mixed fruit were 85,20%. Samples of single fruit apples from fruit store had an accumulation of 85,20% and grapes 88,80% while mixed fruit was 81,50%. It can be concluded that there is coliform Escherichia coli contamination on single and mixed fruit from the traditional market and fruit store.The higher contamination was found in single fruit apples and grapes from traditional market.
Keywords: Coliform, Escherichia coli, Most Probable Number (MPN)

1. INTRODUCTION

Its tropical climate makes Indonesia a fruit-rich area. Fruit has long been recognized as a source of vitamins and minerals. The fruit's nutritive benefits are important for maintaining health. Nowadays, the majority of Indonesians consume fruit as juice or mix multiple fruits to suit their nutritional needs. The objective of processing and treating fruit as a liquid product is to improve time utilization by making it simpler for the digestive system to absorb both the juice and the nutritional value inherent in ingested fruits.

There are microbes in a variety of foodstuffs, such as solid food as well as liquid food. In the food-preparation process, many things can lead to contamination, such as unused knives, used water, and the processor's hands. Also, conditions in both traditional markets and fruit stores where fruit to purchase also contribute to the contamination of coliform bacteria.

Currently, one of the few things that people pay attention to is

whether consuming such processed fruit is truly sterile or free of contamination by bacteria. A lack of understanding of the contamination of the bacteria in processed fruit would also lead to a society that would continue to consume the fruits after mishandling. Bacteria are everywhere, and fruit can be a source of bacterial transmission that causes mild to severe illnesses.

Food and drink can cause disease because of two things: toxic components (heavy metals and toxic chemicals) and contaminated enough pathogenic microorganisms to produce disease (Lestari et al., 2015). More than 90% of the food-borne disease in humans is caused by microbiological contamination (Supardi and Armita, 2019). The World Health Organization defines food-borne diseases as "generally infectious or toxic diseases introduced into the body through digested food".

Coliforms are a group of bacteria that are used as an indicator of pollution, sewage, and poor sanitation conditions in water, food, milk, and dairy products. The existence of these coliform bacteria can be detected with microbiology tests using MPN methods. MPN is a microorganism method of enumeration that uses data from the growth of microorganisms in a specific liquid medium in a series of liquids planted by a solid or liquid sample planted by a number of samples or diluted according to the series of tubes, and thus results in a range of the number of microorganisms tested in a value of MPN/stream of volume or of sample mass (Sari and Pratiwi, 2014).

Escherichia coli is a living bacteria in the intestines of humans and animals. Generally, these bacteria are harmless and are an important part of a healthy human intestinal tract (Sumampouw, 2018). According to Rahayu et al. (2018), Escherichia coli is a gram-negative and basiliform bacteria with a size ranging from 1.0 to 1.5 micrometers x 2.0 to 6.0 micrometers, is not motile or motile with flagella, and can grow with or without oxygen, be free of anaerobic conditions, and endure nutrient-poor conditions.

Escherichia coli is transmitted via the citation line. Flexibility and adaptability make them very common in water, soil, and food. The use of raw sewage as fertilizer poses a high risk of bacterial contamination. Water and soil can be a source of fresh *E. coli* contamination. In most developing countries, including Indonesia, there is usually no adequate control or checking of *E. coli* levels in the market, including vegetables and fruit salads. This could cause harm, especially if people's consciousness on the matter is very low. Some publications report the presence of *E. coli* pathogens in fresh vegetables and fruits (Waturangi et al., 2019). The contamination of the fruit by microbes could be caused by sprinkling and

irrigation contaminated by microbes and the cultivation of animal dung (Suparman & Armita, 2019). Based on the SNI (2009) regarding the maximum extent of microbial contamination in food, the maximum limit of microbial contamination for fresh fruit <20/g.

2. RESEARCH METHODS

The research was carried out between October 2021 - June 2022. A sample was taken by taking a piece of fresh fruit from one of the traditional markets and a fruit store in Makassar. The data analysis in the study uses the formulas for assessments of MPN and percentage calculations for the accumulation of bacteria. Research conducted at the biology laboratory, Department of Mathematics and Natural Science, Universitas Negeri Makassar.

Apples used by 1 fruit and grapes by 3 are then washed with tap water. Then the fruit is rinsed using the sterile water before it enters the laminar air flow (LAF). Each fruit is cut with a sterilized knife and then weighed with a small analytic scale. As much as 20 grams of fruit were placed in 180 ml of sterile water. Puree fruit in a blender. After the sample is homogenized, it is transferred back into a sterile bottle, followed by the recombinant sample. The repulsion used was the introduction of a 3-tube series (333). 180 ml of sample taken by one ml and stuffed into a water bottle containing 9 ml of aquade is sterile for reducer 10^{-1}. Taking 1 ml to go, then 1 ml to the bottle deducer to get 1 ml, and the result of the 2 to take 1 ml (series a: 10 ml, series b: 1 ml, and series c: 0.1 ml).

a. Predictive Test

On day one, a series of nine test tubes prepared with 10 ml of LB medium were sterile, with a retail series of 10^{-1}, 10^{-2}, and 10^{-3}. At every counter are three canisters. The counters samples are fed in a series of tubes (3 10-ml tubes, 3 1-ml tubes, and 3 0.1-ml tubes per sample) into a reaction tube that contains about 10 ml (LB) of media release (with Durham), and then it is homogenized. Homogenized, incubated at 35^0C for 2x24 hours (positive if feculent and develops a gas in Durham), then observation was made.

b. Affirmation Test

After observations were made, positive tubes continued to be tested using EC broth. Using ose, each 44°C positive LB media tube was taken with 1-2 ose eyes and placed into a tube that contained EC broth (complete with the Durham tube). After that, it was incubated in an incubator for 2x24 hours (it was positively marked as turbid, and there was a gas in Durham).

Next, the MPN coliform is calculated and then matched on the chart of the coliform MPN.

c.   Completed Test

The test used an EMBA medium to isolate bacteria from a confirmed sample of E. coli. A positive sample of the affirmation test was taken using an ose and then scratched directly on the EMBA medium. Samples were incubated for 18 to 24 hours and then observed. Next, gram-positive pigmentation was developed to identify the E. coli that were obtained. Observations were made under the microscope with an enlargement of 100x.

3.   RESULT AND DISCUSSION

The MPN test consists of predictive tests, affirmation tests, and completed tests. The predictive test uses lactose broth. The study was intended to identify whether or not the coliform bacteria appeared on the tested sample, which was characterized by turbidity after the incubation process (Bitton, 2005).

The number of bacteria on the traditional market samples from the predictive test by using a Lactose broth medium and from affirmation test by using EC broth medium can be seen at Table 1.

Table 1.The number of bacteria sample markets in the test and the number of *E. coli* tests in affirmation tests

The Traditional Market Samples	Predictive test (LB)			Affirmation test (E.c Broth)		
	MPN value (MPN/mL)			MPN value (MPN/mL)		
	1	2	3	1	2	3
Apple	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$1,1 \times 10^5$
Grape	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$1,1, \times 10^5$	$0,29 \times 10^5$	$> 1,1 \times 10^5$	$0,46 \times 10^5$
Mixed	$> 1,1 \times 10^5$	$1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$1,1 \times 10^5$	$0,15 \times 10^5$

Table 1 shows the results of the number of bacteria that have contaminated the host by using lactose broth media and the number of *E. coli* tests that have been performed using EC broth media. In the analysis, studies showed samples of a single fruit and a mixture of apples and grapes from the traditional market were contaminated with bacteria. The lowest MPN value received is 1.1×10^5 MPN/ml, and the highest MPN value is $> 1.1 \times 10^5$ MPN/ml. At a affirmation test, the lowest MPN value is $0.15 \times$

10^5 MPN/ml and the highest MPN value is $> 1.1 \times 10^5$ MPN/ml. The number of bacteria in the fruit store samples from the predictive testing using Lactose broth medium and from affirmation test by using EC broth medium can be seen at Table 2.

Table 2.The number of fruit store samples at the predictive test and the number of *E. coli* tests at the affirmation tests

Fruit Store Samples	Predictive test (LB)			Affirmation test (E.c Broth)		
	Nilai MPN (MPN/mL)			Nilai MPN (MPN/mL)		
	1	2	3	1	2	3
Apple	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$1,1 \times 10^5$	$> 1,1 \times 10^5$
Grape	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$
Mixed	$> 1,1 \times 10^5$	$> 1,1 \times 10^5$	$0,46 \times 10^5$	$0,15 \times 10^5$	$0,46 \times 10^5$	$> 1,1 \times 10^5$

Table 2 shows the results of the number of bacteria that have contaminated the identification with the user's lactose broth and the number of *E. coli* tests that have been performed on the EC broth. Studies have shown that single fruit and grape samples from the fruit store are contaminated with bacteria. In the analysis, the lowest MPN test on the mixed sample is 0.46×10^5 MPN/ml, and the highest MPN value is $> 1.1 \times 10^5$ MPN/ml. At a affirmation test, the lowest MPN value is 0.15×10^5 MPN/ml and the highest MPN value is $> 1.1 \times 10^5$ MPN/ml.

According to the studies, after the sample was incubated at 37°C for 2x24 hours, there was a change in the apparently feculent reaction tube and a gas in the Durham. Feculent and the formation of gas in Durham are due to the process of lactose fermentation, which comes from a coliform bacterium. Lactose in the medium is a source of carbohydrates used by the bacteria for fermentation. The results of the testing after the sample was incubated at 44 °C for 2x24 hours showed a change in the seemingly feculent reaction tube and the buildup of gas in the Durham tube. That suggests that the fruit sample was positive for E. coli.

Based on the value of the MPN obtained, both single and mixed fruits from traditional markets and fruit stores unqualified bacteriological requirements. According to Indonesian national standardization 7388 (2009), the maximum extent of contamination by coliform E. coli in new fruit is <20/gr. Contamination of food with bacteria or other microorganisms may result from food borne environments, including dirty air and unsanitary hands.

Following that, a positive tube of fruit sample made with EC broth is supplemented by growing genus member bacteria Escherichia in EMBA medium, which is further identified by performing gram pigmentation and testing IMViC. EMBA media are selectively differential in growing E. coli because they contain eosines that inhibit the growth of gram-positive bacteria and can only grow gram-negative bacteria. Lactose, eosin, and methyl blue are capable of differentiating bacteria that are capable of fermenting lactose from those that are not. E. coli in EMBA medium has an iridescent blue-black color due to the large quantity of acid that is produced (Mansauda et al., 2014).

The results obtained on a supplementary basis from a single apple and grape sample from a tested positive EC broth (traditional market sample on single fruit) incubating at 37 °C for 18 to 24 hours, bacterial colony growing in EMBA medium does not produce a black blue with metallic green. The result of identification more leads to *Enterobacter* with a pink characteristic on the media of EMBA. It is likely that a growth of bacteria is a member of the Enterobacter aerogenes or another genus of bacteria that do not ferment the lactose and thus produce a negative E. coli result. The results from a single and mixed fruit of apples and grapes in a supplementary tube of positive EC broth (fruit store sample) are colonies of bacteria growing in the EMBA medium that produce the color of a metallic green colony that indicates a positive sample of the E. coli bacterium.

Based on a supplementation test using an EMBA medium, they were then enhanced by dyeing grams in order to identify more specific traits of the bacterium produced, which is *Escherichia coli*. Microscopic gram-pigmentation identifying the bacteria in grams of mixed fruit samples originating from traditional markets and samples of single fruits (apples and grapes) from the fruit store are bacteria with basil morphology, which indicate that bacteria belong to the gram-negative bacterium *E. coli*.

Observations of the indol test on single fruit samples and the mixture produced negative reactions. E. coli will form a red ring on the tryptone broth medium, but the results it gets don't change colors in the medium. The absence of color changes in the test can be due to bacteria not producing triptofan incisions as a source of carbon. According to Putri *et al.* (2016), the negative indol test results are due to bacteria producing indol that are unable to adequately react with dimethyl-the aminobenzaldehyde of the kovac reagent in order to produce red resinol compounds. While the indol test on the samples of single apples and grapes from the fruit store had positive results that were marked by a change in color in the media from clear to red rings, the results on the mixed fruit samples were

negative. The presence of *E. coli* in the methyl-red test is positive. Observations of the methyl-red test on single and mixed fruit samples (traditional market samples) show no medium change in color (yellow). While the samples of the single apple and the grapes from the fruit store had a red discoloration in the insulated bacteria, the mixed fruit samples had no change in color. The methyl-red test turns red at pH 4.4 and yellow at pH 6.2 (Sapitri and Intan, 2019).

The observations of the Voges-Proskauer test on single fruit samples and the mixture derived from both traditional markets and fruit shops are negative. According to Sapitri and Intan (2019), the voges-proscauer test of *E. coli* is negative because *E. coli* ferments carbohydrates into sour products and does not produce such neutral products as methyl carbonil (acetate).

The results of a citrate test taken on samples of a single fruit and a mixed fruit (the traditional market) are 10 positive samples and 1 negative sample. In the case of the single fruit and apple-mixed samples from the fruit store, 5 of the 15 positive E. coli in EMBA media samples tested did not change color (are negative). Isolated E. coli does not use citrate as a carbon source, so the test is negative for E. coli.

Table 3. Percentage of the increase in the number of bacteria positive *E. coli* in the EC broth media

E.c Broth Medium Samples		Positive (%)	Negative (%)
The Traditional Market	Apple	89	11
	Grape	89	11
	Mixed	85,20	15
Fruit Store	Apple	85,20	14,80
	Grape	88,80	11,10
	Mixed	81,50	18,50

The source. Primary data, 2022

The percentage of E. coli bacteria accumulated in single apple and grape samples from the traditional market was 89%, while the remaining 85.20% was mixed. A single apple sample from the fruit store had an accumulation of 85.20% and an 88.80% of the fruit at 81.50%. A sample of individual apples and grapes from the traditional market has a concentration of 89%.

4. CONCLUSION

Studies suggest that the *Escherichia coli* bacteria have been found to be contaminated by single fruits, apple-mixed fruits, and grapes from traditional markets and fruit stores in Makassar. Higher bacterial contamination is found in a sample of an apple and grape that come from a traditional market with an 89% cumulative percentage of bacteria.

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The Plankton Community in the Mariah Bandar Springs, Pematang Bandar District, Simalungun Regency

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Abstract. The plankton community in the Mariah Bandar springs, Pematang Bandar District, Simalungun Regency is the title of the research that has been carried out. Parameters measured are biological, physical, and chemical parameters. Biological samples, namely plankton, were taken using a plankton net, water samples to measure physical and chemical parameters were taken using dark colored sample bottles. The identification results obtained that the plankton community in Mariah Bandar spring consisted of Spirogyra setiformis, Spirogyra singularis, Spigogyra sp, Melosira sp, Fragillaria sp, Stigeoclonium sp, Aulacoseira sp, , Ilyocryptus sp , dan Synedra acus. The physical and chemical parameters are, the average temperature value is 27.30C, depth is 56.76 cm, BOD is 1.27 mg/L, pH is 5.6, dissolved oxygen is 3.8 mg/L, the substrate is sandy rock. Generally, the physical and chemical parameters still support the life of plankton in Mariah Bandar springs, only the pH is slightly alkaline.
Keywords: springs, plankton, parameters

INTRODUCTION

Plankton are small organisms that float in water and their movements are influenced by currents. Plankton in fresh waters has been widely carried out, such as in lakes, rivers or in dams or reservoirs, but in springs it is still lacking, such as in Mariah Bandar springs, no research results have been found. The upstream of the Mariah Bandar spring is still relatively natural with very clear and relatively calm water and the water keeps changing from the spring. The surrounding community utilizes Mariah Bandar springs for swimming. The parameters measured in this study were biological parameters, namely plankton, physical and chemical parameters, namely subtract bottom waters, temperature, depth, BOD_5, pH, and dissolved oxygen. Plankton samples were taken using net plankton, identification and calculations at the Unimed biology laboratory, water samples were taken using dark botle.

Identification of problems
1. Research on springs is still scanty.
2. Research on plankton in Mariah Bandar spring has not been found.
3. Mariah Bandar spring water is still natural.

Formulation of the problem
How is the Plankton community in the waters of the Mariah Bandar spring, Pematang Bandar sub-district, Simalungun Regency?

Research purposes

This study aims to determine the plankton community in Mariah Bandar springs, Pematang Bandar sub-district, Simalungun Regency.

LITERATURE REVIEW

Plankton

Plankton consists of phytoplankton and zooplankton that live in all waters but the species can be different and the movement of plankton is influenced by water currents. Aquatic ecosystems must have a balance of flow and circulation of energy in the lake's food chain, phytoplankton are the main producers in aquatic ecosystems. Phytoplankton has a high sensitivity to the environment, used as an indicator in ecological evaluatio (Kallfa *et al* ., 2014); (Gao, 2006). The changes characteristics of phytoplankton community structure, with analyzed the water quality of lakes, and the nutritional status of lakes was evaluated. The change of phytoplankton community structure is mainly affected by water temperature, pH, Secchi depth, Dissolved Oxygen (DO), and other hydrological conditions. The presence of fish and zooplankton in the waters is also one of the factors inhibiting the growth of phytoplankton (Wei *et al* 2020); (Miao *et al*., 2019); (Liu *et al*., 2010).

The aquatic plants can to improve water quality through direct or indirect effects and influence phytoplankton community structure together with the water environment (Zheng *et al*., 2022)

Chemical and Physical Parameters

The degree of acidity or pH. Aquatic organisms have tolerance limits that vary widely and are influenced by many factors on pH, including temperature, alkalinity, dissolved oxygen, the presence of anions and cations as well as various types of organismal stages (Pescod, 1973). Aulacoseria granulate is a type of diatom found in slightly alkaline waters at an average pH of 7.9 (Samudra *et al.*, 2013).

Biochemical Oxygen Demand (BOD$_5$)

The BOD value can indicate water quality, if the oxygen ranges from 10 mg/L-20 mg/L, it indicates a high level of organic pollution and for wastewater the BOD value can reach more than 100 mg/L. If the need for O_2 within 5 days is around 5 ml/L O_2, then the waters are considered good. (Brower *et al*., 1990).

Substrate (sediment). The type of sediment can determine the oxygen content and nutrient availability in the sediment. Sandy sediments have a relatively greater oxygen content than fine sediments, because in

sandy sediments there are air pores that allow easy mixing with water above the sediment, but little nutrients are found in sandy sediments.

The brightness of the water is inversely proportional to the turbidity of the water, this can also be influenced by weather, time of measurement, suspended solids and the level of accuracy of a person in researching and taking measurements. A good measurement is done when the weather is sunny.

Temperature.

Microorganisms have different tolerance limits to temperature, so they require different optimum temperatures. Every 10^0C increase in temperature will increase the O_2 consumption process. Phytoplankton assemblages are generally structured by physicochemical and biological variables within aquatic ecosystems (Dalu *et al*., 2022).

Mariah Bandar Springs

Springs are groundwater that comes out to reach the earth's surface, springs are water that is on the ground to be taken by excavation or natural emergence from the ground. The spring in Mariah Bandar village has a width of 20 meters and a length of 40 meters. Based on the environmental hue, this spring is divided into 3 parts, namely, at the source of the spring, in the middle, and before it flows into the river. For the environmental hue of each section, namely: 1. In the spring: This section is still covered by shady trees, as well as the surface of the water is clean and clear, because in this section is the source of the discharge of the spring, 2. Middle: in this section there are no trees that cover the water surface, 3. Before flowing into the river: the part that is open and exposed to sunlight. The waters of Mariah Bandar spring are still natural in which there are many mossy stones, as well as plants that grow thickly in the spring.

RESULTS AND DISCUSSION
Result

The plankton found in each replication during the study are presented in table 1.

Table 1. Plankton Found in Every Repetition
at Mariah Bandar Springs

Species	Number of Species			
	Test I	Test II	Test III	Test IV
1. *Spigogyra setiformis*			2	
2. *Spirogyra singularis*	1	2	1	

3. *Spirogyra sp*	4			
4. *Melosira sp*	1			
5. *Fragillaria sp*	5	3	1	1
6. *Stigeoclonium sp*				1
7. *Aulacoseira sp*		2		
8. *Ilyocryptus sp*		2		
9. *Synedra acus*		6	1	

Based on table 1 that *Fragillaria sp* was found in each sampling (replication). The number of each species found during the study can be presented in Figure 1.
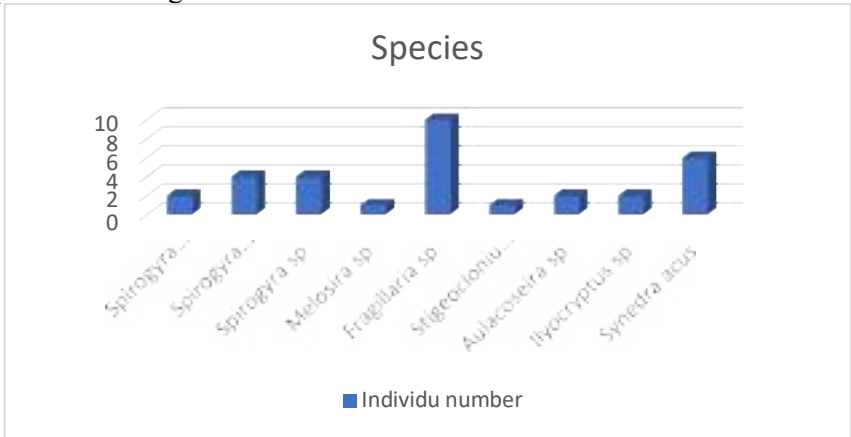
Figure 1. Number Of Each Species

Based on Figure 1 that *Fragillaria sp* was found the most.

Table 2. Physical and chemical parameters in Mariah Bandar Spring waters

No	Parameters	Test			Average
	Physical	I	II	III	
1	Temperature (^{0}C)	27.0	27.0	27.0	27.30
2	Dept (cm)	72	35	63.3	56.76
3	Transparancy (cm)	72	35	63.3	56.76
	Chemical				
4	pH	5.58	5.60	5.62	5.60
5	BOD (mg/L)	1.10	1.20	1.40	1.27
6	Disolved Oxygen (mg/L)	3.30	4.00	4.10	3.80

DISCUSSION

The plankton communities found in the waters of the Mariah Bandar spring include many. This can describe waters that are still not disturbed, especially for the type of phytoplankton that gets enough sunlight to photosynthesize because of the transparency of light to the bottom of the waters.

Fragillaria sp was found in all research sub-stations indicating that species was found in all research sub-stations indicating that the species is widely distributed the species is widely distributed. These diatoms are often abundant and sometimes dominant in freshwater benthic communities (Wetzel & Ector, 2015).

CONCLUSION

The plankton community in Mariah Bandar springs consisted of *Spirogyra setiformis*, *Spirogyra singularis*, *Spigogyra sp*, *Melosira sp*, *Fragillaria sp*, *Stigeoclonium sp*, *Aulacoseira sp*, , *Ilyocryptus sp* , dan *Synedra acus*. The physical and chemical parameters are, the average temperature value is 27.3^0C, depth is 56.76 cm, BOD_5 is 1.27 mg/L, pH is 5.6, dissolved oxygen is 3.8 mg/L, the substrate is sandy rock. Generally, the physical and chemical parameters still support the life of plankton in Mariah Bandar springs, only the pH is slightly alkaline.

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Higher Order Thingking Skill Students in Biology Learning at SMA Negeri 1 Kolaka

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Abstract. The importance of higher order thinking skills must be owned by students related to the rapid development of the 21st century which has an impact on the rapid development of science and technology. Environmental learning in the 21st century requires students to have higher order thinking skill.. The purpose of this research is to measure students ability to use higher order thinking skills assessment. The research method used in this study was a descriptive method with a total sample of 129 students, students of class XI MIPA SMA Negeri 1 Kolaka for the 2021/2022 academic year in biology subjects with the immune system material. Data collection in this study used test instruments totaling 10 essay items, documentation and interviews. The results of the research used are the learning outcomes test sheets in the form of skills tests that are in the realm of cognitive analysis, evaluation, and creation. Based on the test results obtained the average student score in the cognitive domain of analysis was 63.6% in the medium category, in the cognitive evaluation domain 62.1% in the medium category and in the cognitive creative domain 55.3% in the low category.
Keywords: Higher order thingking, biology learning

BACKGROUND

The importance of higher order thinking skills must be owned by students related to the rapid development of the 21st century which has an impact on the rapid development of science and technology. One of the abilities that must be provided to students to face global competitiveness is the ability to think at a higher level. try to solve it creatively. Higher-order thinking is needed by students to solve biology problems or other subjects in the 21st century. Low class activities that cause low higher order thinking skills in other students are in terms of planning or designing an activity such as practicum in the laboratory or in the environment.

Students higher order thinking skills are believed to be able to solve given biology problems. HOTS is a thinking process that requires students to manipulate existing information and ideas in a certain way to solve a problem they face and create something new (Anggraini, et al., 2018). Education are meaningful to expand interests, activities, collaboration and learning outcomes for students, because students are not empty glasses that must be filled from the outside. Students already have something. Little or much has developed (actualized). So this shows a knowledge that is one's awareness of what one actually knows and cognitive regulation is how one

manages one's activities effectively. Higher order thinking skills are important for understanding the learning concepts. Students in Jean Piaget's theory of development are at the formal operational stage. At the time of development, students have been able to think abstractly. This ability directs students to think at a higher level. Because these students have abstract thinking, students will need more complex thoughts in solving problems that are different from the examples that have been given. Higher order thinking skills have three measurable indicators, namely analyzing, evaluating, and creating. If these three indicators are present in students, students do not need to memorize formulas continuously and students already have high-order thinking skills that can solve problems that will be faced. So this shows that knowledge is one's awareness of what one actually knows and cognitive regulation is how one manages one's activities effectively.

Higher order thinking questions cover the taxonomic levels of analysis, evaluation and creation so that students can connect, manipulate and transform their knowledge. The ability to think at a higher order thingking is a skill for analyzing, assessing and creating some of the knowledge one has acquired. Higher order thingking intelligence is a skill in processing information, in order to be able to handle relatively large challenges (Nisak, 2021). Higher order thinking skills aim to make learning develop independently because it encourages students to become self managers, and to become independent because they encourage learning to become self-managers, and become judges of their own thinking and learning.

Higher thinking skills are indispensable for successful learning in the 21st century, considering that this allows students to be able to manage cognitive skills and be able to see or find weaknesses which will later be corrected with cognitive skills. Higher order thinking skills are important for understanding the learning concepts. Students in Jean Piaget's theory of development are at the formal operational stage. At the time of development, students have been able to think abstractly. This ability directs students to think at a higher level. Because these students have abstract thinking, students will need more complex thoughts in solving problems that are different from the examples that have been given. Higher order thinking skills have three measurable indicators, namely analyzing, evaluating, and creating. If these three indicators are present in students, students do not need to memorize formulas continuously and students already have highorder thinking skills that can solve problems that will be faced. So this shows that knowledge is one's awareness of what one actually knows and cognitive regulation is how one manages one's

activities effectively. Cognitive knowledge, contains declarative, procedural and conditional knowledge while cognitive regulation includes planning, monitoring, testing, repair and evaluation activities (Ramadhan, et al., 2018).

RESEARCH METHOD

Types of research
The type of research used is research with quantitative descriptive. Descriptive research was conducted using a way to find information related to symptoms that have occurred. This study used the HOTS question indicators to determine the high-order thinking skills of students in class XI SMA Negeri 1 Kolaka.

Research Subject
The population in this study were all class XI MIPA SMA Negeri 1 Kolaka, totaling 8 class in the even semester of the 2021/2022 academic year. The samples selected through this study used a simple random sampling technique through a drawing process, so the class selected were XI MIPA Galaxy, XI MIPA Matrix, XI MIPA Redox, XI Mipa Varietas. The research instrument was a questionnaire consisting of 10 items of immune system material, which were validated by 2 lecturers.

Data Analysis Technique
Quantitative data in the form of scores of higher order thinking skills. Quantitative data will be analyzed descriptively to determine trends in data or findings that will be used in drawing conclusions. Before the data is analyzed, the steps taken are:
a. Scoring

Scoring is determining the total score. Giving scores to students is carried out on the answers and arguments they write on the answer paper, giving scores from a scale of 0-4. To get the value of students high order thinking skills with the following formula:

$$\frac{\text{Total score obtained}}{\text{Total score maximum}} \times 100$$

The higher order thinking abilities of class XI MIPA students will be grouped based on the test results obtained. The following is a table of interpretations of the aspects of higher order thinking skills.

Table 1. Score criteria higher order thingking skill

Value	Criteria higher order thingking skill
81 - 100	Very good
61 - 80	Good
41- 60	Medium
21- 40	Low
0 – 20	Very low

(Based on Internasional *Center For The Assesment of Higher OrderThingking Skill*) To calculate student scores, it is determined by the following formula:

$$Y = \frac{Total\ score\ of\ achievement\ indicators}{Many\ students}$$

Description :
y = Average student achievement

To calculate the percentage of achievement of all students for each aspect of ability think at a higher level with the following formula:

$$Z = \frac{Average\ student\ achievement}{Maximum\ score\ of\ the\ indicator} \times 100$$

Description :
Z = Achievement percentage

To determine the percentage of students' HOTS absorption in solving questions, the following criteria are used:

$$Absorption = \frac{Total\ score\ student}{Total\ score\ ideal} \times 100$$

Table 2. Absorption percentage category

Value	Category
85%-100%	Very good
75%-84%	Good
60%-74%	Medium
40%-59%	Low
39%-0%	Very low

b. Presenting data, namely writing organized and categorized data sets so that it is possible to draw conclusions from the data.

c. Describe and draw conclusions from the data that has been collected.

Data collection

Techniques Data collection techniques carried out in this study consisted of test and non-test techniques, namely as follows:

a. Test

Data was collected using a test instrument through 10 item essay questions given to students which would produce data regarding students' scores in working on higher order thinking skills questions. These questions are based on material indicators for the even semester of the 2021/2022 school year, with the highest score of 4 and the lowest score of 0.

b. Interviews

Interviews are used for data collection techniques when conducting preliminary studies in order to find problems to be studied and also when researchers want to know things from respondents that are more in-depth (Yani, et al., 2018).

c. Documentation

Documentation is the part that supports the research data from the tests. The documentation includes the syllabus of the biology subject teacher from the school where the research was conducted which has been used in learning related to the material in the test tested by the researcher. This syllabus is used as a reference by researchers to adjust the material in making test instruments to be tested.

RESULT AND DISCUSSION

Higher order thinking as a transfer process in the learning context is to give birth tomeaningful learning, namely the ability of students to apply what they have learned to new situations without direction or instructions from educators or other people (Setiawati, et al., 2019). So based on research the average higher order thinking ability of SMA Negeri 1 Kolaka.

Table 3. Analysis the level of high order thinking skills of SMA Negeri 1
Kolaka students based on the scores for each level

statistics	Score									
	1	2	3	4	5	6	7	8	9	10
Minimum score	0	1	0	1	0	1	1	1	0	0
Maximum score	4	4	3	4	4	4	4	4	4	4
Total	314	342	261	331	324	318	316	308	312	339
Average	2,434	2,651	2,023	2,565	2,511	2,465	2,499	2,387	2,418	2,627
Percentage of questions	60,8%	66,2%	50,5%	64,1%	62,7%	61,6%	61,2%	59,4%	60,4%	65,6%

Higher order thinking as a process of critical thinking in the context
of learning is to form students who are able to think logically (reasonably),
be reflective, and make decisions independently. High-level thinking as a
problem-solving process is to make students able to solve real problems in
real life, which are generally unique so that the solving procedure is also
unique and not routine. Based on students high order thinking skills in
solving question number 1 on the analyzing aspect with an average of
2.434 and the percentage of question number 1 is 60.8% in the medium
category, question number 2 on the analyzing aspect with an average
namely 2.651 and the percentage of questions number 66.2% in the
medium category, number 3 in the creative aspect with an average of 2.023
and the percentage of questions number 3 50.5% in the low category,
number 4 in the evaluating aspect with the average is 2.565 and the
percentage of questions is 64.1% in the medium category, number 5 is in
the aspect of evaluating with an average of 2.511 and the percentage of
questions number 5 is 62.7% in the medium category, number 6 is in the
aspect of analysing. creative with an average of 2.387 and the percentage
of questions is 59.6% in the low category, number 9 is in the evaluation
aspect with an average of 2.418 and the percentage of questions number 8
is 60.4% in the medium category, number 10 is in the aspect of analyzing
with an average of 2.627 and the percentage of questions is 65.6% in the
medium category.

Table 4. Average higher order thingking skill students at SMA Negeri 1 Kolaka

Question level	Percentage	Category
Analyzing	63,6%	Medium
Evaluating	62,1%	Medium
Creative	55,3%	Low

The analysis indicator are a complex and gradual thinking process to find solutions in solving problems. To improve higher order thinking skills, there needs to be habituation through working on higher order thinking skill type questions in the learning process, analyzing is asking students to answer using the various sources of information they get then become a new sentence, namely an analysis. This needs to be trained in learning, for example students are used to discussing problems with their group mates to solve problems, the analytical thinking process requires the ability of students to specify aspects or elements, describe, organize, compare, and find implied meanings. In accordance with Karthwol's explanation that humans understand enough, to improve the cognitive of students increasing HOTS aspects of analyzing can be done by applying various methods, strategies, learning, how to analyze incoming information and divide it into smaller parts to recognize patterns of relationships as well as distinguishing causal factors from a problem (Ichsan, et al., 2019). Overall the percentage obtained from students on the analyzing indicator is 63.6% in the medium category. The high order thinking indicator analyzes the highest results compared to other indicators of 63.6% in the medium category.

Evaluating indicators are defined as making decisions based on standard criteria, the ability to determine the degree of something based on certain norms, criteria or standards. Overall, the percentage obtained from students' ability to answer the types of evaluating questions is obtained in the medium category with a percentage of 62.1%. According to evaluation, namely the ability that requires students to be able to evaluate a situation, situation, statement or concept based on certain criteria, give an assessment of an opinion, solution, problem and use the appropriate category to ensure its benefits. The important thing in this evaluation is to create conditions in such a way that students are able to develop criteria or benchmarks for evaluating something.

Evaluation provides various problems then students are asked to comment on the problems. In this case, of course, students do not only give

comments without basis but must be based on facts. train students in the evaluation aspect by giving problems to students and are required to evaluate, suspect the causes of problems and steps to solve problems. As well as students are accustomed to carrying out practicums so that students are required to reject or accept the truth of a theory in accordance with a definite reality Students are asked to provide criticism of the behavior and attitudes of people who do not care about the immune system After providing evaluations and criticism, students must provide conclusions about attitudes and efforts to solve the given problem. In this evaluation activity, students are trained to dare to comment based on existing data, so that students are trained in their ability to argue (Ichsan, et al., 2019). This is in accordance with research by Gais & Afriansyah (2017) based on research on HOTS based bloom taxonomic indicators in class X students at SMAN 1 Garut showing the percentage of mastery of concepts based on mastery indicators, namely evaluating 67.59% in the medium category.

The indicator of creating questions requires the ability to develop new problem solving strategies. Overall the percentage obtained from the ability of students to answer creative types of questions was found to be in the low category with a percentage of 55.3%. This happens because students have not been able to retrieve information on the questions and do not understand the questions properly, because this ability is not only a way of thinking in memorizing. Higher-order thinking requires someone to do something based on facts and place it in a new way so that they are able to find a solution to a problem (Nugroho, 2019). This is in accordance with research conducted by Irmayanti (2018), obtaining the lowest percentage of 50% on the creative indicator with the sub-indicator making generalizations of an idea or perspective on something with a very poor category. This happens because in the learning process students are less active so that the ability to argue is also lacking so that it cannot stimulate students' thinking abilities.

One of the causes of Indonesia's low score is that students in Indonesia are still lacking in training in dealing with questions that require reasoning and argumentation in solving them. Based on Hariyatmi's research, et al (2021) states that in solving problems, most students are still in the stages of remembering, understanding, and applying, and only a few students have reached problem solving with the stages of analysis, evaluation and creation.

CONCLUSION

Based on the results of the research and discussion that have been presented, it can be concluded that the ability of students in SMA Negeri 1 Kolaka in solving HOTS questions based on test results obtained by the average score of students in the cognitive domain of analysis is 63.6% with a medium category, in the cognitive domain. evaluation of 62.1% in the medium category and in the cognitive domain 55.3% in the low category.

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Analysis of the Need For Development of E-Book Weed Plants as a Student Learning Source

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Abstract. This research is the result of needs analysis of weed plant e-books as a source of student learning. The purpose of this study is to determine the needs of students for the e-book that will be developed. The method used is a research and development (R&D) method. The research subjects are 2 teachers of the basics of plant cultivation and 30 students of class X UPT SMKN 3 Sidrap. The data collection technique used is the survey method, the research instrument used is a questionnaire. The data analysis used is by reducing the data into more specific data to be presented descriptively. The results of the analysis of the needs of teachers and students on the development of weed plant e-books as a source of student learning are needed to develop e-books, especially weed plant material to support the learning process in terms of weed plants.
Keywords: E-book, Learning Resources, Weeds

INTRODUCTION

Education is the right tool to build the Indonesian nation, through education students will be equipped with various kinds of knowledge and knowledge to prepare themselves to face various problems. Education that is declared successful will be born a generation that is smart and able to apply its various scientific provisions to build a better Indonesian nation. The success of education is determined by many things, one of which is the learning system. The learning system is a system that has interrelationships between the components in it. Components of the learning system include students, learning objectives, learning environment conditions, learning resources, and learning outcomes. If one component of some of these components is not met, it will interfere with other components of the learning system, so that education becomes less successful.

Teachers as educators are figures who are directly responsible for improving the quality of an education through improving the learning they manage. There are many things that can be done by teachers such as the application of various media, models, learning resources, as well as evaluation systems and others. In addition to applying, teachers are also expected to develop a product that can later be applied in the learning process. The product of the research results made by the teacher will

certainly be more meaningful because it will correspond to the problems they face (Azrai & Refirman, 2013).

The application of information and communication technology has spread throughout the world including Indonesia. This is a platform for a world of education to improve the quality of education. The use of wise and good technology can improve a quality in the world of education and can change the learning process that is seen today as just delivering material or monotonously. Therefore, an innovation or development is needed in the learning process activities by holding innovative learning resources in order to attract the attention of students so that they are liked to avoid feeling bored and bored during the learning process. According to Prayoga,(2018). Learning by inserting technology in it will have a positive impact where seeing in modern times students are very familiar with the name technology, maybe they can't live even if it's just a day without using technology. In addition, sometimes learners' understanding of technology is much more understanding. If it is like that, students must be more enthusiastic in the teaching and learning process.

The implementation of the application of technology in the learning process is in accordance with the objectives of the 2013 curriculum in "permendikbud number 37 of 2018, that to meet the basic needs of students in developing their abilities in the digital era, it is necessary to add and integrate informatics content in the basic competencies in the basic framework and structure of the 2013 curriculum at the basic education and secondary education levels.

Learning resources are everything that can be utilized by students to learn materials and learning experiences in accordance with the goals to be achieved (Sanjaya, 2008). Based on the use of learning resources, Abdullah (2012) stated that teaching staff have a responsibility to help their students to learn and to make learning easier, more interesting, more directed, and more enjoyable. Thus, teaching staff are required to have various special abilities related to learning resources. The following are some of the abilities of teaching staff, such as: (1) using learning resources in daily teaching activities (2) introducing and presenting learning resources (3) explaining the role of various learning resources in the learning process (4) compiling tasks for the use of learning resources in the form of behavior (5) looking for materials from various sources by themselves.

One of the learning resources that can be used is e-books. E-book is a textbook in the form of electronic format, where its use is presented through computer media and in preparing it requires adequate supporting knowledge and skills, especially in operating equipment such as computers (Febriati & Budiono, 2013). The e-book component consists of two main

components, namely the reader device and software. A reader device is a device in the form of hardware used to read files, which can be a laptop. While software is in the form of software that plays a role in displaying e-books on a computer screen. Teaching materials provided in the form of electronic text are also important, whether available in word form or text-based documents (Portable Document File) PDF that can be accessed and the provision is quite efficient (Ilmi,2017). The procurement of textbooks is one of the learning resources that is not only limited to printed books, but already exists in the form of digital books in electronic form commonly known as e-books (electronic books). E-book is a digital book that contains information that can be in the form of text and images that can be applied using Android. E-books have the advantage of files that do not require a large storage area (Yunita & Hamdi, 2019). The development of e-books will be better and attract students' reading interest if the e-book is developed according to the needs of students in order to understand a lesson. A good learning resource is that it should be able to make it easier for students to understand learning material because it plays an important role in learning that can help smooth student learning in the learning process and can also add new insights to students (Vitrianingsih et al., 2021).

METHODS

This research was conducted in February 2021 using the survey method. The subjects of the study consisted of 2 teachers of the basics of plant cultivation and 30 students of UPT SMKN 3 Sidrap. The research instrument used in the analysis of teacher and student needs is in the form of a questionnaire for the analysis of teacher and student needs for the e-book developed. The data collection process was carried out by distributing questionnaire sheets to 2 teachers of basic plant cultivation subjects and 30 students. The purpose of this needs analysis is to find out and analyze the needs of student teachers and overcome the problems found

Data analysis in this study was carried out by reducing the data obtained from the survey results. The research data obtained are then presented descriptively so as to produce research conclusions regarding the need for developing learning resources in the form of weed plant e-books as student learning resources

RESULTS AND DISCUSSION

Data analysis in the research conducted by outlining the needs of teachers and students for the development of learning resources in the form of e-books (eletkronic books) that can support learning the basics of plant

cultivation, especially weed plant material. The results of the needs analysis are a basic reference for the development of learning resources in the form of e-books. The needs analysis was carried out by providing questionnaires to teachers of the basics of crop cultivation and students in class X. The results of the analysis of teacher blindness towards the development of e-books can be seen in Table 1.1

Table 1.1 Results of Teacher Needs Analysis of the Development of Weed Plant E-books as Learning Resources

No	Question	Answer			
		Yes	Percentage	No	Percentage
1.	Do you think that learning the basics of plant cultivation has been taught well?	1	50%	1	50%
2.	According to you, are there any obstacles taught when providing material on the Basics of Plant Cultivation (especially on weed material)	2	100%	-	-
3.	Are the learning resources used at this time sufficiently supportive of the learning process?	-	-	2	100%
4.	Do you use a handbook as a learning resource to explain weed material?	2	100%	-	-
5.	According to you, do the learning resources that are being used support the needs of students in understanding the material?	-	-	2	100%
6	Are there any other learning resources that you use as a reference in teaching weed material?	2	100%	-	-
7	Have you ever used learning resources in the form of electronic books (e-books)?	1	50%	1	50%
8	Have you ever made a learning resource in the form of an electronic book (e-book)?	-	-	2	100%
9	According to you, is the current procurement of electronic books (e-books, especially weed material, necessary?	2	100%	-	-
10	Do you agree that learning resources are developed in the form of electronic books (e-books) as one of the learning resources to support	2	100%	-	-

No	Question	Answer			
		Yes	Percentage	No	Percentage
	learning activities, especially weed material?				

The results of the analysis of Table 1.1 explain that generally the learning of the basics of plant cultivation, especially weed material, has not been taught optimally because there are several obstacles in teaching such as the lack of learning resources provided to students because the learning resources used during the learning process only use printed books and the lack of exposure in the form of examples accompanied by pictures, making it difficult for students to know the material and There are only a few other references apart from printed books owned by teachers as a handbook in the learning process, so that when during the learning process, the books used have not supported the needs of students in understanding the material, especially weeds.In the use of learning resources in the form of electronic books (e-books) still 50% of teachers have used learning resources in the form of e-books during the learning process, but in making learning resources the e-book itself has never been done by the teacher. So that the procurement of electronic books today, especially weed plant materials, is very necessary

The usefulness of procuring the e-book can make it easier for teachers as well as in providing material for a lesson, students can use the e-book anywhere and anytime so that the learning process continues to take place properly. This is as stated by (Juniarti & Gustiana, 2019) that education carried out in schools and universities in the future with the passage of time will continue to undergo changes. The changes in question are one of the advances in information and communication technology (ICT) which is one of the factors of change in the education system in Indonesia. Technology has a very important role in the educational process and contributes to the development of the world of education. In addition, these changes also include educators who hope that in the future a teacher can develop a learning resource that can be used both outside the classroom and in the classroom so that there are the latest innovations in the teaching and learning process. In addition, students in the learning process can not only interact with the teacher, namely as one of the learning resources but also can interact with all learning resources, one example by observing those in the surrounding environment that may be used to obtain the results to be achieved, therefore to support learning activities, students need learning resources in order to understand learning (Malina et al., 2021)

Based on this, it is necessary to develop an e-book as a learning resource to support learning, especially in weed material. There is a development in the form of an e-book in addition to adding references to teachers in the learning process as teachers and students as e-book users to add insight into weed plant material. E-books that can attract students' attention are useful for arousing students' learning passion in terms of understanding the material

Table 1.2 Results of Student Needs Analysis of the Development of Weed Plant E-books as Student Learning Resources

No	Question	Answer			
		Yes	Percentage	No	Percentage
1.	Do you think learning the Basics of Plant Cultivation is difficult to learn?	22	73,33%	8	26,66%
2.	In learning the Basics of Plant Cultivation is there a handbook that you have?	15	50%	15	50%
3.	Do you have difficulty in understanding the material in particular weeds?	23	76,66%	7	23,33%
4.	Do the learning resources you are currently using support your needs in understanding the material?	10	33,33%	20	66,66%
5.	Are there any other learning resources you use in studying weed material?	19	63,33%	11	36,67%
6.	Do you think presenting the material by adding images can help you understand a learning material?	24	80%	6	20%
7.	Are the learning resources used today easy to understand?	5	16,67%	25	83,33%
8.	Do you need learning resources such as e-books to make it easier to understand the material?	23	76,66%	7	23,33%
9.	Do you think learning resources like e-books are appropriate to use today?	26	86,67%	4	13,33%

No	Question	Answer			
		Yes	Percentage	No	Percentage
10.	Do you agree if a learning resource is developed in the form of an e-book as one of the learning resources to support learning activities, especially weed material?	25	83,33%	5	16,66%

Based on the results of the analysis of student needs for the development of weed plant e-books in Table 1.2, it can be explained that learning the basics of plant cultivation is generally still difficult for students to learn because of the lack of learning resources and an average of 50% of students who only hold handbooks such as printed books in the learning process because during the online learning process not all students come to school to pick up their printed books at school so these things make students do not understand the material, especially weed plants. This has an impact on students' understanding if learning resources are still not obtained by students. In addition, an interesting learning resource for students is the presentation of material by adding pictures in several explanations of a material to make it easier for students to better understand the material, because according to the results of the analysis above, it shows that 83.33% stated that the learning resources used today are handbooks found in schools that are not easily understood by students, one of the reasons is because the learning resources used today are lacking interesting and does not arouse students' curiosity about a material, therefore students agree that an e-book is developed as a learning resource, especially in weed material.

The learning resources in the form of e-books have their own character compared to printed books, one of the characteristics of e-books is that they allow others to learn independently and not depend on other parties (self-instruction), all learning materials needed are contained in e-books (self-contained), do not have to be used together with other teaching materials (stand alone), and have high adaptability to the development of science and technology and the exposure of information that appears is helpful and friendly to the wearer (Yunita & Hamdi, 2019). The advantage of e-books over printed books is that they can be accessed online and minimize costs, and portability. E-books are usually published in digital form which contains writings and images that can be accessed through digital electronic devices such as mobile phones. E-books can be saved in specific formats and are easily accessible on digital devices (Wulandari et

al., 2019)

Based on this, it is necessary to develop learning resources in the form of e-books as one of the learning resources to support learning process activities and add insight for students to be able to find out scientific information that has not been obtained before. The positive impact of learning resources in electronic form is that they provide convenience in accessing materials so that learning becomes more effective and efficient, one of the applications of technology in the world of education is e-books as student learning resources. (Abarca, 2020).

CONCLUSION

The results of the needs analysis which is the first step in the development of weed plant e-books as student learning resources can be concluded that teachers and students at UPT SMKN 3 Sidrap show that they need learning resources other than printed books that are handles that have been provided for the learning process. Teachers and students agree that if learning resources are developed in the form of e-books in order to support learning materials, especially weed plant materials, so that the development of weed plant e-books as student learning resources does need to be developed to support the learning process in the future.

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The Effectiveness of Adding Seaweed to Feed in Reducing Fat and Cholesterol Levels in Broiler Chickens

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Abstract. This study aims to determine the effectiveness of adding seaweed to feed in reducing fat and cholesterol levels in broiler chickens. This type of research is experimental. This research method used a completely randomized design (CRD) consisting of 4 treatments with three replications. The treatments given were Ration without the addition of seaweed (K), R1 (Ration with the addition of seaweed 7 %), R2 (Ration with the addition of 9% seaweed), and R3 (Ration with the addition of 11%). The parameters observed were a decrease in meat fat content, a decrease in cholesterol levels, and the live weight of broiler chickens. Fat content was measured using the Soxhlet method, and cholesterol levels were measured using the Esey Touch GCU. The data analysis technique used is the Analysis of Variance (ANOVA) at the confidence level = 0.05; if the ANOVA results show a significant difference, proceed with Duncan's further test. The results showed that adding seaweed to the feed reduced broiler chickens' fat and cholesterol levels. Treatment with the addition of 7% seaweed reduced the fat content of the meat and cholesterol levels in broiler chickens and did not reduce the live weight of broiler chickens. Meanwhile, the 9% and 11% treatments reduced meat fat content, cholesterol levels, and reduced live weight of broiler chickens. So it can be concluded that the addition of 7% seaweed proved effective in reducing broiler chickens' fat and cholesterol levels.
Keywords: Seaweed, Fat, Cholesterol

INTRODUCTION

The death rate in the world due to excess fat and cholesterol is increasing every year. One of the reasons for this is that many foods consumed by the public contain high levels of fat and cholesterol, causing heart disease, stroke, hypertension, and obesity. This must be addressed gradually because the disease does not appear spontaneously or quickly but gradually, so the reaction will be seen when it has accumulated. Fat and cholesterol are mostly from meaty foods such as beef, goat, shrimp, fish, and chicken.

Cholesterol is a fatty substance made in the liver and saturated fat obtained from food. If the level is too high, the cholesterol level in the blood will increase, which can cause the risk of coronary artery disease (Mahardika, 2017). Meanwhile, fat is an important energy source for the body to carry out daily activities. However, if the fat in the body is too high, it will cause obesity which in turn will cause various diseases

(Santika, 2016). The death toll in the world due to excess fat and cholesterol is increasing every year. High cholesterol is a condition of total cholesterol levels of 190 mg/dL or more in the blood (Kemenkes RI, 2017). Increased cholesterol levels cause 2.6 million deaths and 29.7 million disabilities yearly (Subanrate et al., 2019). In Indonesia, the number of high cholesterol sufferers in 2016 recorded at the integrated PTM coaching post and puskesmas that use the PTM surveillance information system totals 52.3% of the people who suffer from high cholesterol with 48% male sufferers while 54.3% female (Ministry of Health). RI, 2017).

Broiler chickens are superior breeds with high genetic characteristics, especially in growth. The development of broiler breeders is rapid because it has many advantages ranging from fast growth to much-loved, so the demand is great (Tumbal et al., 2020). Children, teenagers, and adults like to eat chicken, especially broiler chicken because it has affordable prices, soft meat, large size, dense, filled, and can be processed as meatballs, crispy chicken, and foods with other main ingredients of chicken meat. In addition, broilers have great business potential, so they can empower and reduce unemployment in Indonesia. But in addition to the advantages, broiler chickens also have weaknesses.

Broiler chickens have several weaknesses, namely high fat and cholesterol levels in the meat, especially in the thighs, which can cause many diseases such as coronary heart disease, stroke, and hypertension. The fat content of normal broiler chicken is 1.15%, water content is 75.24%, protein is 22.92%, and ash content is 1.145% (Rukmini et al., 2019). According to Ismoyowati and Titin (2003), chicken thigh meat has a higher fat content than breast meat. Meanwhile, broilers have HDL cholesterol content of more than 22 mg/dl; normal LDL levels should be less than 130 mg/dl. (Basmacioglu and Ergul, 2005). According to Erwan et al. (2007), normal cholesterol in good broiler chickens is 200-232 mg/dL, while according to Hasibuan (2021), normal cholesterol is 52-140 mg/dL.

Coronary heart disease can be caused by high cholesterol in the body, usually due to foods such as meat. Hypertension occurs due to high fat. If the fat consumed or enters the body increases, the blood will automatically be filled with fat, so blood pressure increases. This fat can also cause diabetes if it accumulates because it will slow down the work of insulin so that sugar levels in the blood increase. The occurrence of hypertension and diabetes is the cause of stroke (Ngitung et al., 2020).

Many things have been done to reduce the consumption of foods containing sources of saturated fat and cholesterol because these sources of fat and cholesterol can lead to heart disease, obesity, stroke, and

hypertension, especially those contained in broiler chicken which is currently very booming among the general public. Because of this problem, many people avoid foods containing high fat and cholesterol, while those who do not avoid these foods will have a greater risk of developing this deadly disease.

The high fat and cholesterol in broiler chickens are due to the feed given in the form of rations that contain high fat and cholesterol content. This feed will stimulate broiler chickens to grow quickly with thick meat rich in fat and cholesterol. Ways that can be done to reduce fat and cholesterol levels in chickens are by manipulating broiler chicken feed (rations) specifically through the gastrointestinal system approach, namely fat and cholesterol can be removed through excreta with the addition of fiber feed to the Ration. The fiber in the digestive tract of chickens binds most of the bile salts to be excreted through excreta, so the body needs to synthesize bile salts from body cholesterol so that cholesterol in the body is reduced (Ngitung et al., 2020).

Seaweed has a lot of nutrients and a high fiber content. Several studies have proven that seaweed containing alginate, agar, and carrageenan influences reducing plasma cholesterol levels. This agar component can help lower blood cholesterol levels by up to 39% (Ren et al., 1994). On the other hand, the alginate component has a high potential to inhibit cholesterol absorption in the intestine to reduce cholesterol levels in the body (Astawan et al., 2005). However, adding seaweed to this feed is still considered fat, and cholesterol is not lost in the meat but only reduced. According to Ngitung et al. (2017), seaweed can reduce fat and cholesterol levels in broiler chickens with the highest concentration of addition of 7% seaweed, which is significantly proven to affect cholesterol and fat levels in broiler meat.

Based on the results of earlier research using seaweed as a feed additive for broiler chickens, seaweed can reduce fat and cholesterol levels in broiler chickens. In this study, the concentrations used to reduce fat and cholesterol levels were 7%, 9%, and 11%. Therefore, this study was conducted to determine the effectiveness of adding seaweed to feed in reducing fat and cholesterol levels in broiler chickens.

METHOD
Research Place and Design
This research is experimental research conducted in June – August 2022. The maintenance and observation phase is carried out in Bulukumba Regency, Balleagging Village. The measurement of the fat content of the meat was carried out at the Animal Husbandry Integrated Biotechnology

Laboratory, Hasanuddin University, and the measurement of blood serum cholesterol levels was carried out independently at the rearing place. The research design used in this study was a completely randomized (CRD), consisting of 4 treatments and three replications to obtain 12 treatment combinations.

Experimental and Treatment Unit
The experimental unit used in this study was broiler chickens aged 17 days who were healthy and had no different body weights. The treatment unit used was one control group and three experimental groups. The control group (K) feeds broiler chickens without using seaweed, which is used as a measure/comparison with broiler chickens fed with the addition of seaweed. There were three experimental groups, namely R1: 7% of seaweed, R2: 9% of seaweed, and R3: 11% of seaweed.

Tools and materials
The tools used in this study were a basin, knife, bucket, 12-unit cage, ration box, drinking water container, scales, blender, Esey Touch GCU, desiccator, oven, soxchlet, boiling flask, ballast, stirring rod, 250 ml glass beaker. , condenser, heater, pipette, and syringe. The materials used in this study were seaweed waste, broiler chicken feed, light bulbs, broiler chickens aged 17 days, hexane, and 70% alcohol.

Data Collection Technique
Data were obtained by measuring fat content using the Soxhlet extraction method to determine the difference in fat content of broiler chickens that were fed with the addition of seaweed and those that were not fed with the addition of seaweed. In addition, chicken blood cholesterol levels were measured using a cholesterol test kit (Esey Touch GCU) to determine the percentage increase or decrease in broiler cholesterol levels and to compare broiler chickens fed with seaweed and those not fed with seaweed. Finally, the average value of the three replications in each treatment group was used as raw data.

Data analysis technique
Data processing was carried out using the Analysis of Variance (ANOVA) technique at a confidence level of = 0.05 if the ANOVA results showed a significant difference, then continued with Duncan's further test.

RESULTS AND DISCUSSION

The data were statistically tested for One Way Analysis of Variances (ANOVA) using SPSS, followed by Duncan's test with a confidence level of = 0.05. The study's results showed that adding seaweed to the diet on cholesterol had a significant effect (0.016<0.05) on blood cholesterol levels in broiler chickens. So it can be said that adding seaweed to broiler chicken rations significantly affects broiler chicken cholesterol.

Table 1. SPSS Results of Average and SD Data on Broiler Chicken Blood Cholesterol Levels (mg/dL)

Treatment	Cholesterol (mg/dL)	
	Initial	Final
K	255.00 ± 4.00^c	243.67 ± 6.80^c
R1	236.67 ± 23.96^c	196.67 ± 3.21^a
R2	223.67 ± 25.54^c	205.67 ± 31.94^a
R3	251.67 ± 20.20^c	218.00 ± 17.34^{ac}

Note:
1. Different superscript letters in the same column show significant differences. However, the same letters in the same column indicate no significant difference between each treatment based on Duncan's test at the confidence level = 0.05.
2. Different superscript letters on the same line show significant differences. However, the letters on the same line show no significant differences in initial and final cholesterol levels based on Duncan's test at a confidence level of = 0.05.

Based on the study's results, it was shown that the addition of seaweed to the Ration of fat had a significant effect (0.24 <0.05) on the fat content of broiler breast meat. So it can be said that there is a significant effect of the addition of seaweed to broiler chicken rations on the fattening of broiler chicken meat.

Table 2. SPSS Results Average and Standard Deviation of Broiler Chicken Meat Fat Content (%)

Treatment	Fat (%)	
	Thigh	Keel
K	2.71 + 0.17b	1.66 + 0.34b
R1	1.92 + 0.77b	0.94 + 0.03a
R2	1.68 + 0.12a	1.16 + 0.13a

Treatment	Fat (%)	
	Thigh	Keel
R3	1.70 + 0.58a	1.02 + 0.29a

Note: Different superscript letters in the same column show significant differences, and the same letters in the same column indicate no significant differences based on Duncan's test at the confidence level = 0.05.

The results of the One Way Analysis of Variance (ANOVA) statistical test for initial data showed that the average thigh fat had a significance (P>0.05) which meant that the average thigh fat of broiler chickens did not show a significant difference between each treatment. However, it can be seen that the treatment of broiler chickens with the addition of seaweed to the Ration of thigh fat content was lower than the treatment without the addition of seaweed to the Ration.

The results of the statistical test One Way Analysis of Variance (ANOVA) initial data showed that the average broiler breast fat had a significance (P < 0.05), which means that the average breast fat of broiler chickens showed a significant difference. The difference in data on average broiler breast fat in treatments R1, R2, and R3 was significantly different from treatment K.

Based on the results of statistical analysis, it can be concluded that the best treatment for reducing fat and cholesterol levels in broiler chickens is the treatment with the addition of seaweed 7% (R1) because this treatment reduces fat and cholesterol levels without significantly affecting the live weight of broiler chickens.

Decreased cholesterol levels occurred in each treatment, including control, because the amount of feed consumed by broilers was different. It is known that the R1 treatment showed the greatest decrease compared to other treatments, and the most effective in reducing broiler cholesterol levels was the R1 treatment seen from the average range of normal cholesterol levels of broiler chickens and the live weight of broiler chickens. The average final blood cholesterol level of broiler chickens was significantly different (p<0.05), meaning there was a significant difference between the control treatment and the addition of seaweed, according to Setyaji and Mulyati's (2013) finding that fiber can lower blood cholesterol levels by more than 5%; this is because the fiber in the digestive tract can bind bile salts, resulting in feces.

The increase in the excretion of cholesterol in the feces causes the amount of cholesterol that goes to the liver to decrease so that cholesterol uptake in the blood increases, which will be synthesized into bile acids.

According to Sinulingga (2020), this decrease occurred due to the mechanism of water-soluble fiber fermentation by the small intestinal microflora, which in turn would modify the production of short-chain fatty acids, thereby reducing acetate levels and increasing propionate synthesis. So it will reduce the endogenous synthesis of cholesterol and free fatty acids.

The results obtained were blood cholesterol levels of broiler chickens in the control treatment were significantly different from the R1 and R2 treatments, while the R3 treatments were not significantly different from the controls; this is because seaweed will stabilize cholesterol levels in the blood so that cholesterol is not too low or high. So increasing seaweed waste (Gracillari sp.) to 11% in the Ration reduces cholesterol levels.

In the SPSS results, the average fat content of broiler thigh meat was not significantly different (P > 0.05); this happened because the amount of feed consumed in treatment K and treatment R1 was more than that of treatment R2 and R3, where the amount of feed consumed by broiler chickens in this treatment was almost uniform. Following Ngitung et al. (2017), namely that air temperature greatly affects the ability of chickens to absorb nutrients; namely, if the temperature is high, the heat needed by chickens for body temperature defense is reduced so that chickens will reduce ration consumption. According to Ismoyowati and Titin (2003), chicken thigh meat has a higher fat content than breast meat.

In the SPSS results, the average fat content of broiler breast meat was significantly different (P < 0.05). It happened because of the addition of seaweed waste to the Ration, so the composition of the nutrients contained in the Ration consumed by each treatment was different. The low-fat content of broiler chicken treated with R1 was due to reduced absorption of fatty acids from the Ration, and the appetite of the chickens was also reduced because the constant temperature was difficult to provide. Accordance to Ngitung et al. (2017), the low levels of meat fat in broiler chickens with the addition of seaweed treatment to the Ration because the absorption of fatty acids from the Ration is reduced by the addition of seaweed which is rich in fiber and good for the growth of broiler chickens.

Seaweed significantly affects the live weight of broiler chickens, following Cristiani's (2019) research that seaweed with high content of carotene and fiber can increase gastrointestinal viscosity, thereby inhibiting the absorption of lipids and carbohydrates in the intestine. In addition, carrageenan can also form colloid ions and reduce serum lipid levels by inhibiting lipid absorption. According to Wahyu (1997), rations with the addition of seaweed have a high fiber content so that the

absorption of other food substances will decrease so that the Ration cannot be fully digested, causing full caches; this is what causes the number of broiler chicken rations to be limited which causes their weight to decrease.

It was concluded that adding seaweed to broiler rations reduced broiler chickens' fat and cholesterol levels and their live weight. The higher the concentration of seaweed given to broiler chicken feed, the lower the live weight of broiler chickens. It happens because seaweed can reduce feed digestibility and appetite for broiler chickens, causing the broiler's body weight to decrease. So it was concluded that the most effective treatment using seaweed with R1 treatment was the addition of 7% seaweed; this was seen from the positive effect of giving seaweed to broiler chickens in reducing fat and cholesterol levels close to normal cholesterol levels and normal fat levels in broiler chickens without reducing weight. Broiler lives weigh significantly.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that the addition of seaweed effectively reduces cholesterol and fat levels in broiler chickens and does not affect broiler body weight with the addition of 7% seaweed. The researcher's suggestion from this research is that it is necessary to do deeper research on the effects of excess seaweed on lowering fat and cholesterol. A more reliable laboratory test is also necessary to check cholesterol levels to determine HDL and LDL cholesterol levels.

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The Effectiveness of the Circulatory System Learning Unit with Guided Inquiry Based Flipped Classroom Learning Settings to Improve Self Regulated Learning and Student Learning Outcomes

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Abstract. This study aims to determine the effectiveness of the circulatory system learning unit with guided inquiry-based flipped classroom learning settings to improve self-regulated learning and student learning outcomes in class XI. This research is a development research using one group pretest posttest design. The subject of this research is class XI IPA 2 MAN 4 Bone, totaling 33 students. The technique of collecting data is by giving essay tests and giving self-regulated learning questionnaires. The results of this study indicate that student learning outcomes using the circulatory system learning unit with guided inquiry-based flipped classroom learning settings have increased after being given treatment. Based on the N-Gain test, student learning outcomes are in the low (6%), medium (55%), and high (39%). Meanwhile, in the results of the self-regulated learning questionnaire analysis, students are in the medium (64%) and high (34%). This shows that learning using the circulatory system learning unit with guided inquiry-based flipped classroom learning settings is quite effective in improving self-regulated learning and student learning outcomes in class XI.
Keywords: Learning Units, Flipped Classroom, Guided Inquiry

INTRODUCTION

Learning and learning are two related things that cannot be separated in educational activities. An education that can lead to an interaction between teachers and students is the learning and learning process. Learning is a process of organizing the surrounding student environment so that students can encourage them to carry out the learning process (Pane et al, 2017).

The quality of learning outcomes is seen from the effectiveness of learning during the teaching and learning process because effective learning cannot be separated from quality learning. In learning activities a teacher can be called a reliable or professional teacher not only seen from the ability to master the material and concepts, but also must know how to teach and also the learning strategies used can be conveyed properly to students. When the teacher carries out learning activities, not a few teachers find difficulties when carrying out the learning process. The teacher's inaccuracy in designing or conducting learning can be a cause of low student learning outcomes.

According to Abdurrahman (2012) the learning method used by the teacher can be a factor causing students' low understanding of learning concepts. Where most teachers use learning methods that are always the same. In the learning process a teacher must experience difficulties. This difficulty becomes a problem that causes ineffective classroom learning which can hinder the achievement of learning outcomes.

The determinant of success in the learning process is good learning outcomes. The success of the learning process is determined by good learning outcomes and vice versa, the failure of the learning process is determined by poor learning outcomes (Muthmainnah, 2019). Low learning outcomes can also be influenced by students who lack self-regulation in learning. One of the factors for achieving learning goals is the ability to regulate or self-regulate in learning that students have. This is called self-regulation or self-regulated learning. Factors that can influence the success of students during the educational process is self-regulation. Self-regulation in the learning process is called self-regulated learning (Yulianti et al, 2016).

According to Santrock (2010) self-regulated learning is showing and controlling oneself, feelings, and behavior in achieving certain goals. The ability to control oneself while studying in creating an effective learning is known as self-regulated learning. Efforts that can be done is to create a learning strategy. The learning strategy that can be used is the guided inquiry-based flipped classroom learning strategy.

The guided inquiry learning model is a learning model that can emphasize the process of finding concepts and bonding between concepts where students want to design experimental stages causing the position of students to be more dominant, otherwise the teacher guides students in the right direction (Sukma, 2016). The guided inquiry model is a model to require students to improve thinking skills by distributing questions and getting answers to questions on the basis of student curiosity. The learning process from teacher domination is changed to student domination, because in the guided inquiry model the students are more active instead the teacher acts as a guide (Hamimi et al, 2018).

According to Sugiri (2020) the learning strategy developed by Bergam and Carroll in 2008 is the flipped classroom learning strategy. This learning strategy can replace the lecture learning method with active assignments in the classroom. The flipped classroom strategy, in which the provision of information through face-to-face lectures in the classroom is then moved out of the classroom. Instead, when in class students will be given active and collaborative tasks. At the time before learning activities in class begin, students participate in preparing learning by learning

through other sources, for example, watching videos related to material to replace face-to-face learning in class. After having preparations at home, so that in class students can solve problems and can provide solutions related to problems experienced. After learning in class, students can learn more and strengthen their understanding. According to Ubaidillah (2019) flipped classroom is a learning strategy in which in the learning process students are more dominant in pursuing subject matter outside the classroom (at home) by watching learning videos, so that the learning process activities in the classroom are more effective so they can do the assignments given, where the material that is still not understood by students will be discussed.

Technological developments that have a major influence on the world of education are a factor or cause for the development of the flipped classroom learning strategy. The teacher as the facilitator will package the material to be taught in digital form in the form of learning videos. Video is an effective medium used in assisting the learning process of students because video has a lot of information and is non-print. The flipped classroom learning strategy is expected to make the learning process in the classroom more effective (Chaer et al, 2021).

Research conducted by Enfield (2013) explains that in order to improve learning skills, motivation and activity, namely by implementing a flipped classroom strategy. From the results of McCarthy's research (2016) states that implementing a flipped classroom in learning can help students to do independent learning by encouraging students to adjust to their new learning experiences. To make it easier for teachers to carry out the learning process, researchers consider the need for a learning unit in the form of a teacher's manual with a guided inquiry-based flipped classroom learning setting.

Based on the problems described above, the researcher aims to find out whether the circulatory system learning unit with guided inquiry-based flipped classroom learning settings is effective in improving self-regulated learning and student learning outcomes in class XI.

METHOD

This type of research is research and development. A suitable method is used in order to obtain a development product, namely the Research and Development method (Purnama, 2013). The development model used in this study is the ADDIE development model. The instruments applied are test questions of learning outcomes and self-regulated learning measurements. Test learning outcomes through a pre-

test given at the beginning of learning and a post-test given at the end of learning which consists of 7 questions. The test questions are in the form of essay questions that have previously been validated. Measuring self-regulated learning by giving a self-regulated learning questionnaire with a total of 20 statements.

It is said to be complete if students get a score that is greater than or equal to the KKM score. Learning can be said to be successful if the completeness score reaches 80%. In addition, the N-Gain test was carried out to find out whether students' scores increased or not after being given treatment by comparing the initial score (pretest) and the final score (posttest).

The calculation of the N-gain value score is expressed by the following formula:

$$(g) = \frac{(Sf) - (Si)}{100 - (Si)}$$

Description:
(g) = *Normalized Gain(N-Gain)*
(Sf) = *Post test Score*
(Si) = *Pre test Score*

Table 1. N-Gain Score Assessment Criteria

Score N-Gain	Category
g > 0,7	Tall
0,3 ≤ g ≤ 0,7	Currently
g < 0,3	Low

Source: (Ramdhani et al, 2020)

Measurement of student self-regulated learning in the form of self-regulated learning scale questionnaires compiled and developed based on the indicators. The scale used in this study is the self-regulated learning scale which consists of positive and negative statements using five answer choices, namely Strongly Agree (SS), Agree (S), Less Agree (KS), and Disagree (TS).

Table 2. Self Regulated Learning Categorization Criteria

Score	Category
N ≤ p 70	Tall
p 30 ≥ N ≤ p 70	Currently
p 30 ≥ N	Low

Description:

N = Score value

p 30 = Percentile 30 (lower limit) normal curve

p 70 = Percentile 70 (upper limit) normal curve

The formula used to calculate the percentage of respondents who fall into the low, medium and high categories is as follows:

$$P = \frac{f}{n} \; x \; 100$$

Description:

P = percentage

f = Frequency

n = Total number of frequencies

RESULTS AND DISCUSSION
Results

The effectiveness test was carried out by giving test questions in the form of learning achievement tests and self-regulated learning questionnaires by students and also testing the effectiveness by analyzing student learning outcome data and analyzing student self-regulated learning questionnaire data.

1. **Student Learning Test Results**

The effectiveness of learning units with guided inquiry-based flipped classroom learning settings developed is analyzed using student learning outcomes tests. The results of the frequency distribution of pretest scores can be seen in Table 3 and Figure 1.

Table 3. Frequency Distribution of Pretest Value Learning Outcomes

Score	Category	Frequency	Persentage (%)
75-100	Finished	0	0
0-74	Not Finished	33	100%
	Amount	33	100%

Source: (Research Result)
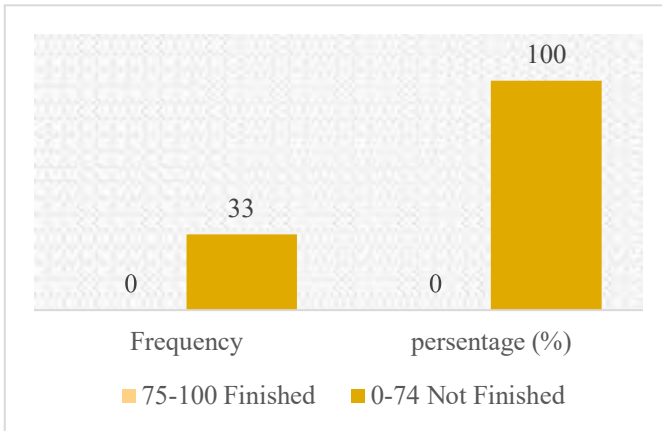
Figure 1. Frequency Distribution of Pretest Value Learning Outcomes

In Table 3 and Figure 1 it can be seen that the results of the data analysis of the frequency distribution of the learning outcomes of the pretest scores, namely 33% of students were said to be incomplete and no students had completed. The results of the frequency distribution of posttest scores can be seen in Table 4 and Figure 2.

Table 4. Frequency Distribution of Post test Value Learning Outcomes

Score	Category	Frequency	Persentage (%)
75-100	Finished	29	88%
0-74	Not Finished	4	12%
Amount		33	100%

Source: (Research Result)
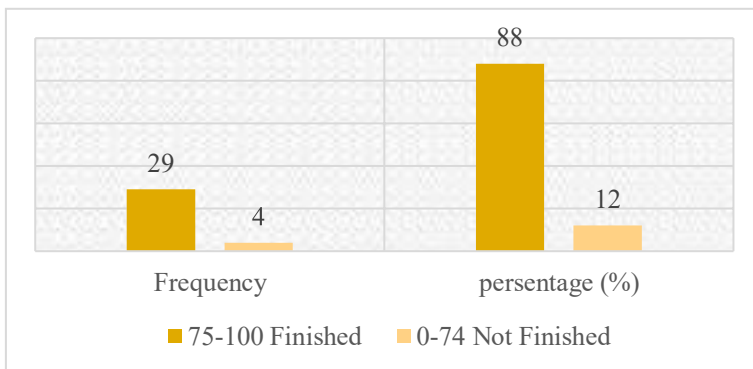
Figure 2. Frequency Distribution of Post test Value Learning Outcomes

In Table 4 and Figure 2 it can be seen that the results of the data analysis of the frequency distribution of learning outcomes in the posttest scores, namely 12% of students were said to be incomplete and 88% of students were said to be complete. The value of students' pretest and posttest learning outcomes will then be compared to determine the increase in student learning outcomes after being given treatment using the N-Gain test. The results of the normalized gain classification analysis of student learning outcomes can be seen in Table 5 dan Figure 3.

Tabel 5. Normalized Gain Classification of Student Learning Outcomes

N-Gain	Total Students	Persentage (%)	Category
$g < 0,3$	2	6%	Low
$0,3 \leq g \leq 0,7$	18	55%	Currently
$g \geq 0,7$	13	39%	Tall
Amount	33	100%	
Average	0,60		Currently

Source: (Research Result)
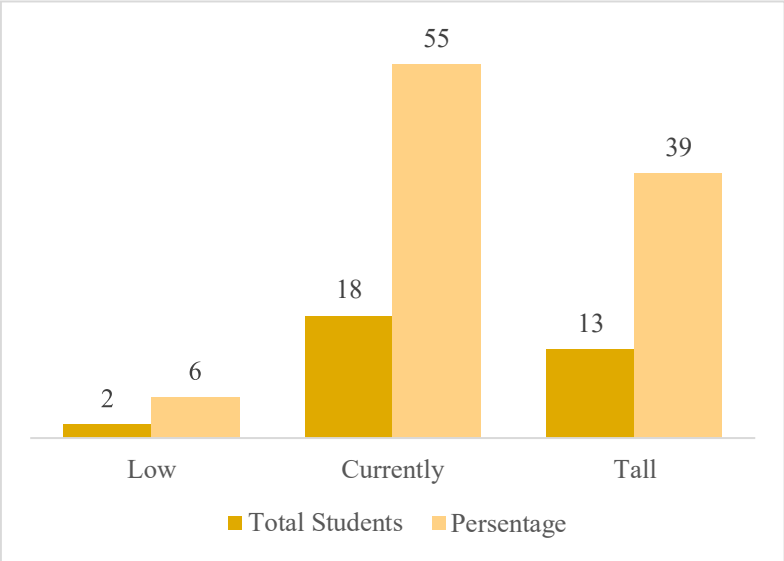
Figure 3. Normalized Gain Classification of Student Learning Outcomes

In Table 6 and Figure 3 it can be seen that the N-Gain value of student learning outcomes is 6% which is included in the low category, 55% is included in the medium category, and 39% is included in the high category. The average value of N-Gain is 0.60 which is included in the medium category. This is based on the category according to Ramadhani (2020) which when it reaches the range of $0.3 \leq g \leq 0.7$, the N-Gain value is classified as moderate.

2. **Self Regulated Learning Questionnaire Results**

The self-regulated learning questionnaire is used to determine the independence of student learning after implementing learning units with a flipped classroom learning setting based on guided inquiry on circulatory system material for class XI IPA 2 MAN 4 Bone. The results of the self-regulated learning questionnaire analysis can be seen in Table 7 and Figure 4

Table 7. Results of Self Regulated Learning Questionnaire Analysis

Score	Total Students	Persentage (%)	Category
$N \leq p\ 70$	12	36%	Low
$p\ 30 \geq N \leq p\ 70$	21	64%	Currently
$p\ 30 \geq N$	0	0	Tall
Amount	33	100%	
Average	65,45		Currently

Source: (Research Result)
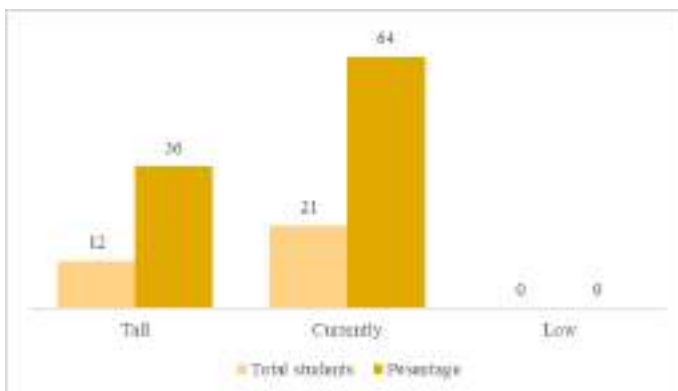
Figure 4. Results of Self Regulated Learning Questionnaire Analysis

Table 7 and Figure 4 show that the results of the self-regulated learning analysis of students are 36% which are included in the high category and 64% are included in the medium category. The results of self-regulated learning analysis of students are in the medium category with an average value of 65.45.

DISCUSSION

Based on the results of the research, the results obtained from 33 students were 4 students declared incomplete with a percentage of 12% and 29 students declared complete with a percentage of 88%. The results of the effectiveness test on student learning outcomes described in the research results 88% of students declared complete from these results included in the effective category.

So it can be concluded that the learning unit with the guided inquiry-based flipped classroom learning setting has an effect on student learning outcomes because in the learning unit it has been clearly described the stages of flipped classroom learning, guided inquiry learning scenarios and equipped with student worksheets that help and encourage participants teach them to learn more independently. The results of this study are in line with the research of Usmaidi and Erguisni (2019) that the flipped classroom learning model can increase student interest in learning and learning outcomes. In addition to the research conducted by Usmaidi and Erguisni, there is also research conducted by Knutas ddk saying that the application of the flipped classroom can improve student learning outcomes, by using the flipped classroom students can independently focus on reviewing the theory students need, teachers can concentrate on help students find solutions to actual problems (Knutas, 2016).

Learning units with guided inquiry-based flipped classroom learning settings to improve students' self-regulated learning can be seen from self-regulated learning questionnaire data. Based on the research results, the percentage of the self-regulated learning questionnaire is in the medium category with an average achievement of 65.54%. Based on this, it can be concluded that students' self-regulated learning is achieved in the moderate achievement category.

According to Lai & Hwang in Yanti's research (2019) which can integrate self-regulated learning into the flipped classroom learning model, the result is that the learning carried out is able to increase student self-regulation. Apart from that, students also learn effectively and have better learning achievements.

CONCLUSION

Based on the research results, it can be concluded that the use of circulatory system learning units with guided inquiry-based flipped classroom learning settings is effective in improving self-regulated learning and student learning outcomes in class XI.

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Development of E-book Material Classification of Living Things Class X SMA

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Abstract. This research and development (R&D) aim to produce a valid and practical Biology E-book for class X high school classification of living things. The development model used is the ADDIE model which consists of five stages, namely, analysis (analyze), design (design), development (development), implementation (implementation), and evaluation (evaluation). The research subjects are biology subject teachers and students of class X MIPA SMA Negeri 3 Makassar. Validity data were obtained using a validated questionnaire instrument while practicality data was obtained using a teacher response questionnaire instrument and student responses. The results of data processing obtained a validity score of 4.15 with a valid category; while the teacher response scores and student response scores were 4.30 and 4.40, respectively, in the very practical category. It was concluded that the Biology E-book material on the classification of living things for class X SMA that was developed was declared valid and practical.
Keywords: E-Book, Valid, Practical

INTRODUCTION

The use of technology is now commonplace for people in Indonesia and has become a lifestyle, not least for students at school. For example, most students use cell phones (smartphones) for their needs. As reported by the kominfo.go.id website which states that in 2018 the digital marketing emarketer research institute estimates that more than 100 million people actively use smartphones in Indonesia. This shows that the Indonesian people have begun to realize the benefits of technology.

According to Saettler (2004), technology is practical and systematic knowledge, based on experimental and/or scientific theory, which increases the capacity of society to produce goods and services, which is manifested in productive, organizational, or machine skills. The purpose of the existence of learning technology is solely to assist students in overcoming the problems that exist when learning. Therefore, to create a pleasant situation for students in teaching and learning activities, educators must innovate supported by technologies that are currently developing rapidly in learning activities.

The current state of learning in schools is still mostly conventional, such as the delivery of material is only lectured, and the use of teaching materials is only in the form of printed books. Completely designed

learning materials, in the sense that media elements and adequate learning resources will affect the learning atmosphere so that the learning process that occurs in students becomes more optimal. Learning materials that are well-designed and equipped with interesting content and illustrations, will stimulate students to use learning materials as learning materials or as learning resources (Raharjo & Panah, 2014).

To come up with a solution to these problems, the Ministry of National Education has started to try this kind of learning approach by introducing information and communication technology (ICT)-based learning resources in the form of electronic books (E-Books). E-Books are used as a substitute for printed books that can be downloaded according to the needs of students. When compared to ordinary textbooks, the advantages of this e-book are that pages and topics are easier to find, colorful display, easy to store and easy to access.

According to Haris (2011), if textbooks generally consist of a collection of papers that can contain text or images, then electronic books contain digital information which can also be in the form of text or images. Along with increasingly advanced technology, e-books can be presented in a multimedia format that can be realized through the use of e-books. In this case, e-books are not only in the form of text and images, but there are also animations and videos.

Based on the results of observations and interviews at SMAN 3 Makassar conducted in March-June 2021, information was obtained that class X biology teachers used teaching materials in the form of PPT, videos, and textbooks given during the learning process. The use of e-books by teachers is still very lacking, especially for grade X teachers who still use textbooks, so grade X students only use textbooks that have been prepared by the school. There are also several problems in the learning process, namely, teachers tend to use direct learning methods without any interactive relationship between teachers and students. The learning process in the classroom only occurs in one direction, namely the teacher without any feedback from students. This causes students not to be active in the learning process just waiting for the teacher to explain the material and then do the given task.

Learning materials, especially the classification of living things, are considered difficult by students because of the large number of taxonomic divisions, and memorizing scientific names is very difficult. The teaching materials used are still very lacking, especially in the textbooks distributed to all students, especially class X, which is very minimal and unattractive, thus making students feel bored in learning. With an interesting and fun e-book, students will not feel bored in learning.

Thus, the development of valid and practical e-books can also be carried out in order to meet the needs of interesting and fun learning for students, especially the classification of living things taught in class X SMA.

RESEARCH METHODS

This research is a research and development (Research and Development). The product resulting from this research is in the form of a biology e-book on the classification of living things taught to class X high school students according to the 2013 Curriculum. The e-book development model used in this study refers to the ADDIE development model. This model consists of five stages or steps, namely (1) analysis (analyze), (2) design (design), (3) development (development), (4) implementation (implementation), and (5) evaluation (evaluation).

This research was conducted in March – July 2022. The results of the development of the biology e-book on the classification of living things were tested in a limited (small scale) class X MIPA 1 SMA Negeri 3 Makassar. The test subjects in this study were students of class X MIPA 1 SMA Negeri 3 Makassar which consisted of 36 students and 2 teachers of SMA Negeri 3 Makassar in the field of biology studies.

Data was collected using research instruments in the form of a questionnaire, that is a validity assessment questionnaire and a practicality assessment questionnaire. The validity assessment questionnaire assessed by expert validators consists of several statements equipped with instructions for using the instrument and 5 assessment criteria are using a rating scale, that is 1 = strongly not good, 2 = not good, 3 = fairly good, 4 = good, 5 = very good. While the practicality assessment questionnaire assessed by teachers and students consists of several statement items equipped with instructions for using the instrument with 5 assessment criteria using a rating scale, that is 1 = strongly disagree, 2 = disagree, 3 = quite agree, 4 = agree, 5 = strongly agree.

Data Analysis Validity

Product validity was assessed by 2 expert validators. After the data input process is carried out, the data obtained from the expert validator's assessment is then analyzed. Then calculate the average validity rating of each validator using the formula:

$$\overline{x}V = \frac{\sum x_i}{n}$$

Explanation:

$\overline{x}V$: The average validity of each validator

$\sum x_i$: The total value of the assessment aspect

n : Many aspects of assessment

After obtaining the average validity assessment from each validator, then calculate the average total validity assessment from all validators with the following formula:

$$\overline{x}V_{total} = \frac{\sum \overline{x}V}{n}$$

Explanation:

$\overline{x}V_{total}$: The average score of the total validity assessment of all validators

$\sum \overline{x}V$: The average number of ratings from all validators

n : Many expert validators

Furthermore, the average total validity assessment of all validators is adjusted according to the validity criteria referring to Widoyoko (2016) according to table 1.

Table 1. Product Validity Criteria and Categories.

Criteria	Category Validity
$1 \leq \overline{x}V_{total} < 1,8$	*Very invalid*
$1,8 \leq \overline{x}V_{total} < 2,6$	Not valid
$2,6 \leq \overline{x}V_{total} < 3,4$	Quite valid
$3,4 \leq \overline{x}V_{total} < 4,2$	Valid
$4,2 \leq \overline{x}V_{total} \leq 5$	Very valid

Source : Widoyoko (2016)

Explanation:

$\overline{x}V_{total}$ is the average value of the total validity assessment of all validators

The category that states the product and the response questionnaire has a good degree of validity if the minimum level of validity achieved is valid.

Data Analysis Practicality

The data on the practicality of the e-book for the classification of living things were obtained from the results of the assessment of the biology teacher and students of class X SMA on the e-book. The practicality test is carried out to test the development product whether it is

practical and easy to use or vice versa.

The teacher and student data obtained from the questionnaire were then analyzed by qualitative analysis. The data analysis techniques used in the practicality analysis are as follows:

a. Calculate the average practicality assessment of each teacher and student using the following formula:

$$\overline{x}P = \frac{\sum x_i}{n}$$

Explanation:
$\overline{x}P$: Average practicality assessment from each teacher/student
$\sum x_i$: The total value of the assessment aspect
N : Many aspects of assessment

b. Calculate the average total practicality assessment of all students using the following formula:

$$\overline{x}P_{total} = \frac{\sum \overline{x} P}{n}$$

Explanation:
$\overline{x}P_{total}$: Average total practicality assessment of all teachers/students
$\sum \overline{x} P$: The average number of assessments of all teachers/students
n : Many teachers/students

c. The results of the calculation of the average total practicality assessment of all known teachers and students can be matched with the product practicality categories presented in table 2.

Tabel 2. Product Practicality Criteria and Categories.

Criteria	Practicality Category
$1 \leq \overline{x}P_{total} < 1,8$	Very impractical
$1,8 \leq \overline{x}P_{total} < 2,6$	Less practical
$2,6 \leq \overline{x}P_{total} < 3,4$	Practical enough
$3,4 \leq \overline{x}P_{total} < 4,2$	Practical
$4,2 \leq \overline{x}P_{total} \leq 5$	Very practical

Source: Widoyoko (2016)

The category that states the degree of practicality is good if the minimum level of practicality achieved is the practical level.

RESULTS

Validity Test

1. The Results of Data Analysis E-Book Validity Test

The results of the data analysis e-book validity test assessed by the validator experts can be seen in Table 3.

Tabel 3. The Results of Data Analysis E-Book Validity Test.

No.	Aspect of Assessment	Average Validator 1	Validator 2	Aspect Average	Category
1	Content Eligibility	4,00	4,43	4,21	Very Valid
2	Bahasa	4,00	4,00	4,00	Valid
3	Presentation	3,00	5,00	4,00	Valid
4	Graphics	4,00	4,75	4,38	Very Valid
	Total Average	3,75	4,54	**4,15**	**Valid**

Based on the analysis shown in Table 3, it can be explained that the average total validity ($\overline{x}V_{total}$) of the e-book class X SMA material classification of living things obtained is 4.15, the value is included in the valid category with the validity criteria $3.4 \leq \overline{x}V_{total} < 4.2$. So it can be said that the developed e-book is valid and feasible to use.

2. The Results of Data Analysis Research Instrument Validity Test

The research instrument developed was validated by two expert validators. The instruments developed include e-book product validation instrument sheets, teacher response questionnaires, and student response questionnaires. The results of the analysis can be seen in Table 4.

Tabel 4. The Results of Data Analysis Research Instrument Validity Test.

No.	Research Instruments	Average Validator 1	Validator 2	Aspect Average	Category
1	E-Book Product Validation Instrument Sheet	4,00	4,57	4,29	Very Valid
2	Teacher response questionnaires	4,00	4,43	4,22	Very Valid
3	Student response questionnaires	4,00	4,86	4,43	Very Valid

Based on the results of the analysis shown in Table 4, it can be explained that the total average for all research instruments is included in the very valid category with a validity criterion of $4,2 \leq \overline{x}V_{total} < 5$, which means the research instrument can be used.

Practicality Test

1. Teacher's Response

The results of the practicality test data analysis of the teacher's response to the e-book can be seen in Table 5.

Tabel 5. The Results of Analysis Biology Teachers' Responses to E-Books.

No.	Aspect of Assessment	Average		Aspect Average	Category
		Teacher 1	Teacher 2		
1	Content	4,5	4,67	4,58	Very Practical
2	Bahasa	4,00	4,00	4,00	Very Practical
3	Presentation	4,00	4,00	4,00	Very Practical
4	Graphics	4,5	4,75	4,63	Very Practical
	Total Average	4,25	4,35	4,30	Very Practical

Based on the results of the analysis shown in Table 5, it can be explained that the total average value ($\overline{x}V_{total}$) of the teacher's response to the e-book material classification of living things for class X SMA obtained is 4.30, this value is included in the very category. practical with practicality criteria of $4,2 \leq \overline{x}V_{total} < 5$. So it can be concluded that the developed e-book is declared practical and feasible to use.

2. Student's Response

The results of the practicality test data analysis of student responses to e-books can be seen in Table 6.

Tabel 6. The Results of Analysis Student Responses to E-Books.

No	Aspect of Assessment	Average	Category
1	Content	4,39	Very Practical
2	Bahasa	4,41	Very Practical
3	Presentation	4,19	Practical
4	Graphics	4,60	Very Practical
	Total Average	4,40	Very Practical

Based on the results of the analysis shown in Table 6, it can be explained that the average value ($\boldsymbol{x}V_{total}$) of the total student response to the e-book material classification of living things class X SMA obtained is 4.40, this value is included in the very practical category with a validity criterion of $4,2 \leq \boldsymbol{x}V_{total} < 5$. So it can be concluded that the developed e-book is practical and feasible to use.

DISCUSSION

The product produced in this study is a textbook for the classification of living things which is packaged in electronic form and can be used as a support in the learning process. The e-book is developed using software such as Canva Pro application, Microsoft Word, and Google form which is used in compiling the layout and content of the e-book. The Hyzine.com application that is connected to Canva Pro can change the appearance of a PDF file into an electronic book that has a display with transition effects where pages can be flipped like a book in general.

Problems for students and teachers in learning at school such as teaching materials that are often left behind, teaching materials are only in the form of compulsory Biology textbooks in printed form, material for classification of living things in the compulsory high school textbooks consisting of pages with explanations and several examples of species, as well as pictures. colorless make students bored and less interested in the learning process can be resolved.

The solution that can be given to these problems is to present teaching materials in the form of e-books that have a more attractive appearance and content and can be distributed more efficiently. E-books can be accessed in several ways, namely, through a URL address and through a scan of the QR Code so that it can be carried everywhere. This is in line with Ruddamayyanti's (2019) statement that e-books have benefits and advantages, namely, being able to create multimedia content in them, enabling the presentation of information that is more interesting and interactive, more practical, and easy to carry everywhere.

The e-book validity test aims to see the shortage of teaching materials and things that must be added to the teaching materials. The e-book validation is carried out by two expert validators by viewing and assessing the e-book that has been made, then assigning a value to the validation sheet instrument which has previously been validated by the expert validator. The validity of the e-book is a requirement that must be met before it is implemented for research subjects. The developed e-book has gone through several revisions both in terms of content and appearance based on the assessment of expert validators and has been tested for validity until a valid e-book is obtained.

Aspects that are assessed to determine whether the e-book is valid to include aspects of the feasibility of content, language, presentation, and graphics. Sriwindayani et al (2016), suggest that in terms of content feasibility, three indicators must be considered, namely; the suitability of the material description with the competency standards and basic competencies contained in the subject in question, the accuracy of the

material, and learning support materials. The feasibility aspect of the content in this e-book assessment includes the criteria that the topic of learning material on the classification of living things in the e-book is conveyed clearly. The presentation of the material in the e-book is explained simply and sequentially according to the level of understanding of high school students according to the curriculum. The practice questions at the end of the chapter are also adapted to the classification of living things that have been described in the e-book.

E-books are developed by taking into account linguistic rules to make it easier to read and understand the material. Suyanto (2014), suggests that in reading there are two aspects to consider, namely the literary aspect and the linguistic aspect. The literary aspect is considered when reading literary works, while the linguistic aspect is considered in each work, especially things that are written with an official character. The linguistic aspects of the developed e-book relate to the use of appropriate language according to the Enhanced Spelling (EYD), spelling accuracy, grammar, and sentence structure. The terms used in the e-book are adapted to the correct writing of Latin names and absorption words and refer to the class X Biology curriculum to suit the thinking level of high school students.

The presentation aspect is related to the sequence of presentation, the presentation of content or material can develop knowledge, and motivation, and how the illustrations presented can support the description of the material. Sriwindayani et al (2016), stated that in addition to the main material, such as standard textbooks in others, this book displays several book components including the title page, foreword, table of contents, glossary, bibliography, and author's biodata. The developed e-books are arranged systematically so that users can construct knowledge and learn independently.

Agustina (2015), suggests that a graphicly attractive reading material will increase interest in reading it, therefore reading teaching materials must be designed in such a way that their appearance is able to attract readers. The display aspect of the developed e-book relates to the color composition, the type of font used is clear and easy to read, the quality of the image and video display, the accuracy of the layout, and the integration between the color of the text and the background.

Based on the results of the data analysis of the validation of the e-book product for all aspects of the assessment, the total average value is 4.15, with valid criteria. The e-book is declared valid based on the assessment of the expert validator after the suggestions are implemented in the developed e-book.

The practicality of the e-book can be seen from the responses of teachers and students. Aspects included in the practicality questionnaire of teacher responses are aspects of material content, language, presentation, and appearance. Aspects included in the practicality questionnaire of student responses are aspects of material content, language, presentation, and appearance. The product-limited scale trial involved 38 respondents, consisting of 2 biology subject teachers and 36 students of class X MIPA 1 SMA Negeri 3 Makassar.

Based on the results of limited trials in the field, the results of the teacher response questionnaire analysis to measure the practicality of the e-book obtained an average total assessment of 4.30, which means that the category is in the very practical category. The results of the student response questionnaire analysis to measure the practicality of the e-book obtained an average total assessment of 4.40, which means that the criteria are in the very practical category. This is in line with the opinion of Widoyoko (2016), which states that the practicality criteria with the practicality assessment category value of $4,2 < \overline{x}V_{total} < 5$ are stated to be very practical.

The practicality of the e-book material classification of living things class X SMA can be seen in terms of use, especially in the learning process. Teachers and students can open and use e-books without having to first install certain e-reader applications, can be used anywhere and anytime and are accompanied by URL addresses that can connect to the web and youtube related to the material so that it can help students to better understand the explanations listed in the e-book. This is in line with the statement by Makdis (2020) that one of the goals of e-books is for humans to get easy access to increase their insight and knowledge.

CONCLUSION

Based on the results of research and discussion, it can be concluded as follows:

1. The biology e-book for the class X high school creature classification material that has been developed is valid, based on the assessment of 2 validators, and is declared suitable for use in the research process.
2. The biology e-book for the classification of living things for class X SMA which has been developed is practical, based on teacher and student assessments which show that the e-book is easy to use and can help teachers and students in the teaching and learning process.

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Development of Ecosystem Material E-Modules as a Source of Learning Biology Of Class X SMA

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Abstract. Electronic modules (e-modules) for Ecosystem Materials as Biological Learning Resources with the aim of 1) producing valid e-modules for class X high school ecosystem materials, 2) producing practical e-modules for class X high school ecosystem materials. This type of research is Research and Development (R&D) with the ADDIE development model which has five stages, analysis, design, development, implementation, and evaluation. The subjects of this study is an expert lecturers who conducts the validity of the instruments and products developed, Biological subject teachers, and students of X MIA 1 SMA Negeri 19 Gowa as subjects to test the practicality of the product. The results showed that the developed e-module product was valid and practical. The results of the validity are in the very valid category with the validity of the e-module values obtained is 4.29. The results of the practicality test of the teacher's response of 4.97 with the category is very practical, and the results of the practical test of the student's response of 4.33 with the category is very practical. So, it can be concluded that e-module ecosystem materials as a source of Biological learning in the grade Senior High School developed highly (SMA) used in the learning process.

Keywords: ADDIE, e-module, ecosystem

INTRODUCTION

Science is developing from time to time. The development of science supports the creation of new technologies that mark the progress of the times. Learning is directed at competency-based. This competence is especially in meeting the needs and demands of the 21st Century. In this century, all aspects of life are developed based on science and technology. The application of technology in education can be implemented in the selection of learning resources. Learning resources are everything that can be used by students and educators to learn materials and learning experiences in accordance with the objectives to be achieved.

Limited learning resources are often a problem in teaching. It can be impact on learning objectives that are less than optimal and learning becomes monotonous and not variative. Therefore, the selection of learning resources needs to be adjusted to the conditions of students and the learning strategies used by teachers. According to Supriadi (2015), the use of various learning resources is an effort to solve learning problems.

Meanwhile, the role of educational technology as a solution to learning problems.

According to AECT (Association of Education Communication Technology), learning resources are everything or resources that can be utilized by teachers, either separately or in a combined form, for the benefit of teaching and learning to improve learning effectiveness and efficiency. In line with that, Sujarwo, Fitta, & Tristanti (2018) also stated that learning resources are everything that can be utilized to facilitate one's learning. Learning resources consist of several types that are be adapted to the needs of students. AECT (Association for Educational Communicatons and Technology) classifies learning resources into 6 types, namely, messages, people, materials, tools, techniques, and settings.

Biology learning has specific material characteristics that are different from other fields of science. Biology examines living things, the environment and the relationship between them. Biological material not only deals with scientific facts about concrete natural phenomena, but also deals with abstract things or objects. One of the learning resources that can be used in learning Biology and combined with technology is the electronic module (e-module). According to Dit. High School Coaching (2018), e-modules are independent learning resources that are systematically arranged in certain learning units, presented in electronic format, where each learning activity in it is linked to a link, complemented by the presentation of video tutorials, animations and audio to enrich the learning experience.

Based on preliminary observations at SMA Negeri 19 Gowa about the needs of students for learning resources, it was found that 90% of Biology learning in the classroom used textbook and 76% of students stated that the content of the material in the textbook was incomplete. The use of textbook has not met the characteristics of Biology learning materials which require a lot of using concept visualization to explain Biology materials. Therefore, learning resources are needed in the form of Biology learning e-modules that contain more specific material discussions.

The results of Itsna's research (2015) stated that the science learning module had a fairly high influence because from the learning outcomes of the cognitive realm obtained an average value of 81.29 while the affective realm average value of 2.9714, while for science textbooks had a lower influence because from the learning outcomes of the cognitive realm obtained an average score of 74.57 while the affective realm the average score result was 2.8357. In line with the research by Widhiantari (2012), the use of modules in learning activities makes it easier for students to learn

the material. The learning module also allows students to be able to learn according to their respective learning abilities, so that the learning process is complete and carried out.

The use of e-modules in learning can be implemented in Biology learning, one of which is in ecosystem materials. Ecosystem material requires visual presentation in addition to verbal explanations to facilitate students' understanding of the concept of ecosystems because ecosystem materials explain many natural environmental phenomena that are not all visible to the naked eye. The use of e-modules in Biology learning is effectively, this is supported by Atsni (2017) research which states that, the level of effectiveness of the Biology learning module on class X ecosystem material at SMA Negeri 16 Semarang shows positive results with the average learning outcomes of the experimental group using the module is 81,105 and the control group that does not use the module in learning is 67,778. According to the Depdiknas (2008), in the module, a set of learning activities has been arranged so that learning can be more efficient and effective. Learning objectives use modules to reduce the diversity of students learning speed through self-study activities.

Ecosystem matter is closely related to the environment. Therefore, one of the efforts in increasing the understanding of ecosystem materials is the use of more interesting learning e-modules by taking examples that are close to the living environment of students, especially in Gowa Regency. The development of e-modules on ecosystem materials is expected to help students understand concepts and increase student learning motivation in learning ecosystem materials.

This ecosystem material e-module is also expected to help teachers in delivering material and adding independent learning resources for students to overcome time and place limitations because it is electronic. Based on these problems, it is considered necessary to conduct research on the development of ecosystem material e-modules as a learning resource for Biology in class X SMA. This study aims to produce e-modules of ecosystem materials that are valid and practical.

METHODS

This research is a Research and Development (R & D) research. This research is carried out until the production of a product that meets valid and practical criteria. This research was conducted in December 2021-August 2022 at SMA Negeri 19 Gowa. This R & D research design uses an ADDIE type development model where this model has five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The subjects of this research were 30 students of class X MIA 1 and

Biology teachers at SMA Negeri 19 Gowa. The expected result of this research is the production of an ecosystem material e-module as a learning resource for Biology class X SMA which is valid and practical by presenting examples and discussions about local ecosystems in Gowa Regency with visual presentations in the form of images, videos and displays that are more interesting and varied.

The analysis stage is carried out analysis of the needs of students and teachers, content analysis, structure analysis and goal analysis. The design stage in the ADDIE development research model is a systematic process that starts from designing concepts and content in the product being developed. The development stage aims to realize all the stages that have been done before so that the initial stage of e-modules is produced. The implementation phase is carried out by limited trial of products that have been valid in Class X SMA Negeri 19 Gowa. The results of this stage will later be used to evaluate the developed product. The evaluation stage is the final stage of the development of the ADDIE model, where an assessment is carried out from the beginning of development to the trial of the product.

Data was collected using research instruments in the form of a questionnaire, namely a validity assessment questionnaire and a practicality assessment questionnaire. The data analysis technique is using descriptive statistical analysis.

Validity Analysis

Measurement of the validity of research instruments is carried out to ensure that the research instruments used are really feasible or valid based on the assessment of expert validators. To calculate the average of the validity assessments of each validator used the formula:

$$\overline{x}V = \frac{\sum x_i}{n}$$

Explanation:
$\overline{x}V$: Average validity assessment of each validator
$\sum x_i$: Total of assessment aspect values
n *: The many aspects of assessment*

After obtaining the average validity assessment of each validator then calculates the average of the total validity assessments of all validators with the formula:

$$\overline{x}V_{total} = \frac{\sum \overline{x}\,V}{n}$$

Explanation:
$\overline{x}V_{total}$: Average total validity assessment of all validators
$\sum \overline{x}\,V$: Total of average validity assessment of each validator
n : Number of validators

The results of data analysis can be matched with the validity criteria referring to Widoyoko (2016) in Table 1 below.

Table 1 Criteria and Categories of Product Validity

Criteria	Category of Validity
$1 \leq xV_{total} < 1,8$	Very invalid
$1,8 \leq \overline{x}V_{total} < 2,6$	Not valid
$2,6 \leq \overline{x}V_{total} < 3,4$	Quite valid
$3,4 \leq \overline{x}V_{total} < 4,2$	Valid
$4,2 \leq \overline{x}V_{total} \leq 5$	Very valid

The category that states the product and the response questionnaire has a good degree of validity if the minimum level of validity achieved is valid.

Practicality Analysis
The practicality analysis of the ecosystem material e-module was assessed from the results of the questionnaire assessment of the response of teachers of Biology subjects and the response of students to the products developed. To calculate the average practicality score from the results of the responses of teachers and learners using the formula:

$$\overline{x}P = \frac{\sum x_i}{n}$$

Explanation:
$\overline{x}P$: Average assessment of the practicality of each students
$\sum x_i$: Number of assessment aspect values
n : Many aspects of assessment

Next, calculate the average of the total practicality scores from the results of the responses of teachers and learners using the formula:

$$\overline{x}P_{total} = \frac{\sum \overline{x}\,P}{n}$$

Explanation:

$\overline{x}P_{total}$: Average total practicality assessment of teachers and students

$\sum \overline{x} P$: Average number of teachers and students

n : Many teachers and students

The results of data analysis can be matched with the validity criteria referring to Widoyoko (2016) in Table 2 below.

Table 2. Product Practicality Criteria

Criteria	Categories Practicality
$1 \le \overline{x}P_{total} < 1,8$	Very impractical
$1,8 \le \overline{x}P_{total} < 2,6$	Less practical
$2,6 \le \overline{x}P_{total} < 3,4$	Practical enough
$3,4 \le \overline{x}P_{total} < 4,2$	Practical
$4,2 \le \overline{x}P_{total} \le 5$	Very practical

The category that states the degree of practicality is good if the minimum level of practicality achieved is the practical level.

RESULTS
Validity Test

The validity assessment is assessed by two expert validators. The results of the validity data analysis of e-module products can be seen in the Table 3.

Table 3. Results of Validity Data Analysis

No	Aspect of Assessment	Validator		Aspect Average	Category
		1	2		
1	Eligibility of contents	3,63	4,75	4,19	Valid
2	Language	4,00	4,50	4,25	Very valid
3	Presentation	4,00	4,83	4,42	Very valid
4	Graphics	4,00	4,60	4,30	Very valid
	Total of average	3,91	4,67	4,29	Very valid

Based on Tabel 3, the results of the analysis of the validity data of e-module from all aspects, a total average of 4.29 was obtained which was at an interval of $4.2 \le \overline{x}V_{total} \le 5$. So the e-module product developed is in the very valid category.

Practicality Test

1. Teachers Response

Tabel 4. Results of Teacher Response Data Analysis

No	Aspect of Assessment	Teachers			Aspect Average	Category
		1	2	3		
1	Eligibility of contents	4,00	4,78	4,89	4,56	Very Practical
2	Presentation	4,75	5,00	5,00	4,92	Very Practical
3	Design	5,00	4,75	5,00	4,92	Very Practical
4	Language	4,33	5,00	5,00	4,78	Very Practical
	Total of average	4,97	4,88	4,97	4,97	Very Practical

The results of the analysis of practicality data of teacher responses to e-modules based on overall aspects obtained an average score of 4.97 which was at an interval of $4,2 \leq \overline{x}P_{total} \leq 5$. These results show that the developed e-modules meet very practical criteria.

2. Student Response

Table 8. Results of Student Response Data Analysis

No	Aspect of Assessment	Aspect Average	Category
1	Benefit	4,14	Practical
2	Contents	4,33	Very Practical
3	Design	4,36	Very Practical
4	Language	4,50	Very Practical
	Total of average	4,33	Very Practical

The results of data analysis on the practicality of student responses to e-modules based on all aspects obtained an average value of 4.33 which is in the interval $4,2 \leq \overline{x}P_{total} \leq 5$. These results indicate that the developed e-module meets the criteria very practical.

DISCUSSION

The development of this e-module product is based on the results of the analysis of the needs of teachers and students that have been carried out previously. Based on the results of needs analysis, the learning resources used by teachers in the learning process have not varied. The use of textbook in learning is still more dominant than other teaching materials. Most of the student also stated that the textbook used was less attractive and did not contain complete material. In the textbook there are pictures to clarify the material but it is not accompanied by colors so that it is considered less attractive, furthermore, the material contained in the

textbook is general in nature seems to have less connection with the daily life of students, and in the textbook is incorporated several subjects of Biology material so that it does not discuss the material more specifically.

Putri, Ana, & Ria (2017) stated that the feasibility aspect of the content consists of the suitability of the material description with the curriculum, the accuracy of the material, and the learning support material. The content feasibility aspect of this e-module assessment includes the criterion that the ecosystem material corresponds to the Core Competencies and Basic Competencies. The material in the e-module is described completely and in sequence, according to the level of understanding of high school students according to the curriculum. Evaluation at the end of each learning activity is also adjusted to the learning objectives and ecosystem materials.

E-modules are developed by paying attention to linguistic rules to make it easier to read and understand the material. Widodo (2015) stated that in linguistic indicators the use of the terms used is in accordance with the development of students. In this ecosystem material e-module, language aspects include the language used is easy to understand, the sentences used are clear and have no double meaning, the language used according to Indonesian rules, and the use of appropriate terms that are adapted to the correct writing of Latin names and absorption words and refer to the class X Biology curriculum to suit the level of thinking of students.

E-modules are packed with complete and sequential presentations. The presentation aspects in the e-module are assessed based on the purpose of using the e-module which is clearly loaded, contains the complete e-module components, there is a reference list to make it easier for students to learn more, the instructions for use and learning activities of the e-module are clearly loaded, and the e-module components are loaded systematically. The last aspect that is assessed is the graphic aspect, which is related to the color of the cover and layout, the type and size of the letters used, the integration of text and background colors, the suitability of the images and videos used with the needs of the material presented, as well as the quality of illustrations (images and videos) both in terms of placement, size, and color.

The practicality of the e-module can be seen from the responses of teachers and students. Based on the results of practicality data analysis, it shows that the ecosystem material e-module as a learning resource for Biology is very practical. This is supported by the advantages that exist in e-modules such as more colorful and varied images, the existence of learning videos, and the insertion of local ecosystems as additional learning

resources. This is supported by Teguh's research (2020) states that the use of e-modules in learning is very interesting, because e-modules provide an attractive appearance that can increase the enthusiasm of students in learning.

In addition, learning with this e-module can help learners to learn independently because the e-module can be accessed through smartphones or computers that on average have been owned by students. So that learning can be done anywhere and allows students to repeat the material they want to learn. This is in line with Laili, Ganefri, & Usmeldi (2019) who state that e-modules can help students to learn independently and can measure their own level of understanding. The existence of additional features such as Bio Watch which contains learning videos makes learning more varied. The addition of Bio News which contains local ecosystems in Gowa Regency is also highly appreciated by teachers and students because there is no teaching material that inserts local ecosystems in it.

CONCLUSION

Based on the results of the research and discussion that has been described previously, it can be concluded that the ecosystem material e-module as a learning resource for biology in class X SMA developed is valid and practical.

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Analysis of Needs for Development of E-Book Based On Case Study on Environmental Change Subject for Grade 10th

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Abstract. This study focuses on analyzing of need for teaching materials in the form of electronic books (E-books) based on case studies on environmental change materials for senior high school students in grade 10th as a means of the learning process. The purpose of this study was to determine the needs of students for the E-book teaching materials to be developed. The data retrieval technique used in this research is lesson plans and survey observations and the research instruments used are questionnaires and checklists. The method used is the descriptive qualitative method. The data analysis used is by reducing the data into more specific data to be presented descriptively. The results of the initial observations obtained are that students need electronic teaching materials in the form of E-books that can train higher-order thinking skills. Based on this, it is necessary to develop an E-book based on case studies on environmental change materials that can support the biology learning process in schools.
Keywords: E-book, Case Study, Environmental Change Subject.

INTRODUCTION

The Indonesian government implements of 21st century learning from character education strengthening programs in schools which are expected to foster students' character to can critical thinking, creatively, able to communicate, and collaborate, who are can compete in the 21st century (Primathojo, 2019). This is in accordance with the 2013 curriculum where the positive side of implementing the 2013 curriculum is that it can encourage students to learn more actively on an activity basis. However, ideal in the curriculum level is not necessary, to obtain ideal results as well. The reason is the many challenges and obstacles in the field when the 2013 curriculum is implemented in the teaching and learning process. One of the problems that occur in the availability of teaching materials.

Procurement and use of teaching materials in the learning process are one of the teacher's tasks, where teaching materials are selected based on the criteria for student learning. This is in line with the opinion of Adnan and Bahri (2018) who states that the strategies, models, and teaching materials used by teachers in the learning process are the main aspects to achieve learning goals. A number of learning materials, media and other learning resources can be easily managed and utilized as needed to make the learning process more effective, practical and efficient. Fot that reason,

teachers are required to use other sources that can present the latest information as technology develops (Adnan, 2015).

One of the facilities that can be developed to improve the quality of the learning process is teaching materials. In its use, teaching materials need to ensure their quality in support the effective learning, because the use of teaching materials is linear with the learning process (Cahyadi, 2019). The preparation of teaching materials can be adapted to the needs of students and educators, so that teaching materials can be designed to encourage interest and provide independent learning opportunities in learning in accordance with one of the goals of national education (Qomalasari, 2021).

The use of teaching materials is always updated in accordance with the readiness of schools and students. The use of teaching materials is also can have an influence on student learning outcomes (Putriani & Hudaidah, 2021). This statement is strengthened by the increasingly rapid conditions of technological development, so that learning must be adapted to the optimum use of technology. Another fact is that students born in 2011-2025 are the alpha generation that tend to become familiar with technology and are seen as a smarter generation than before (Fadlurrohim et al., 2019). This is a challenge for educators to use and use media support such as the use of ICT-based learning media (information and communication technologies) or the use of technology-based media.

The integration of ICT in learning becomes a new force that makes learning easy. According to Adnan et al (2021) that another factor that makes it difficult for students to understand biological material is the use of monotonous teaching materials in the form of books so that students are not active participants in the learning process. Therefore, a number of learning materials, media and other learning resources can be easily managed and utilized when needed. As a result, a number of learning materials, media and other learning materials can be easily managed and used as needed.

The use of electronic teaching materials can assist teachers in realizing ICT-based learning. Electronic teaching materials are teaching materials that contain various contents packaged in electronic form, which can be in the form of audio, audio-visual, or interactive multimedia. One of the electronic teaching materials that implements the development of technology and communication with user interaction that is being developed is an electronic book or known as an E-Book. E-books are teaching materials consisting of text and images published in digital form that can be read on computers or other electronic devices such as Android, tablets and smartphones (Mentari et al, 2018). This is in line with the

results of research by Adnan et al (2014), showing that the application of ICT-based learning models can increase the learning motivation of students in the high category.

Electronic books are a way to facilitate learning activities to form effective interactions between students and teachers. Presenting a case study in teaching materials in the form of an E-book will be able to stimulate students to develop their thinking in the process of getting answers from a case. Students who are faced with cases or problems that occur around them, will stimulate students to find out the answers to these cases and in the end be able to improve students' thinking skills making it independent learning. Therefore, by using case study-based e-books as teaching materials, students are expected to be able to access them easily (Natalia et al., 2014).

E-books based on case studies used in the student learning process should be able to analyse issues presented in case form., make conclusions based on available information, to draw conclusions on the assumptions that have been formulated (Safitri, 2020). If the learning process only trains students to memorize or solve written problems, then students' thinking skills will only increase in their ability to remember or work on written questions. To be able to overcome environmental and technological problems in everyday life, students in the learning process must be trained to think about solving problems around them (Natalia et al, 2014).

Strategies, models, and teaching materials used by teachers in the learning process are the main aspects to achieve learning objectives. Learning experiences can be obtained if the teacher has the ability to create an atmosphere of learning that is consistent with the characteristics of the students and the characteristics of the material (Adnan and Bahri, 2018). With the development of teaching materials that will be carried out, students and teachers will be assisted in overcoming current learning problems, online, especially during the current COVID-19 pandemic. Based on the importance of procuring electronic teaching materials that support the implementation of the 2013 Curriculum, it is necessary to develop an E-book based on case studies on environmental change material for grade 10[th.]

METHODS

The research was conducted in October 2021 using the survey method. The study population consisted of 5 biology teachers from different schools. The research instrument used in the research to analyze the needs of students and teachers is in the form of a questionnaire and a lesson plan checklist as an observation tool for the analysis of the biology

learning process in the classroom and a response questionnaire to analyze the needs of students for the E-book that will be developed.

The data collection techniques were done using 2 methods, this is the analysis of the biology learning process through the observation of teacher learning tools, and the survey method by analyzing the needs of students. The data collection process was carried out by distributing questionnaires to biology subject teachers and students on Googleform due to the Covid-19 outbreak which made it impossible to conduct direct surveys at their respective schools. The analysis of the biology learning process is carried out by observing the learning process through the Learning Implementation Plan used by teachers in learning with the aim of knowing the related problems. The stage of analyzing the needs of students is carried out by distributing questionnaires to find out and analyze what they need and overcome learning problems.

Data analysis in the study was carried out by reducing the data obtained from observations and surveys. The research data obtained are then presented descriptively so as to produce research conclusions regarding the need for developing teaching materials in the form of E-book Based on Case Study on Environmental Change Subject For Grade 10th.

RESULTS AND DISCUSSION

According to Devianti & Sari (2020), that effectively and efficiently meeting the needs of students can improve the learning process. This is in line with the opinion of Hamzah & Nurdin (2011), that a good understanding of the needs of students can provide appropriate and beneficial educational services for each child. Therefore, it is important to understand and meet the developmental needs of students for teachers.

The needs of analysis was carried out by observing and analyzing the learning process of biology in schools through the observation of the lesson plans (RPP) for 5 Biology subject teachers from different schools. The results of the needs analysis for biology subject teachers can be seen in Table 1.

Table 1. Observation Results of Biology Subject Teachers

No.	Indicator	Percentage (%)
1.	Using case study E-books	0
2.	E-book based on case studies relevant about learning activities for high school students.	83.33
3.	Case study e-books help teachers guide students in thinking critically.	83.33
4.	Case study e-books can help students work on HOTS questions	83.33

5.	Case study e-books make it easier for students to collaborate		83.33
6.	E-books based on case studies can make it easier for students to communicate		83.33

Based on the data in table 1 obtained from observations of 5 high school biology teachers using a questionnaire, as many as 0% used case study e-books, 83.33% of teachers stated that case of study e-books were relevant to high school student learning activities, 83.33 % of teachers stated that case study E-books made it easier for teachers to guide students in critical thinking, 83.33% of teachers stated that case study-based E-books could help students in working on HOTS questions, 83.33% of teachers stated that study-based E-books cases can make it easier for students to collaborate, 83.33% of teachers stated that case study-based E-books can make it easier for students to communicate. This is a reference for developing case study-based E-book teaching materials that can improve students' thinking skills which is based on the results of research by Kurniawan Saputra et al (2019), that the use of E-books is effective in improving students' thinking skills and improving problem solving skills.

Analysis of the biology learning process in schools is carried out to find out the obstacles and problems associated with analyzing the lesson plans used by teachers in learning activities. The results of the analysis of the lessons plan (RPP) for biology subject teachers can be seen in Table 2.

Tabel. 2 The Results of Analysis of Teachers Lesson Plan

Cognitive Level	Total Score	$\bar{x} \pm EM$	Average (%)
Remembering (C1)	8	1.60 ± 0.67	21.62%
Understanding (C2)	7	1.40 ± 0.24	18.92%
Applying (C3)	6	1.20 ± 0.48	16.22%
Analyzing (C4)	8	1.60 ± 0.67	21.62%
Evaluating (C5)	0	0	0
Creating (C6)	8	1.60 ± 0.67	21.62%
Total	37		

The results of the teachers lesson plan analysis in Table 2 show that the cognitive level indicators used by teachers are still dominant at the C1-C3 level with an average percentage of 56.74% and the lack of use of cognitive level indicators at C4 - C6 levels with an average percentage of 43.24. %. The cognitive level is a category of Low Order Thinking Skills (LOTS) and the lack of indicators at the HOTS (Higher Order Thinking Skills) level where in the learning process students are expected to have the skills to observe, ask, try, reason, present and create. According by

Kristiyono (2018), that the learning process using LOTS emphasizes students' ability to memorize things that are conveyed by the teacher, where students tend to be inactive or passive, and unable to recognize and solve their own problems.

The use of electronic books in the learning process implemented by many teachers was then analyzed to determine the criteria that the E-books used were case study-based or non-case study-based E-books. The results of the observation of the E-book can be seen in Table 3.

Table. 3 Teacher's E-book Analysis Results

E-book	Case Study	Non Case Study
E-book 1	0	PJBL
E-book 2	0	PBL
E-book 3	0	PBL
E-book 4	0	PBL
E-book 5	0	PBL

Based on the results of observations in Table 3 that have been carried out, it can be seen that the lack of use of case study E-books in the learning process with a value of 0%. This is in accordance with research conducted by Desfaur Natalia et al (2014), that the E-books used by students do not facilitate students to learn independently. Most of the material descriptions are informative and do not direct students to be able to learn according to the competency characteristics for senior high school contained in the 2013 curriculum.

Analysis of student of the needs is also carried out to find out the problems and needs to support their understanding in the learning process. The results of the analysis of the needs and problems of students can be seen in Table 4.

Table 4. The Results of Problem Analysis and Student of The Needs

No.	Indicator	Percentage (%)
1.	Liked Biology lesson	85
2.	The learning process is always accompanied by an E-book	10
3.	Teachers use dominant lecture method	95
4.	It is difficult to understand material that has a broad scope.	75
5.	Feeling difficult to understand the material of environmental change	70
6.	Enjoy learning by observing pictures or videos	85

No.	Indicator	Percentage (%)
7.	Enjoy group learning	80
8.	Enjoy learning with practicum	60
9.	Be motivated by an interesting e-book.	100
10.	Requires an e-book with observational tasks.	80

Based on the results of the analysis in Table 4, it was found that students had various problems in forming their understanding of biological material. As much as that 85% like Biology lessons. The use of E-books for each learning meeting is 10%, this is related to the results of the analysis which shows that 95% of teachers lecture more in the learning process, so that 75% of students find it difficult to understand material that has a wide scope and 70% have difficulty to understand in particular the material of the respiratory system. 85% of students who like to learn by making observations/observations (pictures/videos) before learning, and 60% of students who like to learn by conducting experiments/practicums.

Through needs analysis, the ideal learning criteria according to students are obtained to help them improve understanding with the results of the analysis showing that 100% of students are more motivated to learn if they use interesting E-books. Some of these criteria are as many as 80% like learning with a group system. In addition, 80% of students need an e-book whose questions can be answered based on the results of direct observations/activities, not just copying what is in the literature book/package book.

The process to meet the ideal learning criteria desired by students includes learning with the help of teaching materials that is done in groups, in which there are pictures/videos that support the material, as well as questions that can be answered based on the results of direct observations/activities. This is considered ideal for students because it can require them to be able to process their own information. Based on this, it is necessary to develop teaching materials in the form of case study-based E-books. The solution provided is in accordance with one of the functions of the E-book which can provide students with a varied learning experience, with case study learning it can train students' higher-order thinking skills by solving cases. In line with Natalia's opinion (2014), that case study learning is able to make students think systematically, learn to analyze a problem from various aspects, educate students to be confident, and improve critical and creative thinking skills.

CONCLUSION

Based on the results of initial observations, it can be concluded that the need to develop case study-based E-books can train students' higher order thinking skills. This is obtained from the results of the analysis which shows the dominant use of printed or non-electronic books in the learning process. The cognitive level indicator shows the learning process is still at the C1 and C2 levels at the level of low-level thinking skills.

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The Effect of the Problem Based Learning Model on Student's Critical Thingking Skills at School

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Abstract. This study aims to determine the effect of the problem based learning (PBL) model on students' critical thinking skills in the cell material of class XI SMA Negeri 6 Luwu Timur. This research is a quasi-experimental study using the Pretest Posttest Control Group Design. The research samples were selected randomly (random sampling) so that two classes were obtained, namely class XI IPA 2 as a control class used the lecture method (conventional) and XI IPA 3 as an experimental class with used a problem based learning (PBL) model. The data collection technique used is through tests or evaluations. The collected data is analyzed by descriptive statistics and inferential statistics. The results of descriptive statistical analysis show that the average posttest score in the experimental class is 73.33 higher than the average posttest score for the control class, which is 63.03. The results of inferential statistical analysis show that there is an effect of the problem based learning (PBL) model on students' critical thinking skills in the material for class XI SMA Negeri 6 Luwu Timur.
Keywords: Problem Based Learning, Direct Learning (lectures), Critical Thinking Skills.

INTRODUCTION

21st century learning requires humans to have the ability to think well in making decisions and filtering information. Education today needs to develop high-level thinking skills to face the era of both personal and major life. Thus, critical thinking is a skill that is very necessary in the learning process and it is important to develop it from an early age. Robbins (2005) says that critical thinking skills are abilities that can be utilized, so that these abilities can be learned. One way to develop critical thinking skills is through learning science, especially biology.

Critical thinking is a round that becomes intellectual capital for students as the most important part of thinking maturity. Everyone should find out what is trustworthy and act accordingly. According to Ennis (1996) the ability to think critically is important for us in aspects of life that continuously make a decision to determine what to believe or do. The aim of teaching critical thinking is so that students can learn how to solve problems in a structured and creative way, so they can find various alternative solutions. This critical thinking ability can be developed in the learning process at school.

Critical thinking skills in the learning process in schools have not been well developed. This can be seen from the results of observations at

SMA Negeri 6 Luwu Timur showing that Biology learning was less successful. Teachers still use a one-way learning model consisting of teachers so that learning takes place less effectively and monotonously. According to Sari (2015) conventional learning with lectures has weaknesses in learning so that very few students dare to answer the problems posed. The learning applied by the teacher has not touched significantly the efforts to develop critical thinking skills which ultimately affect the learning outcomes.

One of the efforts to overcome this problem is that a more appropriate learning model is needed, because one that determines learning outcomes is the learning model used by the teacher in the teaching and learning process to achieve the goal. This greatly affects the behavior of students. As a teacher, you should not continuously convey material if you want students to develop a scientific attitude. One of the learning models that can be used in the learning process is the Problem-Based Learning (PBL) model.

Problem-Based Learning is a learning model that raises issues and problems that occur around students where these issues are related to certain materials in teaching. This model is designed to make students think actively both independently and in groups. Learning with the PBL model is based on the principle that problems can be used as a starting point in gaining new knowledge. EL-Shaer & Gaber (2014) in his research entitled Impact of Problem-Based Learning on Students' Critical Thinking Dispositions, Knowledge Acquisition and Retention has introduced PBL as a substitute for teacher-centered learning. The results showed that apart from critical thinking skills, students' knowledge acquisition and retention also increased. Based on this background, this study aims to determine the effect of the PBL model on the critical thinking skills of class XI students in Cell material.

RESEARCH METHODS

This research was conducted at SMA Negeri 6 Luwu Timur. This quasi-experimental study uses a Pretest-Postest Control Group Design. The population of this study were students of class XI consisting of 2 classes. Class XI MIPA 2 as the control class is taught using the lecture learning model and Class MIPA 3 is the experimental class which is taught using the Problem Based Learning learning model. The sample in this study used a random sampling technique. The variable that is measured is students' critical thinking skills. Students' critical thinking skills were obtained from the pretest and posttest scores which were tested using descriptive analysis techniques and inferential analysis. Inferential analysis is used to test the

hypothesis by using the one-way ancova test. One way analysis of variance (ANOVA) was used as a hypothesis test in this study. The significance level used in hypothesis testing is 0.05 (sig. $\leq$ 0.05). Before testing the hypothesis, the data is tested first to find out whether the data meets the assumptions of normality and homogeneity. Hypothesis testing and assumption testing were analyzed using SPSS 24 for windows.

RESULTS AND DISCUSSION
1. Descriptive Statistical Analysis

This study, student Critical Thingking Skills who received conventional learning and students who received PBL model were measured. Measurements were made at the beginning of the study (pretest) and the end of the study (posttest).

Table 1 The Average Value of the Test Critical Thingking Skills

Class	N	Mean Pretest	Mean Postest
Eksperiment	33	39.62	73.33
Control	33	36.57	63.33
Total	66		

Based on Table 1, the value of the critical thinking skills of students in the experimental class is always higher than that of the control class, both at the pretest and posttest. From these data it can be seen that students who receive PBL learning have higher critical thinking skills compared to students who receive conventional learning.

Table 2 Distributed of Pencentage The Test of Critical Thingking Skills

Interval	Category	Eksperiment Class		Control Class	
		Pretest	Posttest	Pretest	Posttest
81-100	Very high	0	21.21%	0	0
61-80	High	0	72.72%	0	72.72%
51-60	Medium	0	6.06%	0	24.24%
21-50	Low	100 %	0	100%	03.03%
0-20	Very Low	0	0	0	0
	Amount	100%	100%	100%	100%

Based on Table 2, the percentage of students' critical thinking skills test scores in the experimental class reached the very high category, namely 21.21% and the rest were in the high and medium categories. Whereas in the control class the students' critical thinking skills test scores reached the high category of 72.72% and the rest were in the medium and low categories, but none touched the very high category. This shows that

the experimental class taught using the PBL model has a higher level of critical thinking skills compared to the control class which uses the lecture method.

2. Inferential Statistical Analysis

The data that has been collected is then analyzed using a hypothesis test that has been determined by the research method. Based on the results of the assumption test, the data meets the assumptions of normality and homogeneity. Thus, the data can be continued to be analyzed using one way ANCOVA. The Ancova test results are presented in Table 2.

Table 3 The Ancova test results

Diversity	SS	DF	MF	F	Sig.
Class	944.921	1	944.921	19.948	0.000
Error	2984.219	63	47.469		
Total	312950.000	66			

Based on Table 3, a significance value (Sig) of 0.000 <0.05 is obtained. Meanwhile, based on Table 1, the posttest data for students in the treatment class is higher than the control class. Thus, based on these two tables, students who receive PBL learning have significantly higher Critical Thinking Ability compared to students who take conventional learning. So it can be said that the PBL model tends to have more potential in improving the thinking skills of class XI students in cell material.

Score of students' ability to solve critical thinking questions with different indicators in the experimental class and the control class both increased from pretest to posttest. The average score of the experimental class experienced a higher increase compared to the control class. The increase in students' ability to solve problems with indicators of critical thinking in the experimental class was higher with the PBL learning model compared to the control class which was taught with conventional methods such as one-way lectures. This is because the experimental class which is taught using the PBL model has learning stages that accommodate students to better understand the material, so that the learning process is more active than the control class which tends to be passive. This is in line with the opinion of Arends (2008) which states that PBL helps students analyze and evaluate their own thinking processes as well as their investigative skills and intellectual skills. Afcariono (2008) also stated that problem-based learning provides conditions for improving critical and analytical thinking skills and solving complex problems in a real environment.

PBL model syntax consists of five phases that can facilitate students in developing critical thinking skills through the problem solving process. The results of the study proved that the level of critical thinking skills in the experimental class in solving problems was higher than that of the control class. This is because in the learning process of the PBL model students tend to develop high-level critical thinking activities while the control class develops low-level thinking activities. As explained by Torff (2011) who divides critical thinking skills into two parts, namely high-level critical thinking and low-level critical thinking. High-level critical thinking activities include discussion, debate, problem solving, problem finding, giving opinions, making decisions, criticizing, analyzing, writing imagination, and classifying. Low-level critical thinking activities include taking notes, searching for words, filling in blank worksheets, watching videos, matching, memorizing, and summarizing.

Critical thinking skills of the control class which were taught using the lecture method were not well developed. In addition to lower posttest results than the experimental class, this is also due to direct learning using the lecture method causing passive students, monotonous learning and only copying explanations from the teacher which causes a lack of development of students' thinking power. This is in accordance with the statement of Miri et al. (2007) who said that teachers must be able to train students' higher-order thinking skills, for example by using real-world problems, encouraging class discussions, and conducting investigations will be able to develop students' critical thinking skills. The lecture learning method in the control class is not supported by activities that can develop students' critical thinking skills, in contrast to the experimental class where the learning process uses the PBL model as a process for developing high-level critical thinking activities.

CONCLUSION

The results showed that the PBL model had a positive effect on students' critical thinking skills. Based on the results of the study of the application of the PBL model to students' critical thinking skills in cell material, it can be concluded that there is an influence of the PBL model on students' critical thinking skills in class XI.

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Analysis of the Need For Development of Google Sites Web-Based Learning Media on Motion System Materials For Class XI SMA

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Abstract. This study aims to analyze the level of needs of students and teachers in high school (SMA) for learning media for motion system materials. The research method used is descriptive. The research subjects were two biology teachers and 30 students of class XI IPA 2. Data collection techniques used interview methods and questionnaires. Based on the results of interviews with biology teachers, especially in the presentation of motion system material, information was obtained that (1) the learning media used in the learning process were in the form of printed books and modules containing material with a less attractive and monotonous appearance. (2) Teachers rarely use learning media that are integrated with technology even though there are adequate Wi-Fi facilities (3) The use of PowerPoint in the form of text that is displayed makes students not focus on the material because the display is monotonous and lacks supporting images and animations. Meanwhile, the information obtained after distributing needs analysis questionnaires to students obtained information that (1) as many as 87% of students stated that the use of learning media in the form of printed books and power points did not motivate students in learning (2) As many as 63% of students stated that media in the form of printed books is inadequate so that students have to share textbooks, which results in not all students being maximal in learning (3) Up to 100% of students claim to own smartphones. (4) As many as 83% of students need learning media that is integrated with technology in other words can be accessed through mobile learning on motion system material. Need for the development of web-based learning media Google sites aim to increase students' motivation and interest in learning so that there is an increase in the quality of learning and to assist teachers in the learning process who still use conventional learning media. In addition, the development of learning media based on the Google Sites web is a media innovation and is a form of integrating technology into the learning process in the 21st century. Based on the results obtained, it can be concluded that the development of Google Sites web learning media is needed to support a more effective learning process.
Keywords: Google sites web, Learning Media, Motion system

INTRODUCTION

Science and technology are developing so fast that it encourages everyone to respond quickly to any such developments to keep up. Advances in information and communication technology have changed the way humans work, socialize, play and learn. The progress of science and technology is in line with the 21st century, and these technological

advances have entered all aspects of life, one of which is the aspect of education which currently refers to multidimensional education that prioritizes scientific and technological approaches.

The advancement of information technology in education requires teachers to be able to take advantage of super-fast advances in information technology to improve the quality of the teaching and learning process and prepare superior human resources. Therefore, improving teacher competence is important. Technological adjustment in the learning process is one of the challenges for a teacher so that teachers must continue to make new breakthroughs in the teaching and learning process in achieving learning goals. Breakthroughs and innovations that teachers can make are supported by the availability of adequate internet network connections, smartphones and laptops. This is supported by data submitted by the Indonesian Statistics Agency which shows an increase in the use of smartphones and laptops with a percentage of 62.84% in 2020. The increase in internet use by students was 53.73% in 2020. This proves that children with junior high to high school age have a considerable concern in the use of smartphones and laptops. New innovations are needed in utilizing smartphone media in a more useful direction, one of which is used as a means of learning media, especially in science learning.

A teacher has a very important role in the success of the learning process. Facilities that can support both teachers and students in the learning process are learning media that function as mediators or intermediary tools from teachers to convey learning content to students. The use of learning media is very helpful for teachers in teaching and makes it easier for students to receive and understand lessons. The importance of using learning media is in line with the Student Centered Learning paradigm, where teachers are not presenters of material or information and are not the only source of knowledge, but as mediators and facilitators (Putri & Citra, 2019).

Learning media is a tool used by teachers to help achieve learning goals. Learning media can also be called everything that can be appropriately used as a message delivery, providing stimuli and even providing motivation for students to pay attention to learning so that it can encourage effective learning. Learning media can also be said that a way, technique and method used to increase student motivation and learning in order to achieve learning outcomes in accordance with the indicators that have been made by an educator (Hamid et al., 2020).

The web that can be utilized in the learning process is Google Sites. Web Google Sites are still rarely used among teachers. Google Sites is an online application launched by Google since 2008 to make creating a class,

school or project website as easy as editing a document. Google Sites is one of Google's products as a tool for creating sites. Google Sites is very easy to use, especially to support learning by maximizing features such as Google Docs, Google Sheets, Google Forms, Awesome tables and so on (Azis, 2019).

Google Sites has various advantages over web bloggers in general. Free Google Sites web hosting service that has been provided by google so that it can create a website that can present various interests on the internet. Google Sites has several features in the form of elegant and simple design templates. Google Sites can be combined with the functions of Analytics, Webmasters Tools, and of course Adsense easily and practically. To connect such features the user only needs to copy the code provided on the code template. Google Sites can be accessed using gadgets provided by Google as well as designed by some parties outside of Google. Google Sites also provides several links to access the various information needed (Harsanto, 2014).

RESEARCH METHODS

This research is a descriptive study. The data obtained through the distribution of questionnaires to 30 students in one study group and conducting unstructured interviews with 2 biology teachers at SMAN 4 SIDRAP. The sampling technique uses a random sampling technique because basically we don't know the ability of all learning groups so it is taken randomly. Data analysis in this study was carried out by reducing the data obtained from the results of the distribution of questionnaires. The research data obtained is then presented descriptively so as to produce research conclusions regarding the need for the development of web-based learning media google sites on the material of the movement system class XI SMA.

RESEARCH RESULTS & DISCUSSION

Data analysis in the research conducted by outlining the needs of teachers and students for the development of google sites web-based learning media that can support the learning process, especially in the motion system. The results of the needs analysis are the basic reference for the development of google sites web-based learning media. Needs analysis is carried out by providing questionnaires to biology subject teachers and students. The results of the analysis of teachers' needs for the development of google sites web-based learning media can be seen in Table 1.

Table 1. Results of Teacher Needs Analysis

No	Question	Answer	
		Teacher 1	Teacher 2
1.	What learning media do you use in the learning process	Printed books, material files	Printed books, power points
2.	According to you, are there any obstacles faced when studying Biology subjects, especially motion system materials?	Yes, there are obstacles in the form of inadequate biology package books	Yes, the use of books and powerpoints does not attract the attention of students
3.	Whether the existing or currently used learning media is sufficient to support the learning process?	Not yet	Not yet
4	Have you ever used learning media in the form of the web?	Never	Never
5	Do you think it is important to use technology-based learning media that is in accordance with current developments?	Very important, because it can attract the attention of learners, facilitate learning activities	Very important, in order to help improve the quality of learning and not to go out of style
6.	Have you ever used learning media in the form of web Google sites?	Never	Never
7	Do you need technology-based learning media that contains material, learning videos and assignments contained in one learning media?	Yes, if there is something more efficient, of course, it will be better in supporting the learning process	Yes
8	According to you, whether there is a need for Google Sites web-based learning media that contains material equipped with clear images, there are learning videos and learning assignments	Yes, If the google sites web feature is like that then I think it will make it easier for students to learn and be a solution to the lack of a Biology handbook	Yes, the learning media can be used in schools with the availability of Wi-Fi networks and allowing students to use cellphones during learning
9	Do you think the use of web-based learning media google sites is appropriate to use in the learning process?	Appropriate because it is an innovation in learning	Appropriate, because its use is more practical and flexible
10	Do you think that the use of web-based learning media google sites on motion system	Exactly, because it is more efficient and technology-based	Exactly

materials is appropriate to be
used in the learning process?

The results of the analysis of Table 1 explain that in learning biology, especially the material of the motion system, has not been effective. This is due to obstacles in the learning process of motion system material biology such as the lack of variety of learning media used in addition to printed books and powerpoints. Google Sites web-based learning media has never been developed and used by teachers so that the procurement of google sites web can provide convenience for teachers because the presentation of material, HD quality images, and learning videos are packaged in one google sites web whose use is flexible as long as the device is connected to the internet network.

Google Sites web-based learning media can be used to support the learning process, especially motion system materials. The procurement of web-based learning media google sites is a form of innovation and integration of technology into the learning process so that teachers do not only race on the use of conventional learning media in the form of limited numbers of books.

The use of web-based learning media google sites can attract attention, increase students' interest in learning and train students' learning independence. This is in line with research Darussalam (2015) suggesting that the use of web-based learning media in the learning process has several advantages, namely 1) students can do independent learning so that they can improve and expand knowledge, 2) students will do more learning activities because they not only focus on listening to information from the teacher but can also carry out image and video observation activities.

Google sites web used in learning can be said to be efficient because the presentation of interestingly packaged materials, videos, and tasks is available in one learning media. This is in line with Aziz (2019) stated that the advantages of google sites can make learning more interesting because it can collaborate google sites with other learning sites, can store learning materials accompanied by learning images and videos, can be combined with google groups that allow students to have thematic discussions and there is a web page template feature to display articles so that it can add insight learners.

In addition to analyzing teacher needs, researchers also analyze the needs of students through the distribution of questionnaires presented in Table 2 below.

Table 2. Results of Students Needs Analysis

No	Question	Answer			
		Yes	Percentage	No	Percentage
1	Do you think the material of the motion system is difficult to understand?	16	53%	14	46 %
2	Do teachers use learning media in the form of printed books?	26	86,33%	4	13,33%
3	Do you have a Handbook of Biology?	19	63,33%	11	36,66%
4	Are there any other learning media that teachers use when presenting motion system materials?	27	90%	3	10%
5	Do the learning media that have been used motivate you to learn biology?	4	13,33%	26	86,67%
5	Has the learning media used helped to understand the material of the motion system?	17	56,67%	13	43,33%
6	Do you have a smartphone?	30	100%		
7	Do you often use smartphones in the learning process?	23	77%	7	23,33%
8	Do you often look for learning materials through websites?	19	63,33%	11	36,66%
9	Is there adequate Wi-Fi (network connection) facility at the school?	26	86,67%	4	13,33%
10	Do you need learning media that can be accessed via smartphone / laptop by containing materials, images, videos and schoolwork?	21	70%	9	30%

The results obtained from the analysis of student needs in Table 2, show that students still find it difficult to understand the material of the motion system because they still use conventional learning media in the form of printed books that are limited in number so that students are not optimal in learning. The monotonous use of printed books makes students less interested so that it has an impact on student learning motivation. The existence of supporting facilities can be used as a solution to increase

student learning motivation through google sites web sites because generally students need learning media that contains material, images, videos and schoolwork and can be accessed through mobile learning, especially smartphones and laptops.

The presence of smartphones in the learning process provides easy access to various learning information that is not limited by time and space. This is in accordance with Yuniati (2012) who stated that mobile learning is an alternative learning medium that has unique characteristics, namely it does not depend on place and time. According to Kumar (2013), mobile learning has the advantage of increasing mobility and saving time, allowing students to access learning content in various places and times, providing learning opportunities at their own pace, and stimulating students to learn comfortably and interestingly.

Web google sites can be utilized in the learning process equipped with telecommunication and multimedia facilities (graphics, audio and video) as the main media in delivering material and interaction between teachers and students. The use of web google sites in the learning process aims to attract attention and increase the learning motivation of participants in the community so that effective learning occurs. This is in line with Syakhiroh's research (2020) stated that the use of web google sites as a learning medium can be said to be effective with an increase in learning outcomes with an increase in the average score from 72.59 to 85.36, which is 17.5%. Google Sites web learning media can be used as a choice of learning media both offline and online so that students are trained to learn independently and students do not only rely on package books to obtain information.

CONCLUSION

Based on the needs analysis, the results were obtained that teachers and students need learning media with google sites on motion system materials to support the learning process and increase student interest and motivation for learning which allows effective learning to occur.

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Guided Inquiry Learning To Scientific Attitudes: The Experimentals Evidence

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Abstract. This research is a quasi-experimental research that aims to determine the influence of the guided inquiry learning model on scientific attitudes of students in class XI MIPA on the motion system material at SMA Negeri 1 Kodeoha. The independent variable was guided inquiry learning model and the direct instructional model, while the dependent variable was the scientific attitudes of students on the motion system material. The population in this study were all students of class XI MIPA SMA Negeri 1 Kodeoha as many as 4 classes. The sample class was XI MIPA 2 as a control and class XI MIPA 1 as an experimental class. Both class having also with 30 students. The research data were obtained by giving a form scientific attitude questionnaire in the form the motion system material. The results of the analysis of the scientific attitude questionnaire data for the experimental class and the control class using the t-test obtained t_{count} of 4.288 and t_{table} at a significant level ($\alpha = 0.05$) of 2.0484, so $t_{count} > t_{table}$. It can be concluded that there is an influence of the guided inquiry learning model on scientific attitudes of students in class XI MIPA on the motion system material at SMA Negeri 1 Kodeoha.
Keywords: Guided Inquiry, Direct Instruction, Scientific Attitude.

INSTRODUCTION

Education is meant to improve human resources. The government wants to raise the standard of education in Indonesia through upgrading the curricula in order to meet these educational objectives. A new paradigm, the 2013 curriculum should deliver a more learner-centered education. This indicates that pupils actively participate in learning activities and the teacher merely serves as a facilitator. Observing, asking questions, gaining facts, connecting, and communicating are some of the 2013 curriculum learning activities (Gumilar, 2020). Permendikbud number 103 of 2014, which aims to develop three domains that are inherent in students, namely affective (attitude), psychomotor (skills), and cognitive (knowledge), in the learning process in general can develop students' potential is growing through a scientific approach, has regulated the application of the 2013 curriculum in the learning process (Ministry of Education and Culture (2017).

The goal of the learning process is to be able to equip students with knowledge, comprehension, and the capacity to think, operate, and act in a scientifically sound manner (Atika, 2016). Biology education places a

strong emphasis on providing hands-on experience. Three fundamental elements make up science's nature: biology as a process, an attitude, and a product. When you refer to biology as a product, you're referring to an organized body of knowledge made up of facts, ideas, rules, theories, and generalizations. In order for students to find and apply what they have learned in biology, they must engage in a thought process, one of which is the development of process skills in the natural sciences. Biology as an attitude means that every student must have a scientific attitude, such as a conscientious, objective, honest and open attitude (Nirtamalasari, 2017). Direct learning experiences through the application and development of process skills and scientific attitudes are given increased importance in biology education. According to Baharuddin in Atika (2016), a scientific attitude is a person's propensity to act or conduct in a way that uses scientific methods to solve problems systematically. Additionally, Natsir in Kurniawati (2018) claimed that a scientific attitude is a knowledge attitude that is crucial for students to develop. The range of indicators for a scientific attitude includes curiosity, integrity, an empirical bent, critical reasoning, and accountability. The availability of instruction that stresses science process abilities will aid pupils in developing a scientific outlook.

Scientific attitude has two meanings, namely *attitude toward science* and *attitude of science.* The *attitude towards science* refers to the attitude towards science while the *attitude of science* refers to the attitude that is attached after studying science. Scientific attitude is one of the characters possessed by scientists, this character must be owned when students learn science lessons to achieve the expected results. In addition, the scientific process is based on logical thinking based on supporting facts (Ambarwati, 2017). This opinion is consistent with Jumadi (2015) "Scientific attitude is an attitude that is inherent in a person in seeking and developing new knowledge".

Setiawan (2018) suggests that there are 4 main attitudes that must be developed in science, namely: "(a) *curiosity,* (b) *inventiveness,* (c) *critical thinking,* and (d) *persistence"*. Furthermore, Hendracipta (2016) says that a scientific attitude through guided inquiry-based learning activities means that every step of the learning activity must contain elements of activities to foster a scientific attitude which includes an objective/honest attitude, not in a hurry, drawing conclusions, being open, not mixing facts. with opinions, being cautious, wanting to investigate or high curiosity *(couriosity).* According to Wahyudi (2019), students with a high scientific attitude are more productive in learning both in class and in the laboratory, so that student academic results are better. Every student who will conduct scientific activities, such as watching, observing, communicating,

measuring, and others, must have a scientific attitude when learning biology. An open mindset, critical thinking, being free from deviations, accepting others' viewpoints, preserving honesty, patience, thoroughness, precision, and discipline are of course all supported by scientific work, which is a talent in the science process (Rahmah 2019). According to Kerch in Pertiwi (2013), teachers must truly be able to choose, organize, and process learning materials and resources in order to obtain the best learning results and mold students' scientific attitudes. The active involvement of students both physically and mentally in practicum activities will later have an influence on the formation of student action patterns which are always based on scientific matters (Sagala, 2013).

Because students might come up with new ideas by interacting with a symptom, the scientific mindset is crucial to learning biology. Students with a strong dedication to learning and a high level of scientific mindset will think clearly and be highly motivated. It is important to cultivate a scientific mindset in students because they will serve as positive role models for them when conducting research or interacting with others in society (Guswita, 2018).

The learning process is still teacher-centered and students are still passive in the learning process, according to the findings of observations on the scientific attitudes of students at SMA Negeri 1 Kodeoha for the 2021–2022 academic year. Students' participation in discussions, demonstrations, and question-and-answer lectures does not exhibit a scientific mindset. When learning in class, students frequently simply pay attention to and listen to the teacher's explanation. Thus, students' attitudes and behaviors continue to be less material-focused, and their level of confidence is still low. The interaction of students asking the teacher as an attitude of curiosity when asking questions or expressing opinions does not materialize in the learning process.

These issues are definitely not related to the quirks of biology, and teachers continue to control the learning process and give emphasis to product-related factors over process and attitude-related factors. As a result, science is not at all treated as a process or attitude in the educational process. By using the appropriate learning model, these issues can be solved, and with that model, students' attitudes toward science can advance. Applying the guided inquiry learning methodology is one way to go about it (Nirtamalasari, 2017). According to Nuraini (2015), a sort of scientific process-oriented learning model that stresses actions, skills, and knowledge through active search based on curiosity is the guided inquiry learning model. Additionally, the guided inquiry learning model's grammar is ideal for fostering in pupils a love of science. Based on this assertion,

the guided inquiry learning model can be viewed as an effective teaching strategy for fostering students' interest in science. This teaching method places the learner at the center of the process, encouraging engagement. Students can make experimental improvements so that the information obtained can be stored in the memory of students for a longer period of time (Nirtamalasari, 2017).

The guided inquiry learning model according to Amijaya (2018), succeeded in making the learning atmosphere more active. This learning model is student-centered which makes students more active in the learning process and the teacher is no longer the only source of information. The syntax of the guided inquiry learning model consists of five phases, namely: 1) the identification phase and determining the scope of the problem, 2) the hypothesis formulation phase, 3) the data collection phase, 4) the data interpretation phase, and 5) the conclusion development phase. The Guided Inquiry Model syntax has the potential to improve students' science process skills and science attitudes (Wulanningsih 2012).

The success of guided inquiry learning has been proven by several previous studies, one of which is Gumilar's research (2020) which states that the scientific attitudes of students who learn through guided inquiry learning have better social interaction than the scientific attitudes of students who learn using conventional learning models. The same thing in Atika's research (2016) the effect of the inquiry model practicum method on scientific attitudes and student learning outcomes concludes that there are differences in learning outcomes and scientific attitudes between students who are given lessons using the inquiry learning model combined with practicum methods with students who are given lessons using the learning model conventional. The guided inquiry learning model provides opportunities for students to learn actively which trains students to solve problems and make decisions based on observation and research. The teacher's role is only as an instructor who guides students and finally students are trained to use the guided inquiry learning model. Based on the background and problems above, the researcher is interested in conducting research with the title "Guided Inquiry Learning to Scientific Attitudes: The Experimentals Evidence".

RESEARCH METHODS

This type of research is a *quasi experimental research.* Treatment is given to the experimental class and the control class. The population in this study were all study groups in class XI MIPA SMA Negeri 1 Kodeoha consisting of 4 study groups, while the samples in this study were taken by *random sampling* . The entire population in each class is considered to have

relatively the same initial abilities, so class XI MIPA 1 with a total of 30 people is chosen as an experimental class taught with the guided inquiry learning model and class XI MIPA 2 with a total of 30 people as a control class taught with a direct learning model *(direct instructions)*. The data collection technique used in this research is to use a non-test instrument in the form of a questionnaire which will be used to measure students' scientific attitudes. Analysis of research results using descriptive statistical analysis and inferential statistical analysis.

RESULTS AND DISCUSSION
Results
1. Descriptive Statistical Analysis

Table 1 The mean value of the experimental class and control class scientific attitude questionnaire

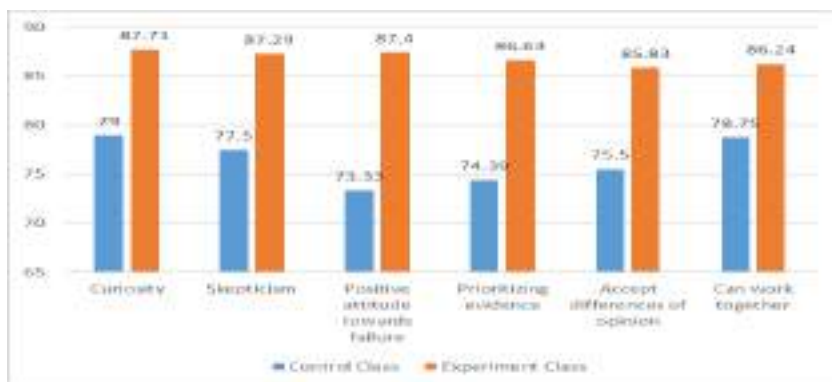| Class	Average Scientific Attitude of Students	Category
Experiment	69.23	High
Control	60.53	Medium

Figure 1 Percentage diagram of scientific attitude indicators in the control class and experimental class

2. Inferential Statistical Analysis

Table 2 Results of the Scientific Attitude t-test of the Control Class and the Experimental Class

Statistics	Value	Results	Conclusion
t_{count}	4.288	$t_{count} > t_{table}$	H_1 is accepted
t_{table}	2.0484		

DISCUSSION

Testing the hypothesis of the experimental class and the control class using the t-test is known that there is a significant difference between the experimental class and the control class. This is evidenced by $t_{count} > t_{table}$, namely (4.288 > 2.0484). This shows that there is a significant difference in the use of guided inquiry learning models on the scientific attitudes of students in the motion system material. In accordance with the main principle of guided inquiry that students can build their own understanding by carrying out active activities in learning activities. The description of the scientific attitude indicators is as follows:

a) **Curiosity**

Curiosity is a mindset that constantly seeks the correct response from the subject being observed. Two sub-indicators of a scientific attitude are seen in the curiosity indicator: attention to the object being observed and exhibiting passion for finding solutions. The experimental class's curiosity indicator percentage, which is 87.71%, is higher than the control class's, which is 79%. This is due to the fact that there are stages of data collection in the experimental class taught using the guided inquiry learning model, and as a result, the students' eagerness to learn is closely related to what transpired during the experimental activities carried out to encourage attention to the object being observed. This is consistent with Hagtvedt's (2019) assertion that curiosity might develop while examining objects or other similar stimuli. Additionally, students' interest grows as a result of participating in experimental activities, which increases their passion for seeking solutions. Students are motivated by curiosity to solve the difficulties presented (Hendracipta, 2016).

b) **Skepticism**

Skepticism is a doubting mindset where one always has their doubts if there isn't very convincing proof. Being objective/honest and not manipulating data are two sub-indicators of the skeptical indicator that are detected. The experimental class's skeptical indicator percentage, which is 87.29%, is higher than the control class's, which is 77.50%. This is because there are several stages of data gathering and experimentation opportunities in the experimental class that uses the guided inquiry learning approach. Honesty in data collecting is a sign of the scientific mindset that should be present in experimental operations. Students are supposed to write based on observations and decisions they make based on the facts in order to avoid manipulating the data. Suryani (2015) claims that in order to revise your findings when new evidence is discovered,

being skeptical sometimes requires you to have doubts about the conclusions you draw.

c) Positive Attitude Towards Failure

According to Uno (2008), the ability to sustain a realistically positive attitude in this case, the attitude of students who constantly expect well and do not quickly despair is what constitutes optimism or a positive attitude toward failure. Three sub-indicators have been identified for the positive attitude indicator toward failure: continuing the experiment despite the failure, finishing the assignment entirely, and finishing an activity even though a classmate had already finished it. The experimental class's percentage of positive attitude indicators regarding failure is 87.40%, which is higher than the control class's rate of 73.33%. This is due to the fact that students in the experimental class using the guided inquiry learning model are more conscientious and the teacher always encourages students who fail so they become more interested about discovering facts in observations. Dewi Utami claims in Gusmentari (2014) that as science is subjective, it demands persistence to carry out further studies or tests. As a result, when students engage in experimental activities that are unsuccessful, they should attempt again to collect more accurate data rather than giving up right away.

d) Attitude to Prioritize Evidence

In all scientific endeavors where this approach may support its conclusions and assertions, evidence must always take precedence. Three sub-indicators of the attitude indicator that prioritizes evidence have been identified: disputing friends' conclusions, replicating their actions, and paying attention to the data despite its modest size. Evidence-prioritizing attitude indicators account for 86.63% of the experimental class's attitude indicators, compared to 74.39% in the control group. When tabulating data and making this the focal point of the observation activities to support a conclusion, the attitude of valuing evidence in learning using the guided inquiry paradigm is evident. Evidence is prioritized in this way because the conclusions reached must be backed up by empirical data that is relevant to the facts; in this case, this data must come from both classroom issues and accurate information. Basically, students' cognitive and spiritual capacities will be impacted by erroneous information (Sukaesih, 2011).

e) Attitude to Accept Differences of Opinion

Two sub-indicators, taking input from other people's opinions and respecting other people's opinions, are observed under the attitude

indicator of accepting differences of opinion. The experimental class's acceptance of variations in opinion is indicated by a higher percentage 85.83% than the control class's, which is 75.50%. When providing the experimental data as a topic for debate, the guided inquiry learning approach exhibits the attitude of accepting differences of opinion. Students can now cultivate an open mindset to receive advice from friends. Students in this situation are willing to admit that others may have more knowledge and feel that their opinion is incorrect while others' opinions are correct, according to Suryani (2019), who claims that the attitude of accepting differences of opinion is the attitude of someone who does not feel he is the greatest. After being put to the test, students will accept other people's opinions. Students who want to learn more are open to hearing other people's perspectives and contrasting their own, demonstrating a high level of tolerance and a lack of conceit.

f) Attitude to Cooperate

A good scientist, according to Suryani (2015), is able to work with others and is not selfish or individualistic in this situation since he knows he cannot survive without their assistance. Two sub-indicators, actively participating in groups and appreciating other people's opinions/findings, are seen in the indicator of the attitude of being able to work together. The experimental class's rate of attitude indicators that can cooperate is 86.24%, which is higher than the control class's rate of 78.75%. This is so that students can exhibit the necessary scientific attitude of being able to collaborate with their group friends in order to advance knowledge. The experimental class is taught using a guided inquiry learning paradigm. Additionally, students are aware that other people may possess knowledge beyond their own.

Data analysis revealed that students in the experimental class who were taught using the guided inquiry learning model had a more positive attitude toward science than those in the control class who were taught using the direct instruction style. This is due to the fact that the guided inquiry learning model can give students the chance to actively engage in the science learning process. Learners discover the ideas being learned on their own, based on the provided problems. As a result of students only accepting the concepts the teacher conveys, the enthusiasm for seeking solutions is less developed in the control class, which is taught using the direct instruction model and does not require active activities from students in translating or giving meaning to a statement.

According to Dobber's (2017) assertion that the guided inquiry learning model is the ideal way as a learning center to build students'

thinking abilities and facilitate students' scientific attitudes, there is evidence that the model has a substantial impact on students' attitudes toward science. The findings confirm that the guided inquiry learning model is one that should be taken into account because it not only stresses the acquisition or discovery of answers but also fosters students' interest by allowing them to conduct searches and produce further studies and analyses.

CONCLUSION

Based on the results of the statistical test analysis that has been carried out, it can be concluded that there is an influence of the guided inquiry learning model on the scientific attitudes of XI MIPA class students on motion systems material at SMA Negeri 1 Kodeoha.

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Analysis of the Need for The Development of an Enrichment Flipbook from the Study Results of Orchid Diversity in Mallawa Resort, Bantimurung Bulusaraung National Park, Maros Regency

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Abstract. In order to create an enrichment flipbook that will serve as an additional learning resource for students studying biodiversity material, this study will analyze the needs of teachers and students. The research looked at the diversity of orchids at the Mallawa resort, Bantimurung Bulusaraung National Park, and Maros Regency. This study employed a descriptive qualitative methodology. A questionnaire was used to gather the information. The results of the needs analysis show that all teachers and 96.55% of students would support the creation of an add-on book in the form of a flipbook as a learning resource that can be used as an additional source of information to support learning, particularly when it comes to biodiversity-related topics. Based on this, it is important to create a flipbook-style orchid diversity enrichment book that may aid in the teaching of biology in classrooms.
Keywords: Enrichment book, Flipbook, Learning Resource, Orchids.

INTRODUCTION

The development of science and technology took place very rapidly. As we enter the 21st century, these technological advances have penetrated various joints of life, not least in the field of education. The development of existing technology has supported many learning resources with the aim of facilitating learners in the learning process. Adnan (2015) stated that the greatest benefit of technology in learning is that it empowers and helps build thinking and knowledge. Students can quickly solve problems, make decisions, communicate, and collaborate with each other.

The learning and teaching process is inseparable from teaching materials that involve educators and learners (Ramadani, 2012). An educator must involve the role of varied teaching materials in the learning process to achieve the learning objectives according to the demands of the curriculum. Teaching materials used by educators can be primary learning resources or additional learning resources. The right teaching materials can certainly improve human resources in a positive direction.

Learning resources are all sources in the form of data, people, and certain forms that can be used by students in learning, both separately and in combination, so as to make it easier for students to achieve learning

goals or achieve certain competencies (Cahyadi, 2019). Books are a form of learning resource that present the thoughts of the author. A textbook is a book that is widely used in learning. The textbook is a mandatory reference book for use in educational units, both basic and secondary, and universities that contain learning materials. In addition to textbooks, non-textbooks can also be used to support the learning process at every level of education.

Enrichment books are included in non-text books that contain supporting materials. Enrichment books consist of knowledge enrichment books, skill enrichment books, and personality enrichment books (Center for Books, in Kusumo and Glena, 2017). Enrichment books can be obtained from various sources that are tailored to the purpose of their manufacture. The spread of the book is expected to improve students' understanding and habituation to reading. "Enrichment books can be used as a source of independent learning so that they can gain broader and deeper knowledge" (Suryani and Atun, 2017). The development of enrichment books can be obtained from a variety of references, either from direct observation by researchers or other sources relevant to the material presented. This enrichment book can also be used as a medium to introduce and preserve local culture.

Based on the results of observations conducted in September 2020 by interviewing biology teachers and Grade X students at SMAN 2 Maros, information was obtained that the learning resources used in the learning process are still conventional learning resources in the form of package books and LKPD. In addition, the use of learning resources in this school is still less varied, so the relationship between teachers and students is less interactive because the communication process only occurs in one direction, namely, learning only focuses on the explanation given by the teacher without any feedback from the students. The findings of the interview revealed saturation and a lack of motivation to learn among students when it came to receiving the material, which was caused by a lack of variety in learning resources that could help students understand the material presented by the teacher. In the learning process, it was found that students are less attentive and less confident. This can be a benchmark that shows students are less motivated.

One solution that can be used to overcome the problem of limited learning resources is to take advantage of existing technology and integrate it with learning materials so that practical, efficient, and interesting learning resources can be produced. Practical and efficient learning resources will make it easier for students to access them anytime and anywhere, so that the frequency of learning activities increases. Flipbook

is a type of classic animation made from a stack of paper that resembles a thick book, on which the process of something that later appears moving or animated is described on each page. With the development of technology, printed books are now replaced by three-dimensional digital books known as flipbooks, where pages can be opened and read on a monitor screen (Fuad, 2017).

Based on the description above, the author feels motivated to create additional learning resources, namely the add-on book on orchid diversity, presented in the form of a flipbook. The content of the material contained in the enrichment book is based on orchid diversity studies conducted at Mallawa Resort and Bantimurung National Park and has been adapted to the needs of and with attention to the characteristics of the add-on book. The goal is to support the biodiversity material and broaden students' understanding of the diversity of orchids around them.

METHODS

The study was conducted in April 2022 using a qualitative descriptive method. The research subjects consisted of 2 biology teachers and 29 students from Class X SMA at SMA Negeri 2 Maros. The research instrument used in the study was the analysis of the needs of students and teachers in the form of an observation questionnaire to analyze the needs of the developed flipbook. Research data were collected through interviews with teachers and students and questionnaire observation sheets from teachers and students. The data was gathered through unstructured interviews and the distribution of questionnaire sheets to biology teachers and students. The data obtained were then presented to generate research conclusions regarding the need for the development of high school teaching materials in the form of add-on flipbooks. The results of the needs analysis serve as the basis for determining alternative solutions and recommendations for flipbook specifications that must be developed.

RESULTS AND DISCUSSION

This study aims to describe the needs of teachers and students in relation to the development of an add-on book on orchid diversity in the form of a flipbook as an additional learning resource that can support learning biology, especially biodiversity material.

A needs analysis was carried out by providing questionnaire sheets to biology subject teachers and students in Class X Mathematics and Natural Sciences 2. The results of the questionnaire analysis of biology subject teachers' needs can be seen in Table 1.

Table 1. Needs Analysis Results Teacher

No.	Questions	Response	Percentage (%)
1.	According to you, has biology learning been going well?	Yes No	100% 0
2.	According to you, are there any obstacles encountered when providing biological material (especially biodiversity material)?	Yes No	50% 50 %
3.	Are the learning resources used at the time sufficient to support the learning proccess?	Yes No	0 100%
4.	Do you use the printed handbook as a learning resource to explain the biodiversity material?	Yes No	100% 0
5.	According to the father/mother, whether the learning resources used have supported the needs of students in understanding the material?	Yes No	50% 50%
6.	Are there other learning resources that you are using as a reference in teaching biodiversity material?	Yes No	50% 50%
7.	Have you ever used enrichment books to support the learning process?	Yes No	50% 50%
8.	Have you ever used a source learning in the form of electronic books ?	Yes No	50% 50%
9.	Have you ever used a learning resource *flipbook*?	Yes No	0 100%
10.	According to the father/mother, whether the use of add-ons in the form *flipbook* can you help students learn independently?	Yes No	100% 0
11.	Agree father / mother when developed books in the form of add-ons *flipbook* as one of the learning resources that can be used as an additional reference to support the learning process, especially in biodiversity materials?	Yes No	100% 0

Based on the results of the observations of teachers in Table 1, it was concluded that there are constraints experienced by teachers when teaching biology subjects, namely that the learning resources used are not enough to support the learning process for biodiversity material. 50% of teachers have used electronic teaching materials, but 100% have never created and used flipbooks in the learning process. Whereas Wijayanti (2011) revealed that the use of technology in learning is very helpful for teachers in learning management and other things related to teaching and learning activities. 100% of teachers agree that flipbooks can help students with self-study. A flipbook is an intriguing teaching tool. Flipbook (an electronic book) has the characteristics of hypermedia with animation, music, and video features, making it more attractive than printed books. Furthermore, digital flipbooks also overcome the challenges of distance learning so that they can be accessed anytime and anywhere (Roemintoyo, 2021).

An analysis of the needs of students is also carried out to determine the problems and needs necessary to support their understanding of the learning process. The results of the questionnaire on the needs of students can be seen in Table 2.

Table 2. Needs Analysis Results Students

No.	Questions	Response	Percentage (%)
1.	Do you like biology lessons?	Yes	62,06%
		No	37,93%
2.	Is Biology hard to learn?	Yes	51,72%
		No	48,27%
3.	Do you have a handbook in biology learning?	Yes	68,96%
		No	31,03%
4.	do you have difficulty understanding the material, especially biodiversity?	Yes	75,86%
		No	24,13%
5.	Do the learning resources you are currently using support your needs in understanding the material?	Yes	37,93%
		No	62,06%
6.	Are there other learning resources you use in studying biodiversity material?	Yes	31,03%
		No	68,96%
7.	Are the learning resources currently used easy to find/ access?	Yes	62,06%
		No	37,93%
8.	Have you ever used *flipbook* as a learning resource?	Yes	3,44%
		No	96,55%
9.	Do you need other learning resources that can be used as a reference in studying biodiversity material?	Yes	93,10%
		No	6,89%
10.	Do you agree when developed add-ons book in the form *flipbook* as one of the interesting learning resources and can be used as an additional reference for studying biodiversity material?	Yes	96,55%
		No	3,44%

Based on the results of the needs analysis in Table 2, it was found that 37.93% of students did not like biology lessons, 51.72% of students felt that biology was difficult to learn, and 75.86% of students stated difficulties in understanding biodiversity material. This can be caused by variations in examples for gene-level biodiversity that have been accepted by students and are limited to color differences and generally have the same preposition, for example, red roses, white roses, and yellow colors. This causes students to only understand concepts in a narrow scope and needs to be expanded so that the understanding of concepts about biodiversity becomes better. One example that should be highlighted is the environment around students so that they can directly apply it in their daily lives. Research by Nugroho and Hanik (2016) states that learning that utilizes the

environment around the classroom can improve cognitive learning outcomes.

62.06% of students stated that the learning resources used today do not support the need to understand biodiversity materials, and 68.96% have no other learning resources for learning biodiversity materials. Therefore, it is necessary to create learning resources that are packaged in such a way as to help students make observations in nature, where learning resources can be developed through the potential of nature, such as flora and fauna. Similarly, 96.55% of students have never used a flipbook as a learning resource, and 96.55% of students agree if an add-on book is developed in the form of a flipbook as one of the learning resources that can be used as an additional reference for learning biodiversity materials, especially orchid diversity. According to the Times and the needs of students, the innovation of various learning resources continues to be carried out to support the learning process (Ariyanto, 2018).

Teacher factors, student factors, infrastructure factors, and environmental factors all have an impact on the learning system's processing activities (Sanjaya, 2008). This is evidenced by the results of a needs questionnaire analysis, which showed that both teachers needed other supporting learning resources for learning biodiversity materials. Both teachers expect enrichment flipbook learning resources that can later be presented as an additional support book for learning biodiversity materials devoted to orchid diversity. The enrichment flipbook presented includes an overview of the area, the history and determination of Bantimurung Bulusaraung National Park, the introduction of orchids based on morphological and habitat characteristics, and the diversity of orchids in the Mallawa resort in the form of pictures and descriptions of each orchid. In the end, a glossary is presented that can make it easier for students to understand biology terms that are not yet known.

Based on the results of interviews and questionnaires, it can be concluded that there is a need for learning resources that can help teachers present interactive learning and help students learn independently through supporting biodiversity materials. Learning developed based on local potential can use local biodiversity data as a form of contextualization to make learning more meaningful (Santoso, 2010).

CONCLUSION

Based on the results of the needs analysis as the initial step or the basis of the development of the flipbook enrichment of orchid diversity, it can be concluded that teachers and students in SMA Negeri 2 Maros require other learning resources in addition to the printed handbook or

book package provided by the school for the learning process. All teachers and 96,55% students approve of developing an add-on book in the form of a flipbook as one source of learning, so flipbook enrichment needs to be developed.

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Analysis of School Field Introduction I Implentation Biology Education Faculty of Mathematics and Natural Sciences Makassar State University at SMAN 14 Makassar

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Abstract. The School Field Introduction Program (PLP) I is a compulsory subject at the Department of Biology, Faculty of Mathematics and Natural Sciences, Makassar State University for students of the Bachelor of Education Program to study aspects of learning and management in the Education Unit. The PLP implementation took place at SMAN 14 Makassar in September-October through qualitative descriptive methods in the form of observation, interviews, and documentation. This research was also carried out using the snowball sampling technique. The aspects of the implementation of PLP I are observing school of physical environment, social environment, culture, management, student co-curricular and extracurricular activities, and teaching and learning processes. Based on the observation result, it can be concluded that the school field introduction implementation was running properly because of the data from all aspect as indicators of this research.
Keywords: School Field Introduction, SMAN 14 Makassar, Observation

INTRODUCTION

Introduction to Schooling Field (PLP) is a course that requires students to gain hands-on experience in the field as prospective teachers through various activities at school. Armed with professional knowledge and skills acquired during the lecture process, PLP trains students to study, observe and analyze the realities and situations on the ground. (Hidayat *et al*, 2021). As a teaching and learning tool for students so that they can become scholar-oriented, observational studies and explore learning components which include preparation of teaching and learning activities and learning outcomes, reporting of learning outcomes, education management, education administration, and public relations.

Introduction to the School Environment (PLP) is an introduction that must be carried out by students to get a bachelor's degree. This activity includes observing the school's organizational structure and work procedures in schools, learning processes, school culture, and the integration of educational activities in schools (Nurasiah & Supriatno,

2015). The core of this PLP activity is direct observation and analysis of activities related to school culture, aspects of learning and education management.

According to Permenristekdikti No. 55 of 2017 concerning teacher education standards, PLP courses are a process of observation or observation, and practices or apprenticeships carried out by undergraduate or undergraduate education students so that they can explore the components of teaching and learning activities and administration of education and or education personnel in schools. This course is also a compulsory subject for PPG (Professional Teacher Education Program) which has the role of preparing non-educational graduates and graduate education graduates to become professional teachers. PLP courses have a minimum weight of four (4) credits, which include: Planning carried out by students under the guidance of tutors and supervisors, implementation held at partner schools, reporting of observations, and evaluation or assessment and giving feedback carried out by tutors and supervisors. In simple terms, this course is a means of teaching and learning activities to make undergraduate students oriented, observe, study and deepen the learning components which include preparation of teaching and learning activities, teaching and learning process, evaluation of learning processes, and outcomes, reporting of learning outcomes, management of education, educational administration activities, and public relations (Asrial et al., 2018).

PLP courses must have precise, clear, and measurable objectives, by completing this course, prospective teacher students have a complete understanding of all components related to the practice or implementation of learning (Mardiah & Yulhendri, 2020). Furthermore, this course must also be able to contribute input to schools to improve quality well in aspects of the concept, planning, implementation, and assessment. Components for conducting education that must be observed, analyzed, studied, and fully understood by prospective teacher students (Junaidi, et al., 2018).

PLP provides opportunities for students to apply all the knowledge they have learned and study in more detail professional work standards. In order to prepare prospective teachers who have professional, pedagogical competence, efforts are made to improve, including improving teacher skills, developing curriculum content, improving the quality of learning, assessing student learning outcomes, providing adequate teaching materials, and providing appropriate learning facilities. Improving the quality of learning through improving the quality of educators is quite important and has a positive impact. The positive impacts are in the form of: (1) increasing the ability to solve real educational and learning

problems; (2) improving the quality of input, process, and learning outcomes; and (3) increasing the professionalism of teaching staff.

PLP takes place at SMAN 14 Makassar which is very strategic in the middle of the city, the distance from the research campus is not too far from the campus, making it easier to make observations and SMAN 14 Makassar is an A-accredited flagship school. for students in conducting research both in terms of culture, physical environment, facilities, school management, extracurricular and co-curricular activities of students, as well as the learning and teaching process. PLP is a form of devotion in the community by student teacher candidates. It is hoped that students can comprehensive understanding of schooling. Considering PLP is a new and different program with the previous program, namely PPL (Practice field experience) it is necessary to hold research on the implementation of this PLP in schools. Therefore, this study was conducted to find out the results of the PLP implementation at SMAN 14 Makassar specifically in the field of biology studies as a one part of the program activities to provide mutual feedback between researchers and the school.

METHOD

Qualitative descriptive is the type of research used in this activity. Qualitative descriptive research is research that explains a description or description of an object or event as deeply as possible without intervention in the event or object under study (Sadikin, 2019). In this study, observations were made in the SMAN 14 Makassar environment, as well as interviews with parties from SMAN 14 Makassar to obtain information regarding the description of the learning process and activities that took place at SMAN 14 Makassar. Qualitative research is words and actions, the rest is additional data such as documentation and others. The subjects in this study were students, teachers, and several activities that took place at SMAN 14 Makassar. The research subject selection technique used the snowball sampling technique (Nurdiani, 2014). This activity was carried out because the source data from one source was not able to describe it completely and completely, so another source was needed to complete it (Sugiyono, 2015).

Researchers occupy a quite complicated position in this qualitative descriptive research because it directly becomes a data capture tool itself in every data collection that is carried out. The main instruments in this study were observation and interview guidelines. Therefore researchers play a direct role in planning, implementing, collecting data, analyzing, interpreting data, concluding the results of the data obtained and discussing and concluding conclusions to be interpreted (Usman & Maruf, 2017).

Researchers collected data from September-October. The researcher carried out two stages in collecting data, namely observing from the observations made and collecting school data obtained from interviews with teachers, administration staff, and students. Observations were carried out to obtain information about things that could be directly observed by researchers and which were focused on the school environment of SMAN 14 Makassar. For data that could not be observed directly, interviews were conducted with TU staff and teachers who had information related to the data to be asked.

RESULTS AND DISCUSSION

Based on the results of observations and interviews conducted at SMAN 14 Makassars during the PLP I process. First, students carry out observation activities or orientation processes that aim to get to know the school they are currently occupied in carrying out PLP activities. At this stage, students only focus on making observations related to the environment of SMAN 14 Makassar and things that can be observed directly. Based on the results of observations obtained data:

Table 1. Observation Results during the Orientation Process

No	Observation Aspect	Description
1.	The general condition of the school environment	The environmental conditions of SMAN 14 Makassar are neat, clean, and comfortable. This is evidenced by the condition of the building which is regular and structured and has two floors. Several small gardens in front of each class are maintained and placed in the corners of the school. The school is also kept clean from garbage because students also play a role in keeping the school clean. The feeling of comfort is also added by the presence of a security guard who is on guard at the school gate area during the learning process. Apart from that, the parking area is quite spacious and neatly arranged.
2.	General school facilities	The facilities available at SMAN 14 Makassar are generally said to be quite complete, starting with facilities to support the learning process, co-curricular and extra-curricular. The general facilities are also quite complete, starting from separate parking areas for teachers and students, prayer rooms, canteens, and separate toilets for teachers and students.
3.	General condition of students	All students who are studying at SMAN 14 Makassar are 1,020 people, with a total of 49 classrooms, with 34 students in each class.
4.	Interaction between school members	This observation is in the form of 3S activities (Smiles, Greetings, and Greetings) which are very well established including students with students, teachers with students, teachers with teachers,

		students with TU staff, and teachers with TU staff. Broadly speaking, all components at SMAN 14 Makassar interact well with each other.
5	School regulations/rules	These observations are in the form of conditioning for early learning, flag ceremonies, use of school uniforms, suggestions for maintaining cleanliness, suggestions for maintaining calm, and suggestions for using time. The description of the observation results is as follows.
		1. The initial conditioning of learning is carried out by students who are directed directly by the teacher.
		2. The flag ceremony which is held every Monday starts at 08.00 WITA however, by 07.30 students must be in school.
		3. The rules for using uniforms are determined by the school itself so that students wear uniform clothes as a student identity at SMAN 14 Makassar. At this school, it is very good to use a good school uniform. On Mondays and Tuesdays, wear a gray and white uniform. On Wednesday, wear batik and white skirt/pants. Thursday, wearing a scout uniform, Friday, wearing a white and white uniform, black mandatory shoes and white socks and socks should not be below the ankles, and a gray and red sports uniform that is used during the PJOK class schedule.
		4. Maintaining cleanliness is the responsibility of all students, teachers, and employees and this has been carried out by several components in the school so that the school is always clean and beautiful.
		5. Maintaining calm is carried out by students and teachers very well during the learning process so that the school environment looks disciplined
		6. Suggestions to use time are implemented well, this can be seen when there are classes that are empty or not studying, the School Safety Patrol (PKS) from OSIS will provide a report to the student/teacher section to follow up immediately.
6.	School programs	This program consists of two parts, namely an internal program in the form of teaching and learning activities in class, especially X MIPA 4. Based on the results of interviews at SMAN 14 Makassar, there are also external programs in the form of extracurricular activities that are contested to increase students' motivation to continue learning.
7.	Curriculum and Learning Tools	The curriculum used is the 2013 curriculum (K-13). Indonesian government imposed Curriculum 2013 in the national education system since 2013 in order to improve the quality of education. Curriculum 2013 is different from the previous curriculum, especially on approach to teaching and learning and assessment techniques used. This curriculum emphasizes learning in the scientific and authentic assessment approach in the assessment of learning outcomes competences include spiritual, social, knowledge, and techniques used varied assessment and reporting description model (Gunawan, 2016; Apino & Retnawati, 2017)

The implementation of orientation activities has been carried out, followed by the PLP I process or core activities, where the process only focuses on building the foundation of educator identity through the form of direct observation of the physical environment, social environment, culture, management, and the teaching and learning process which is the place for implementing PLP. From the results of observations and interviews that have been conducted students get the results:

Table 2. Observation Results during the PLP I Process

No	Observation Aspect	Description
1.	Observation of the physical environment	Regarding the physical environment of SMAN 14 Makassar, there are several things that can be obtained: 1) Regarding the prayer room, there are deficiencies such as the number of places for ablution for men and women, the rest are quite complete. Moreover, the musholla is usually used for Friday prayers for men. 2) For the library, there are several things, including the arrangement of books that have not been arranged neatly. In addition, there is a library structure and order. 3) For the school canteen, the place is quite clean, but there is still not enough seating. 4) Regarding classrooms, all of them already have a blackboard, cleaning tools and others are quite complete. 5) The laboratory consists of a chemistry laboratory and a physics-biology laboratory, however, the facilities in the laboratory are still incomplete. 6) The room for educators and education staff is complete, starting from the principal's room, administration room, teacher's room and BP room.
2.	Observation of the social environment	Interaction between school members is well established.
3.	Observation of facilities and infrastructure management	School management is monitored online by DAPODIK. schools report matters related to the condition of school infrastructure, what are not yet available, to subsequently receive special allocation funds, as well as sanitation assistance for toilets and others.

4.	Vision and mission	Vision: "Educated in achievement, Character, Independent, and Cares for the Environment"

Mission :

1) Fostering the spirit of practicing the values and teachings of the religion he adheres to

2) Carry out learning and BK with National Education standards by activating the role of MGMP at the school level

3) Improving the quality of the performance of education and education staff as an effort to fulfill optimal services

4) Improving the development of the talents and interests of students through environmentally friendly sports, arts, and skills

5) Encouraging the use of various facilities, media and learning resources as well as information and communication technology (ICT)

6) Fostering communication and collaboration between parents of students, by optimizing the role of school committees.

5.	Presentation of school goals	1) Producing students who can carry out and practice the values and teachings of the religion they adhere to.

2) Producing students who are educated, achievers, and have high competitiveness

3) Improving the quality of education and education personnel

4) Producing outstanding students according to their talents and interests

5) Utilization of various quality facilities, media and learning resources integrated with information and communication technology (ICT).

6) Fostering school cooperation with parents, the community and the school committee.

6.	School programs	SMAN 14 Makassar has co-curricular activities such as

1) Islamic Spiritual (Rohis)

2) Nature activities

3) Art Gallery

4) Futsal, and

5) Basketball.

Extracurricular activities in the form of

1) Mozzac (Chorus),

2) Paskibra,

3) Youth Red Cross (PMR),

4) Silat,

5) *Dance*,

6) Scout

All activities have their own practice schedule as needed. For example, basketball and futsal co-curricular activities cannot be carried out simultaneously because they use the same field. Based on the results of interviews with students, SMAN 14 Makassar requires all class X students to take part in both co-curricular and extra-curricular activities as a forum for developing interests and talents at school.

| 7. | Teaching and learning activities | Observation of teaching and learning activities carried out in class X MIPA 4 is described as follows.

1) Before learning begins, Biology learning package books are distributed to students, the teacher greets then invites students to pray first led by the class leader. The teacher asks the students' news, asks the readiness of students and attends students. Before entering the material, the teacher reviews the previous material to remind students of the previous material.

2) The material given to students in the class is well structured and clear. The teacher explains the material coherently, not in a hurry and according to the level of understanding of students.

3) The learning method used is discovery learning method. Where students must find their own learning concepts.

4) The teacher motivates students by repeating at a glance the material that has been studied before, before starting learning in new material. In addition, at the end of the lesson the teacher gives individual assignments to students. Teachers often motivate students by giving questions to students, then those who can answer these questions will be given additional points. The teacher also motivates students from bad test scores

5) The way to evaluate students is to give questions to students in the form of material that has been submitted.

6) The lesson was closed by asking one of the students to conclude the material that had been discussed during the learning process. The teacher gives assignments to students as a reflection of learning. The teacher closed the lesson by reading the hamdalah together and greeting the students.

7) The learning media used are conventional books and cellphones. |

All the activities that have been carried out researchers get new knowledge that has not been obtained before. The researchers also after the implementation of PLP are able to identify and analysis the data by observing and interviews such as the the culture, management, facilities, programs of school, and the instructional process.The implementation of orientation activities has been carried out, followed by the PLP I process or core activities, where the process only focuses on building the foundation of educator identity through the form of direct observation of the physical environment, social environment, culture, management, and the teaching and learning process which is the place for implementing PLP I.

Meanwhile, according to Sadikin & Siburian (2019), this course is a means of learning activities teaching in order to make students scholar oriented, observe, study and explore the components of learning which includes the preparation of learning activities teaching, the process of

teaching and learning activities, evaluation of learning processes and outcomes, reporting of results learning, education management, activities, education administration, and public relation but, PLP I in Biology Departement, State University of Makassar conducted to observe and analyze the data regarding school culture, facilities, management, schools program, and others.

CONCLUSION

School Field Introduction I is a course that requires students to gain hands-on experience in the field as prospective teachers through various activities at school. Based on the result of data analysis, it can be concluded that the implementation of School Field Introduction I at SMAN 14 Makassar is accomplished by the researchers.

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Analysis of the Need for Development of Mind Mapping-Based Biology E-Book on Animalia Materials For Class X Senior High School

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Abstract. This research focuses on needs analysis in the form of a mind mapping-based biology e-book on animalia material for class X of Senior High School. The purpose of this study is to determine the needs of teachers and students for the teaching materials to be developed. The method used is a qualitative descriptive method. The data collection technique used in this study was the survey method, using research instruments in the form of questionnaires. The data analysis used is by reducing the survey results into more specific data to be presented descriptively. The initial observation results obtained are that teachers and students need teaching materials in the form of e-books with more interesting material designs, which can support learning activities. Based on this, it is necessary to develop a mind mapping-based biology e-book on animalia material that can support the learning process in schools.
Keywords: Needs, E-book, Mind Mapping.

INTRODUCTION

Science and technology that continues to develop is also one of the aspects that need to be considered in the world of education. It is time for education to become an agent of change that continues to develop along with the times, especially in the use of technology that exists today. Husaini (2014), states that one of the fields that has a significant impact with the development of this technology is the field of education, where basically education is a process of communication and information from educators to students containing educational information, which has elements of educators as sources of information, media as a means of presenting ideas, ideas and educational materials as well as students themselves. Some parts of these elements get a touch of information technology media.

The use of ICT (information and communication technology) in learning is an urgent demand today. The rampant flow of information and the variety of sources of information make teachers not the only source of

learning. However, in school education units, teachers have a strategic role. Therefore, the use of ICT in schools should start from a strategic starting point, namely teachers (Budiana et al., 2015). Psychologically, psychological learning media is very helpful for children's psychological development in terms of learning. This is said because psychologically teaching aids in the form of learning media make it very easy for students in terms of learning because media can make abstract things more concrete (real) because in principle the media is used in the learning process with the intention of making a more effective and efficient way of communicating (Magdalena et al., 2021).

One of the learning media combined with ICT is an e-book or digital book. An e-book is an electronic book of a traditional book with digital features that can help readers, such as video, animation and sound. E-books are an interesting tool for most learners. E-books have become advanced technological innovations that are expected to evolve over time replacing traditional paper books for a prospective future. Interactive e-books are digital books whose users can interact and communicate reciprocally (Jannah et al., 2017). The use of e-books can increase interaction between educators and students in distance learning and students are more interested in using e-books in learning (Restiyowati & Sanjaya, 2012).

E-books have a very big role in the world of education, especially in today's digital era. Looking at the present use of e-books as a source of information cannot be underestimated by its implications for everyday human life. Users do not have to go to the library if they want to read or even spend special times to go to the library, users can access it from home. With the acceleration of the digitization process of printed book collections in the library, it will give birth to easy access to these books without having to go to the library. In the sense that if every printed book in the library has its e-book then the opportunity for humans to access books anywhere and anytime will be wide open and in a very easy way (Makdis, 2020).

E-books are very helpful in supporting learning activities. E-books that will be used in learning need to pay attention to the feasibility of presentation and the level of understanding of students. Mind mapping is a creative, effective way of recording and will literally map out one's thoughts (Panggabean et al., 2020). The mind map is also a great route map for memory, allowing us to structure facts and thoughts in such a way that the natural workings of the brain are involved from the very beginning. This means remembering information will be easier and more reliable than using traditional recording techniques. We will also get to know the brain better and find ways to make it easier for the brain to learn and remember information. If we understand how to help the brain work for us, we will

be able to exert all our mental and physical potential. The mind map uses the brain's ability to visual recognition to get the greatest results. With a combination of colors, images, and curved branches, mind maps are more visually stimulating than traditional recording methods, which tend to be linear and one-color. This will make it very easy for us to remember the mind map information (Buzan, 2012).

The importance of electronic teaching materials such as e-books, especially in the current digital era, it is necessary to analyze the needs of developing e-books with a more attractive design, namely based on mind mapping as a support in learning that is in accordance with the guidance of the times and easier to understand.

METHODS

The research was conducted in November 2021. The research subjects consisted of 2 biology teachers who taught at the school where the research was conducted, namely at the State High School 1 Sumarorong and one group studying class X students, namely class X Mathematics and Natural Sciences 1 consisting of 30 people. The research instrument used in the research is in the form of an observation questionnaire to analyze the needs of teachers and students for the teaching materials to be developed.

Data collection techniques are carried out through a survey method with an analysis of the needs of teachers and students. The data collection process is carried out by distributing questionnaire sheets to biology subject teachers and students through google forms due to the Covid-19 pandemic which does not allow conducting surveys directly in schools. The stage of analyzing the needs of teachers and students is carried out by distributing questionnaires to find out and analyze what they need and overcome the problems found.

The data analysis process in the study was carried out by reducing the data obtained from the survey results. The research data obtained is then presented descriptively so as to produce research conclusions regarding the need for the development of teaching materials in the form of mind mapping-based biology e-books on animalia material for class X of Senior High School.

RESULTS AND DISCUSSION

This study aims to describe the needs of teachers and students for the development of teaching materials in the form of electronic textbooks (e-books) that can support biology learning, especially animalia materials. The results of the needs questionnaire are used as the basis for the development of teaching materials in the form of e-books. The needs

analysis is carried out by providing questionnaire sheets to biology subject teachers and students in class X Mathematics and Natural Sciences 1. The results of the questionnaire analysis of the needs of teachers of biology subjects can be seen in Table 1.

Table 1. Results of Teacher Needs Analysis

Number	Statement	Answer			
		Yes	Percentage	No	Percentage
1.	Biology learning has been going well so far	1	50	1	50
2.	Teachers have biology textbooks	2	100	-	-
3.	The biology textbooks used today already support the learning process	1	50	1	50
4.	There are obstacles encountered when teaching kingdom animalia material	2	100	-	-
5.	Using a handbook as teaching material to explain kingdom animalia material	2	100	-	-
6.	The textbooks used have supported the needs of students in understanding the material of the kingdom animalia	-	-	2	100
7.	Has other teaching materials that are used as references in teaching kingdom animalia material	1	50	1	50
8.	Using teaching materials in the form of electronic textbooks (e-books)	-	-	2	100
9.	E-books used based on mind mapping	-	-	2	100
10.	Have made teaching materials in the form of mind mapping-based electronic textbooks (e-books)	-	-	2	100
11.	Requires mind mapping-based e-book teaching materials to support learning activities for kingdom animalia materials	2	100	-	-

Table 1 shows that learning biology, particularly animalia material, is less effective. This is due to obstacles in the learning process of biology of material in the anialia such as the lack of variety of teaching materials used other than printed books. Teaching materials in the form of electronic books (e-books) have never been developed and used by teachers so that the procurement of e-books can provide convenience for teachers because the presentation of materials can be presented more varied. In addition to

presenting material accompanied by images, with e-books the material can also be equipped with animations and videos. The use of e-books is a form of innovation and integration of technology into the learning process so that teachers do not only race on the use of conventional teaching materials in the form of printed books, which are also very limited in availability. This is in line with Amalia & Kustijono (2017) which states that E-books help teachers in streamlining and streamlining learning time. Teachers struggle if they have to carry a lot of reading books in their heavy physical form. E-books in the form of digital books are very easy to carry in many files, teachers do not run out of materials in teaching.

E-books can be used in supporting the learning process, but with a fairly broad subject matter with a very large sub-core such as animalia material, the presentation of material in the e-book needs to be presented creatively to make it easier for teachers to teach animalia material. E-books with a mind mapping-based material presentation method, especially animalia material, make animalia material easier to understand with a more concise presentation and with colorful images that make it easier for the brain to remember the material. This is in accordance with Panggabean et al (2020) which states that Mind mapping is the easiest way to put and retrieve information in the brain through the creation of route maps regarding information obtained by learners. With a mind map that contains many images and colors, it is hoped that students will more easily and clearly understand the subject matter.

Analysis of the needs of students is also carried out to find out the problems and needs to support their understanding in the learning process. The results of the questionnaire analysis of student needs can be seen in Table 2.

Table 2. Results of Student Needs Analysis

Number	Statement	Answer			
		Yes	Percentage	No	Percentage
1.	Love the Biology lesson	28	93,3	2	6,7
2.	Teachers speak more in the learning process	20	66,7	10	33,3
3.	Learning activities are always accompanied by textbooks	25	83,3	5	16,7
4.	The textbooks used are interesting	12	40	18	60
5.	The textbooks used are dense essays on writing	16	53,3	14	46,7
6.	Love the learning process with material accompanied by color images	27	90	3	10

Number	Statement	Answer			
		Yes	Percentage	No	Percentage
7.	Liked the learning process with the material presented more concisely	29	96,7	1	3,3
8.	Can access the internet at school	27	90	3	10
9.	Teachers use e-books when teaching	9	30	21	70
10.	Love the learning process by using e-books	26	86,7	4	13,3
11.	Need textbooks such as e-books that are more attractive	30	100	-	-

Table 2 shows that learners generally like biology lessons. However, the learning process of biology is not optimal. This is because the textbooks used seem less attractive, where the presentation of material is only in the form of printed books that are dense in writing which can also make students easily feel bored and less interested in learning the material. In addition, the availability of books in schools is very limited so that the subject matter cannot be conveyed optimally to students. E-book is one of the innovations that is very supportive in learning the subject matter. By using e-books, the subject matter can be accessed by students anytime and anywhere, not only during the learning process in the classroom with the internet network. This is in line with Restiyowati & Sanjaya (2012), which says that a digital book or e-book (eletronic book) is a book in digital form consisting of text, images or both, produced and published via a computer, the results of which can be read or accessed through computer devices or mobile phones and other electronic devices. The use of e-books can increase interaction between teachers and learners in distance learning and students are more interested in using e-books in learning.

The delivery of biology material based on the results of the analysis is less effective, where with conventional material delivery, namely only using printed books as teaching materials and with lecture methods so that learning is only teacher-centered and can also trigger a lack of motivation and interest of students in learning. The results of this study are in line with Yuliani & Fitri (2021), which states that the motive of learning is very influential in the success of the learning process. The results of the response of students stated that they like the learning process with material accompanied by colored images and the presentation of the subject matter presented is more concise because it makes it easier to learn and remember the material, so that the use of e-book teaching materials presented is more creative and interesting, namely with a mind mapping-based presentation method, it is hoped that it can arouse students' interest and motivation in

learning and make it easier to understand and remember the subject matter. It is also in accordance with the Ministry of Education and Culture (Magdalena *et al.*, 2021), which affirms that the use of media in the learning process can arouse the interest and motivation of learners' learning, reduce or avoid the occurrence of verbalism, generate regular, systematic reasoning, and to foster understanding and develop the values inherent in learners.

CONCLUSION

Based on the results of the study, it can be concluded that teachers and students of class X, especially at SMA Negeri 1 Sumarorong, need a mind mapping-based biology e-book to support the learning process, the subject matter of animalia.

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Analysis of Character Values of Natural Science Education Students at Bosowa University

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Abstract. This study aims to analyze the character values that exist in students of the Natural Science Education at University of Bosowa. In this study, character values are integrated into four dimensions, namely the dimensions of thought, taste, heart, and exercise. The research method used is descriptive research with a quantitative approach with three stages; planning, data collection and data processing. The sampling method is the saturated sample technique. The technique of collecting data is through a questionnaire distributed in the form of a google form. The number of statements is 33 items. The sample in this study were all students of the Natural Science Education Study Program. Data collection was carried out from August to September 2022. The data analysis technique used was quantitative descriptive data analysis. Based on the results of the data analysis of the average practice of character values by students of the Natural Science Education Study Program at the University of Bosowa, data was obtained, namely the percentage of experience with the lowest character values in the thinking dimension of 75.63% which was in the good category. While the percentage of experience the highest character value is in the sports dimension, which is 82.52% which is in the very good category. In general, the practice of character values by students of the Natural Science Education Study Program at the University of Bosowa for all dimensions is an average of 79.96% in the good category. This indicates that the students of Natural Science Education Study Program at the Bosowa University have implemented and practiced character values well.
Keywords: Character Values, Character Education, Natural Science Education.

INTRODUCTION

Character is an intrinsic value that is obtained through a combination of environmental influences, experiments, experience, education, sacrifice with the values contained in a person so that it can be seen from a person's fighting power through his thoughts and behavior (Soedarsono, 2013). A person's character can be seen from the character and form of a person which originates from virtuous values and is reflected through attitudes and behavior that are in line with moral ethics (Mumpuni, 2018). This character is a distinctive sign of an individual or group that has a set of values and morals, ability, and endurance in facing every obstacle and problem (Soedarsono, 2013). Therefore it is important that character must be possessed in humans and must be instilled from childhood. For this reason, education should be a vehicle for preserving and spreading moral and noble values as the roots of Indonesian national culture which can be instilled through the attitudes and personalities of students in the life of society, nation and state.

Efforts to build and develop character can be carried out both on a

macro and micro basis through the education system. On a macro level, this can be started at the implementation stage into learning experiences and activities, for example the application of structured-learning experiences or habituation in persistent-life situations and reinforcement. Meanwhile, on a micro level, character development can be carried out through the teaching and learning process in the classroom using an integrated approach in all subjects, daily activities in the form of school culture, extra-curricular and co-curricular activities, activities at home and the community environment (Jasrudin et al., 2020).

The rise of anarchic behavior, brawls between citizens, drug abuse, promiscuity, corruption, crime, environmental damage, and various other acts of social pathology indicate an acute problem in building national character (Mustakim, 2011). For example, data from the National Narcotics Agency (BNN), the number of narcotics abuse from 13 provinces in Indonesia reached 2.29 million people. The millennial generation or people aged between 15-35 years are a group of people who are very vulnerable to exposure. There was an increase of 4-8% of teenagers using narcotics, where the results of research conducted in the previous year said that the abuse of narcotics by teenagers or the millennial generation was 20% and until now it has increased to 24-28% (Puslitdatin, 2019). Even in the campus world, several issues of plagiarism often occur. As stated that plagiarism is an act intentionally or unintentionally in obtaining or trying to obtain credit or value for a scientific work, by quoting part or all of other people's scientific works and/or works, without stating the source properly and adequately (Tismi: 2021). In addition, several things that trigger the character crisis include changes in human thinking where material is everything, the lack of relationships between teachers, parents and society, and the weak role of social institutions and the family as the basis of character education. This is in line with what was expressed by Prof. Suyanto who stated that the national character possessed by some Indonesian people is currently in a weak condition (Aqib: 2011).

The government's seriousness in solving this problem can be seen since 2010 by launching character education as a national movement at all levels of education through the Ministry of Education and Culture. Character education is here to be one of the solutions to problems that exist today. The Ministry of National Education has issued 18 points of cultural and character education values that must be introduced, exemplified, taught, students and textbooks including religious values, honesty, peace-loving, tolerance, discipline, hard work, creative, independent, democratic , curiosity, fond of reading, national spirit, love of the homeland, respect for achievement, friendly/communicative, care for the environment, social care, and responsibility (Kemendiknas, 2011). However, it should also be

noted that internalizing these values requires skill in capturing values through real experiences, including open-mindedness, silence, serenity, and a supportive mental disposition; open, trusting, honest, humble (Suryani, 2010).

The nation's hope lies in its young generation. One of the very supportive agents of change is in the hands of students. Students who play an important role in continuing the direction of development of a nation should have the personality or character needed in today's era. Students as adult humans certainly know what to do and what not to do. And through character education it is hoped that it can perfect and strengthen oneself personally so that a better person.

Referring to some of the problem analyzes that have been described, especially education students as youth of the nation as well as future teacher candidates, the authors conducted a study to analyze the character values possessed by students of Natural Science Education, Faculty of Education at Bosowa University. This research is expected to be a material or basis for conducting ongoing research related to other character values as well as solutions in implementing student character strengthening.

METHOD

This research method is descriptive research with a quantitative approach. There are three stages namely; planning, data collection and data processing. This research was conducted from August to September 2022 for students of Natural Science Education, Faculty of Teacher Training and Education, University of Bosowa. The sampling method is the saturated sample technique, namely all members of the population are used as samples (Sugiono, 2009). The sample of this research is all science education students. In this study the data collection technique was in the form of a questionnaire using a Likert scale which was distributed in the form of a Google form which was then distributed to students via WhatsApp application. The list of statements in the questionnaire relates to the implementation of the character values of students in science education at Bosowa University. The data analysis technique used is quantitative descriptive data analysis. The data collected was then analyzed and described. To analyze the data based on the scores obtained by students, percentages were used, while to interpret the research results, standards were used, namely: 81% - 100% : Very good, 61% - 80% : Good, 41% - 60% : Moderate, 21% - 40% : Less, 0% - 20% : Very Less (Umari, 2018).

RESULTS AND DISCUSSION

The character values that humans should have can be divided into four parts which can be called the pillars of character education. Other terms that can be used to refer to the pillars of character education include character traits, domains, aspects, dimensions and of course the pillars themselves. These character values must be integrated in processing thoughts related to cognition or knowledge, processing feelings related to attitudes or affective, processing hearts related to spirituality, and cultivating bodies related to skills or psychomotor (Yaumi, 2016). In this study, character values are integrated into four parts, namely the dimensions of thought, taste, exercising the heart, and sport. From the results of data processing, the percentage of practicing the character values of students in Natural Science Education at Bosowa University was obtained, which can be seen from Figure 1.
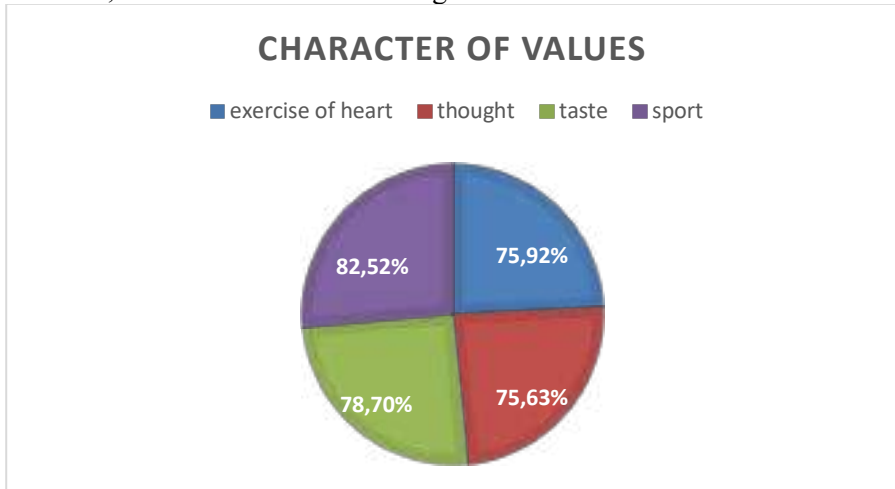

Figure 1. Character Values of Natural Science Education Students
at Bosowa University

Figure 1 shows that the percentage of practicing the character values of Natural Science Education Students from all dimensions includes character values from the dimensions of heart, thought, taste and sport are well. Data on the average practice of character values by students of the Natural Science Education Study Program at Bosowa University obtained data, namely the lowest percentage of experience of character values is in the thinking dimension of 75.63% which is in the good category. While the highest percentage of experience of character values is in the sports dimension which is equal to 82.52% which is in the very good category.

This indicates that students of Natural Science Education Study Program at Bosowa University have implemented and practiced character values well. The following is an analysis of the percentage of character values for each dimension.

Exercice of Heart Dimension on Character Values

Exercise the heart is a dimension of character education related to ethics. The character values contained in this dimension are trustworthy, faithful, fair, never give up, honest, empathetic, responsible, dare to take risks, willing to sacrifice and have a patriotic spirit, (Rezekiah, 2022). However, in this study there are two character values that you want to see, namely the value of honesty and responsibility. Honesty is a pure speech or action that comes from a person's heart, so what he wants to express or do comes from his desire according to what is felt without any pressure or coercion from the surrounding environment. This honest attitude is the forerunner of the formation of one's integrity so that later it will be easy for him to make his own decisions. Through an honest attitude it will produce people who are trusted and reliable. Students who have an honest character generally will every word and action to friends or their environment. The percentage of practicing honest character values in natural science education students is 68.51% which is in the good category while the percentage of practicing responsibility character values is 83.33% which is in the very good category. The character of this responsibility is more directed to the completion of the assigned task in accordance with the given time limit accompanied by the risks involved in the task.

EXERCISE HEART

■ Honest ■ Responsibility

68,51%

83,33%

Figure 2. The Heart of Dimension Character Value

Dimensions of Thought on Character Values

Thought is a dimension of character education related to brain activity, both in receiving, processing and responding to something that happens in the environment. The character values contained in this dimension are innovative, curious, intelligent, critical, creative, open-minded, productive, science-oriented, and reflective. In this study there are only two character values to be seen, namely creative values and curiosity. Based on the results of research on the dimensions of the character of thought, it was obtained that the proportion of creative character values in science education students was 78.47%. This shows that creative values are quite well owned by students of natural science education at Bosowa University, especially in giving new opinions or ideas when working in groups, producing products or works of value so that they can make themselves proud, have the ability to imagine, like to try new things in adding experience, knowledge or skills. Meanwhile, the percentage of practicing science education students' curiosity character values was 72.16%, which was in the good category. This curiosity includes digging up information around to increase insight, always asking for material that is not understood to lecturers or friends, and not easily believing in information before first looking for the truth. Through curiosity can stimulate one's ability to think creatively.
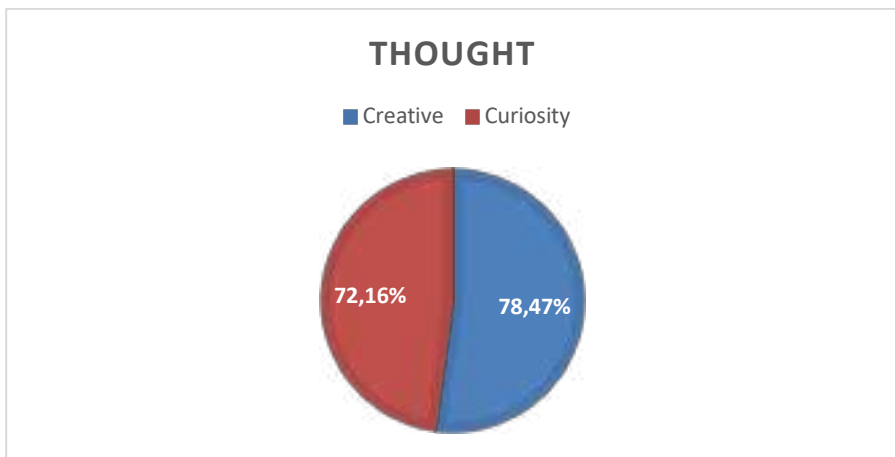

Figure 3. Thought of Dimension on Character Values

Taste of Dimension Character Value

Feeling is a dimension of character education related to emotion. The character values contained in this dimension are tolerance, friendship/communicative, respect for the work of others, patriotism and

love of technology (Rezekiah, 2022). In this study there are three character values that we want to see, namely friendly character values, tolerance and patriotism. Based on this research, the results obtained were that the percentage of the practice of friendly character values in science study programs was 65.97%, which was included in the good category. This dimension includes treating other people equally without being selective, when working together in groups they have no problems communicating, thinking positively of people they just know, easily starting conversations even with strangers when in a forum or activity.

The percentage of practicing tolerance character values in Science Education study program is 86.80% in the very good category, especially respecting the opinions of others who are different from themselves, not imposing will on others, associating with anyone from various religious, ethnic or ethnic backgrounds. The value of friendly character is a person's openness to accept people around him to want to interact, get along, share, give, and have good relations so as to create a comfortable and warm atmosphere between them. While the percentage of practicing the value of the patriotism character obtained a percentage of 83.33% in the good category. This means that the character of patriotism has been instilled very well by students. This patriotic character includes: being proud and preferring to use products made in Indonesia compared to foreign products, not easily spreading hate speech or hoaxes, and having high concern for others and the environment. The character of loving the motherland itself must be owned by all students because students as the nation's successors are a reflection of national identity so that Indonesia will not be easily eroded by cultural and technological developments.
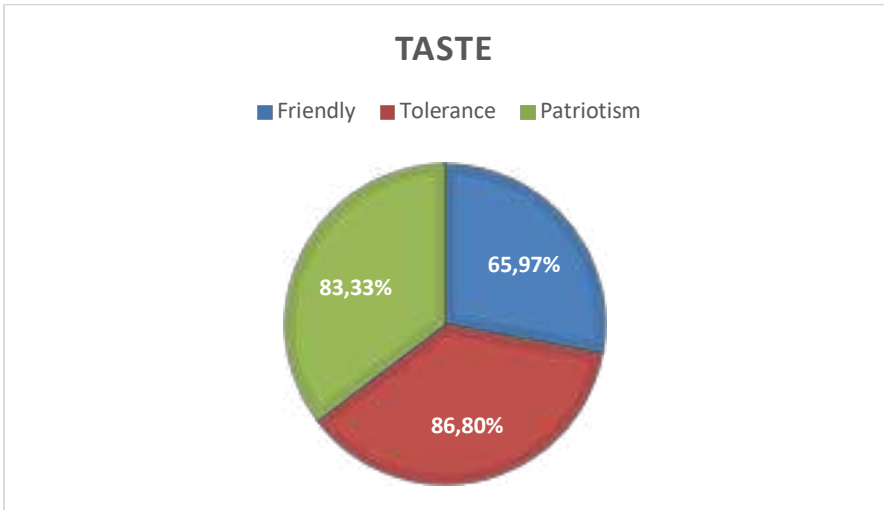
TASTE

■ Friendly ■ Tolerance ■ Patriotism

65,97%

83,33%

86,80%

Figure 4. Taste of Dimension Character Value

Sports of Dimension Character Value

Sport is a dimension of character education related to physical, physical, psychomotor activity which is usually often connected with the ability to manage emotions. The character values contained in this dimension are independent, tenacious, hard work, enthusiasm, tough. In this study, there are two character values that you want to see, namely the value of discipline and responsibility. Discipline is a character related to regularity and consistency that is carried out in an organized manner and is the result of habituation. As for the percentage of student discipline character value practice in the Natural Science Education study program, 79.86% is in the good category. This shows that the value of discipline is quite good for students, especially for scheduled and regular living, always on time, obedient and obedient to every provision or rule that applies in the environment. How important is the character of this discipline to have, with discipline a person is able to play his own time so that his life can be more organized and directed. While the percentage of the hard work character value practice, which is 85.18%, is in the very good category. These results indicate that the value of hard work is very well embedded in natural science education students at Bosowa University. This hard work includes facing student learning difficulties not easily giving up, always eager to achieve the best results, and easily getting back up when facing failure. The character of hard work is always followed by high spirits, all the obstacles that exist are certainly not easy to ignite his enthusiasm. At the present time we are faced with an uncertain flow of development, hard work is one of the characteristics that can help a person to be able to keep

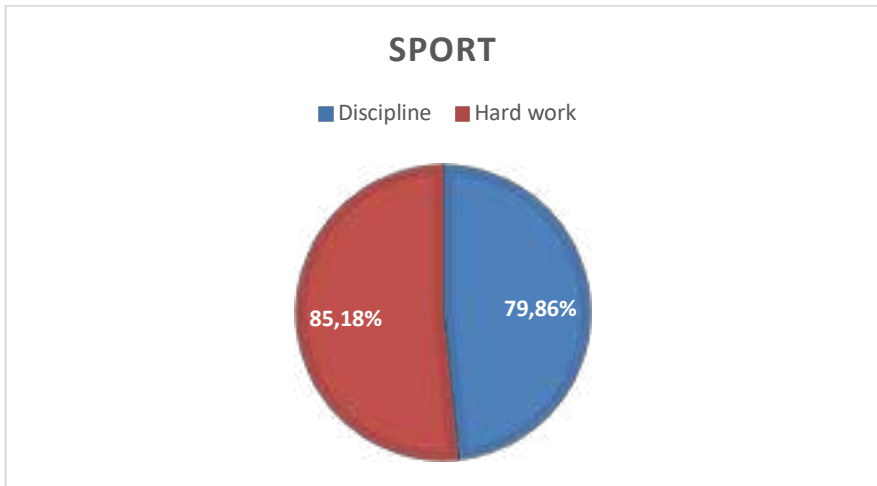up with the changes that occur so that he can always be ready to face changing conditions.

Figure 5. Sports of Dimension Character Value

CONCLUSION

The results of data analysis on the average practice of character values by students of the Natural Science Education Study Program at Bosowa University obtained data, namely the lowest percentage of experience of character values is in the thinking dimension of 75.63% which is in the good category. While the highest percentage of experience of character values is in the sports dimension which is equal to 82.52% which is in the very good category. In general, the practice of character values by students of Natural Science Education Study Program for all dimensions averaged 79.96% in the good category. This indicates that students of the Natural Science Education Study Program at Bosowa University have implemented and practiced character values well.

SUGGESTION

Character education is important to be applied at all levels of education. And it is necessary to develop further research on eight Indonesian gold characters

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