THE DEVELOPMENT OF STUDENT WORKSHEET UNDER THE TOPIC OF INTERACTION OF LIVING THINGS TO TRAIN OCEANIC LITERACY FOR 7TH GRADE JUNIOR HIGH SCHOOL STUDENTS

THESIS

By
MILLAH KHOIRUL MU'AZZAH
ID 16030654031

STATE UNIVERSITY OF SURABAYA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
SCIENCE DEPARTMENT
SCIENCE EDUCATION PROGRAM
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ABSTRACT

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Name	: Millah Khoirul Mu'azzah
ID	: 16030654031
Study Program	: Bachelor's Degree of Science Education
Department	: Science
Faculty	: Mathematics and Natural Sciences
Institute	: The State University of Surabaya
Advisor	: Siti Nurul Hidayati, S.Pd., M.Pd.

At present literacy skills have become a necessity, therefore people of science must have scientific literacy skills which include oceanic literacy. Paciran area as an area close to the coast, low oceanic literacy ability. Oceanic literacy indicator itself are understands the essential Principles and fundamental concepts about the ocean, can communicate about the ocean in a meaningful way, and is able to make informed and responsible decisions regarding the ocean and its resources The aim of this study is to create an eligible worksheet for 7th grade junior high school students to practice oceanic literacy. The worksheet eligibility is determined through three aspects, there are validity, practicality, and effectiveness. The worksheet mainly focuses on three aspects of scientific literacy and direct observation which is uses interaction of living things as its content. Research design used in this study are Research and Development (R&D) and One Group Pretest-Posttest Design, with quantitative descriptive analysis and data collection techniques such as validation, observation, questionnaire, and test. The results of the validation were reviewed in three conditions, namely the didactic, construction, and technical requirements, a trend

value of 5 was obtained with a very feasible category. The practicality aspect in terms of the learning implementation, the percentage of the performance obtained by 100% so that it has been implemented well, then based on the activities of students in the group as a whole that appears dominant is doing activities in LKS, student activity based on oceanic literacy skills has increased from meeting 1 namely 58 , 6% until the fifth meeting that is equal to 69.43%, and for percentage score of students response is 98,9%. For effectiveness aspect is obtained from the pre-test and post-test results, from a total of 30 students, 24 students received n-gain scores in the high category and 6 students received n-gain scores in the medium category with an overall student n-gain average of 0.83 with the high category. Based on the n-gain shows an increase in the ability of oceanic literacy from the results of the pretest to posttest, the increase shows that the effectiveness of the device used to train oceanic literacy of seventh grade junior high school students on the material interaction of living things

Keywords: Student worksheet, oceanic literacy, direct observation, interaction of living things

CHAPTER 1
INTRODUCTION

A. Background

Education is very much needed in this 21st century. The education sector is one of the steps to prepare the younger generation who are expected to be able to build superior human resources who can conquer and keep up with the times. Improving the quality of education is necessary to achieve the goals of human resource development, because improving the quality of education is integrated with the process of improving the quality of human resources itself (Tilaar, 2012). This is also supported globally by an agenda called Sustainable Development Goals (SDGs) compiled by the United Nations. This agenda contains 17 global goals and one of them is to improve the quality of education in terms of ensuring that all students acquire the knowledge and skills needed to promote sustainable development (United Nations, 2015). The National Education Standards Agency (2014) itself also states that one of the qualities of education in question is quality in the learning process, namely learning must be carried out interactively, challenging, and motivating students to actively participate in providing space for students to foster creativity, initiative, and independence.

The quality of education in Indonesia is currently still low. It is based on data*The United Nations Educational, Scientific and Cultural Organization* (2018), of all countries in ASEAN, Indonesia is in the order 5th with the acquisition value of 0.603.

Based on data obtained from the Education Development Index (2014), Indonesia still ranks 57th out of 115 countries as released by the Coordinating Ministry for Human Development and Culture.Improving the quality of education in Indonesia must be carried out immediately as an effort to build the quality of human resources as well as membersUnited Nations, Indonesia is obliged to participate in achieving the SDGS agenda, especially in terms of education.

Practicing literacy in students, both general literacy and scientific literacy, can be a solution in improving the quality of education in the learning aspect. Students will be better prepared to master learning at a higher level if students have literacy skills, and with these abilities students will be able to explain and solve problems that occur in life (Winarti, 2017).Suragangga (2017) states that training both general literacy and scientific literacy to students in the learning process can improve the quality of education and also human resources. The literacy skills of students will help improve the quality of education in Indonesia, especially in the learning process so that it can produce quality young generations.

Science learning is learning that cannot be done just by listening to the teacher explain concepts and being passive. Students mustconducting learning through experiments, observation and active experimentation which will eventually form creativity, be able to explain events or phenomena of natural phenomena scientifically and also awareness to maintain the stability of this nature properly and sustainably (Mariana and Praginda, 2009). In the learning process, science is something that must be done by students, not something that is done to students (Rohmawati et al, 2018). Science learning is also said to be of very good quality when the

learning can providemeaning for students. This meaning can be obtained by students if these students have good scientific literacy skills because science itself is a method for producing scientific products or new knowledge and attitudes like scientists, namely scientific attitudes through scientific process activities, then activities are mandatory things that must be done by students. in learning science or what is called the scientific process (Bundu, 2006).

In fact, the students' literacy skills needed to improve the quality of education are still below average or can be said to be low. On the Survey*Program for International Student Assessment*2015 placed Indonesia at number 62 in the context of science, 64 in the context of reading, and 63 in the context of mathematics out of a total of 72 participating countries (OECD, 2016). Survey results from*Program for the International Assessment of Adult Competencies* indicates that 60% Indonesia's adult population is in the lower category for numeracy, literacy and problem solving. Indonesia still has great potential to improve literacy skills because based on the results of a survey by the Ministry of Home Affairs Research and Development Agency (2019),said that the level of literacy skills of Indonesian students is around 61%,This result is considered good enough and is a sign that the reading interest of Indonesian students has also increased as much as 61%. This comes from the results of a study of 6,500 grade 10 students spread across 34 provinces. Science literacy itself has been taught in Indonesia for a long time, such as in the process of making batik, processing seaweed and so on, so the hope of improving the scientific literacy skills of Indonesian students is still very high.

In this study, the school used as the research subject was SMP Negeri 1 Paciran, Lamongan. The results of the

questionnaire distributed to 30 students turned out that 100% of the students had never carried out practicum activities regarding the interaction of living things, students had never made direct observations to the sea to directly observe the interactions of living things, and the teacher also only explained the material without relating it to everyday life . Students' knowledge of oceanic literacy is only 13.3%. As many as 78% of students do not understand the material on the interaction of living things. Based on the results of observations and pre-research questionnaires distributed in class VII-A,

Based on these data, it shows that Indonesia must strive even harder in training literacy, especially scientific literacy. Husamah (2014), states that every child needs scientific literacy in order to survive in the conditions of dynamic, fast-paced world competition. The ability of scientific literacy will make students able to survive in any environment armed with the knowledge, understanding, skills, and values in it. This is reinforced by the results of Permatasari's (2015) research that the quality of a nation is determined by its intelligence and knowledge, while intelligence and knowledge are generated by how much knowledge is obtained, while knowledge is obtained from information obtained both orally and in writing. The more people in an area who are enthusiastic about seeking knowledge, the higher the civilization will be.

Scientific literacy can be defined as knowledge and scientific skills to be able to identify questions, acquire new knowledge, explain scientific phenomena, and draw conclusions based on facts, understand the characteristics of science, awareness of how science and technology shape the natural, intellectual and cultural environment, and the

willingness to be involved. and care for science-related issues (OECD, 2016). Scientific literacy is also defined by AAAS (American Association for the Advancement of Science) with "Project 2061" as the ability to solve problems with scientific knowledge, identify questions and also make conclusions based on evidence, that ability is used to understand and make a decision.

An understanding of science includes facts, concepts, principles, laws, theories and models that have been established by scientists from time to time. Knowledge of the content science is categorized into three, namely physical systems, life systems and earth and space systems (OECD, 2016). The physical system includes the structure of matter, the properties of matter, changes in the chemistry of matter, energy and transformation, the interaction of energy and matter, for living systems including cells, the concept of an organism, humans, populations, ecosystems, biosphere and finally for earth and space systems including system structures. earth, energy in the earth system, changes in the earth system, earth history, earth in space, history and the scale of the universe.Hoffman and Barstow (2007) reviewed the implementation of this scientific literacy content and concluded that in general, significant improvement and development is needed in literacy content, especially in living systems.

Based on the explanation by Hoffman and Barstow (2007), one thing that needs to be developed is a living system, especially in marine ecosystems. This presentation shows that it is important for students to understand and have scientific literacy skills about marine ecosystems. Literacy that discusses marine affairs is called oceanic literacy (UNESCO, 2013).

The United Nations Educational, Scientific and Cultural Organization or UNESCO (2013) defines marine literacy (Ocean Literacy) as "the influence of the sea on humans and the influence of humans on the sea". Understanding the ocean is important to understand and for the purpose of preserving the ocean and protecting the planet where we live (Cava et al, 2005). GlobalyThis marine education is very important, this is because if we talk about the sea then we will say that The ocean covers 71% of the earth's surface and is the dominant feature of the earth. The ocean regulates the weather and climate, supplies nearly all of the Earth's oxygen, supports a large diversity of life, and provides a rich source of food for human populations (Cava et al, 2005).

Students in Indonesia expected later have oceanic literacy skills, especially students in coastal areas because we know that Indonesia is a maritime or marine country. Indonesia is known as a maritime country from the time of the migration of the Austronesian people to the glory days of Majapahit first.Indonesia has a wider sea area than land. The total area of Indonesian oceans is 3.25 million km2 of the total area of Indonesia of 7.81 million km2 (Puspitawati, 2005).In addition, there are many types of fish, namely around 2000 types of fish and 500 types of coral reefs in Indonesia, making Indonesia the center of the coral triangle (The Coral Triangle Center).Burke, et al, 2012). This proves that Indonesia has a very marine area so that the potential of the sea must be developed, maintained, and every citizen should be able to understand and have oceanic literacy skills, especially students as the next generation of young people who will cultivate Indonesia's natural wealth.

The desired competence that students have is not only about knowledge of events or processes that occur in the sea

in the context of life in the sea and biodiversity, but students must also be able to understand and explain how these processes occur, such as how the processes of living things in the sea get food, get foo, oxygen, their influence on humans, and the influence of human activities on the oceans, especially the balance of the ecosystem so that later they can get to know the marine environment well and be able to protect the marine environment (attitude) by doing conservation. This is in accordance with the objectives of the President of the Republic of Indonesia Regulation 121/2012 concerning the rehabilitation of coastal areas and small islands. Basic competence 3. 7 grade VII in the 2013 curriculum also says that students must analyze the interactions of living things and their environment as well as population dynamics due to these interactions (Kemdikbud, 2016). This basic competency can be a means of training oceanic literacy because it relates to biodiversity and population dynamics due to the interaction of these living things, especially in marine ecosystems.

A person who has marine literacy must have three aspects, namely content knowledge about the sea, have a good attitude towards the marine environment and do not violate marine values, and behave well towards the marine environment (Strang and Schoedinger, 2007). UNESCO (2013) states that someone who is said to have marine literacy or oceanic literacy is able to understand important principles and basic concepts about the ocean, can communicate about the sea in meaningful ways, and can make informed and responsible decisions about the oceans and their resources. . Oceanic literacy has seven important principles broken down into 45 basic concepts (UNESCO, 2013).The seven principles of literacy are (1) the oceans on earth are one unit that has

many characteristics, (2) the oceans and life in them form the characteristics of the earth, (3) the oceans are the main determinant of weather and climate, (4) the existence of oceans is the reason why the earth is habitable, (5) the oceans have a large wealth of biodiversity and ecosystems, (6) the oceans and humans have an inseparable relationship, (7) the oceans are still not widely explored. Of the seven important principles, five (5) of them are studied in science subjects, as well as the basic concepts mostly related to science (biology, physics, and chemistry).

In a study conducted by Schoedinger (2006), a topic related to the oceans that can be used to train oceanic literacy is the interaction of living things. This material requires students to learn how organisms work together and compete in an ecosystem, organisms have the capacity to produce populations of infinite size but limited environments and resources, and humans modify ecosystems. The fifth principle of oceanic literacy is abou toceans support a large diversity of life and ecosystems and the sixth principle concerning oceans and humans are inseparable and interrelated very much in accordance with the needs of learning in the material interaction of this living thing. The material for the interaction of living things is very suitable to be used as material in training oceanic literacy and oceanic literacy itself will also be a method of teaching this material because the two are interrelated. In addition, through oceanic literacy while learning about ocean ecosystems, students will gain knowledge that empowers them to be able to make wise and correct decisions about the environment or in the sense of directing students to be able to do conservation and one of the things that is most emphasized is the handling of plastic waste

that threatens the Indonesian sea (Menkomaritim in Hindrasti, 2018).

Based on interviews that have been conducted with science teachers at SMPN 1 Paciran, it is found that science teachers at the school are not aware of the importance of oceanic literacy for students, even though the area of Paciran is very close to the sea but there is still no awareness of the importance of oceanic literacy. Results of interviews with several teachers of SMPN 1 Paciran regarding oceanic literacy in schools, the result of the interview is that many science teachers do not know about oceanic literacy and think that the material for the interaction of living things is only specifically for terrestrial ecosystems, whereas in basic competency 3.7 it has been stated that this material covers all ecosystems where all living things live (Ministry of Education and Culture, 2016). The teacher there also said that reading books was enough as an activity to train and improve student literacy.

The low oceanic literacy of these students, especially at SMP Negeri 1 Paciran, is due to the lack of teaching materials used to teach oceanic literacy to students. Teachers tend to only use activities that are in textbooks. The researcher also conducted an interview with one of the science teachers at SMP Negeri 1 Paciran and got the result that the teacher did not use additional teaching materials such as worksheets and also never included insights about maritime or marine science subjects, especially on the material of interaction of living things .In this study, researchers will take advantage of the surrounding environment, in this case, the marine area in the Paciran area, in the learning process which is one of the demands of the K13 curriculum which emphasizes the contextual learning process. The deputy minister of education stated that The 2013 curriculum is a contextual praxis

curriculum that emphasizes a transdisciplinary approach through contextual-based learning themes with the surrounding environment (KEMENDIKBUD, 2014).

To achieve a marine literate society, marine science must be integrated into educational practice, research, curriculum, textbooks, and assessment (Tran, Payne, & Whitley, 2010). One of the teaching materials that can be used to practice oceanic literacy is student worksheets (LKS).LKS is a student worksheet that contains guidelines for students in carrying out activities that show students' process skills in gaining knowledge or skills that must be mastered (Indrianto, 1998). Student worksheets are used as facilitators in learning activities developed by the teacher. The design and development of student worksheets are also adapted to the conditions and situations faced in learning activities. According to Toharudin, et al. (2011) stated that student worksheets are part of teaching materials that can be used to improve student understanding and have the opportunity to apply their knowledge to strengthen their scientific literacy. The development of this LKS is expected to help train students' oceanic literacy through the interaction of living things.

Based on the explanation above, it is necessary to develop worksheets in the research with the title "The development of worksheets on the interaction of living things to train oceanic literacy for seventh-grade junior high school students".

B. Formulation of the problem

The formulation of the problem of this research is as follows:

1. How is the validity of the LKS on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students?
2. How is the practicality of the LKS on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students?
3. How effective is the LKSon the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students?

C. Research purposes

The objectives of this study are as follows:

1. To describe the validity of the LKS on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students.
2. To describe the practicality of the LKS on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students.
3. To describe the effectiveness of LKS on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students.

D. Benefits of Research

Based on the research objectives, the expected benefits of this research are:

1. For teachers
   a. Research on the development of worksheets is expected to be an alternative in the selection of inner teaching materials to train students in oceanic literacy.
   b. Provide motivation for science teachers to be more creative in developing teaching materials or learning

media related to learning to train students in oceanic literacy.

2. For student
   a. As a learning tool for students to have oceanic literacy.
   b. Provide motivation for students to have oceanic literacy and understand the importance of human influence on the ocean and oceans on humans.
3. For researchers
   Adding experience in training oceanic literacy to students through developing student worksheets, then also improving teaching skills in education about oceanic literacy.
4. For other developers
   As input and knowledge about the development of worksheets to train junior high school students' oceanic literacy, especially in the material interaction of living things.

E. Scope of the problem

In order for research to be directed and measurable, it is necessary to provide limitations on research, namely:

1. The material used is the material for the interaction of living things and is limited to the marine ecosystem.
2. The scientific literacy used is oceanic literacy (marine) or oceanic literacy.
3. The study content used in oceanic literacy is living system.
4. Indicators of oceanic literacy that are used are being able to understand the importance of the oceans to humans, being able to communicate about the ocean in meaningful ways, and being able to make informed

and responsible decisions about the oceans and their resources.

5. This development research uses the research and development or Research and Development (R&D) method which is only limited to the product trial stage.
6. This research was only conducted on students of SMPN 1 Paciran class VII-A, totaling 30 students.

F. Research Assumptions

In this study, assumptions are taken to facilitate the research process, namely:

1. The oceanic literacy skills of grade VII-A students of SMP Negeri 1 Paciran are still low.
2. Class VII-A students of SMP Negeri 1 Paciran have never carried out practical activities (direct observation) on the interaction of living things.

G. Product specifications

The products developed from this research are:

1. The worksheets being developed are worksheets that aim to train students' oceanic literacy.
2. The physical form of the worksheets is as follows:
   a. Worksheet size : A4 (21.0 x 29.7) cm
   b. Paper Type (cover) : Art Paper
   c. Paper Type (content) : HVS 70 grams
   d. Contents : Full color
   e. Cover font : Cambria
   f. Fill font : Cambria

CHAPTER II
REVIEW OF RELATED LITERATURE

A. Science Literacy

1. Understanding Science Literacy

Scientific literacy is defined as the ability to think, recognize questions and make conclusions based on scientific evidence which is then used to make decisions about events and changes through human activities (Toharuddin, et al, 2011). Science literacy has also focused on the construction of students' expertise to utilize appropriate and meaningful concepts, sharp thinking, and sparking ideas in the form of ideal, knowledgeable decisions that are relevant to their lives (Guiterez, 2014).

PISA 2015 describes scientific literacy as an ability related to scientific ideas and ideas as reflective citizens (OECD, 2016). Science literacy is an essential element of education in our modern science and technology-driven society and it is essential to teach science to all citizens, not only those who are actively involved or have early career choices in science (McPhearson, 2008).

Heller (2005) provides the following reasons for the importance of scientific literacy to include scientific and technological competences in the minimum standards for basic literacy:

a. Competitiveness and employability are closely related to individual capacity to be active and promote innovation in the workplace.
b. In the 21st century, science and technology have played an increasingly leading role in many areas of society, including the development of recreational activities, arts, sports and recreation.
c. Many of the greatest social problems of our time involve important scientific and technological components. To solve this problem, citizens must be able to participate in discussions and decision-making processes with a well-developed understanding of these scientific and technological aspects.
d. The world is in dire need of citizens with critical thinking skills, people who are able to question the fundamentals on which certain statements are constructed, and who can independently seek out information to construct rational and well-supported opinions.

The essence of literacy-based learning in effective and productive learning strategies refers to the same substance, namely utilizing reading-writing activities to study and deepen the material (content area) (Rosdiana, et al. 2018).

The aspect of the context of scientific literacy in PISA 2015 focuses on situations related to personal, family to society (local or national), and to problems in the world (global). There are five context areas in scientific literacy which have meaning for humans

that aim at improving and maintaining the quality of life. The five frameworks for the context of scientific literacy are as follows:

Table 2.1 Five Contexts of Science Literacy

Context	Personal	Local / National	Global
Health and Disease	Health care, accidents and nutrition	Disease control, social transmission, food selection, and public health.	Epidemic or epidemic, the spread of infectious diseases.
Natural resources	Consumption of personal materials and energy	Maintenance of human populations, quality of life, security, food production and distribution, and energy supply.	Renewable and non-renewable resources, population growth, sustainable species preservation.
Environmental Quality	Environmentally friendly action.	Population distribution, waste disposal, and environmental impacts.	Biodiversity, control of pollution, production and loss of soil / biomass.
Disaster	Lifestyle choice risks	Rapid changes such as	Climate change.

Context	Personal	Local / National	Global
		earthquakes, volcanic eruptions, extreme weather; slow and progressive changes such as coastal erosion and sedimentation; risk assessment.	
Science and Technology	Scientific aspects of hobbies, personal technology, music and sports activities.	New materials, devices and processes, genetic change (GMO), health technology, transportation.	Extinction of species, exploration of space, origin and structure of the universe.

(OECD, 2013)

From the PISA explanation, the material for scientific literacy is material on biology, physics, chemistry, and IPBA. According to the National Science Foundation,*Center for Ocean Sciences Education Excellence,* and The National Marine Educators Association supported by the National Science Education Standards and the American Association for the Advancement of Science Benchmarks for Science Literacy, scientific literacy that discusses the ocean is called oceanic literacy.

2. Oceanic Literacy

Oceanic literacy is an individual understanding of the oceans, the influence of the oceans on us and our influence on the oceans (UNESCO, 2013). In a textbook

entitled The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages (2013) issued by UNESCO states that someone who is said to have marine literacy or oceanic literacy is as follows:

a. Being able to understand the importance of the oceans for humans
b. Being able to communicate about the importance of the sea in a meaningful way.
c. Able to make informed and responsible decisions about the oceans and their resources.

The book also contains seven big ideas in oceanic literacy whereof the seven big ideas there are main ideas and supporting concepts regarding the importance of studying the ocean in living system content, especially in ecosystems (the interaction of living things in marine ecosystems), and the effect of the activities of living things in the sea on human activities and vice versa. The main ideas and specific supporting concepts are as follows:

a. The oceans support a large diversity of life and ecosystems.

   Incredible biodiversity can be found in the oceans, from the smallest living organisms to the largest animal currently alive, the blue whale. Most of the major groups that exist on Earth are found exclusively in the oceans and the diversity of major groups of organisms is much greater in the oceans than on land. Marine biology provides many unique examples of life cycles, adaptations, and important relationships among organisms (symbiosis,

predator-prey dynamics, and energy transfer) that do not occur on land.

1). Marine life ranges in size from living things the smallest, microbe, for the largest animal on Earth, the blue whale.

Marine biodiversity refers to the diversity of organisms living in the sea; microbes, invertebrates, fish, marine mammals, plants and birds. These biotas are intricately connected to the environmental conditions in which they occur and also to each other through the flow of energy (food) through the ecosystem. Any change in the environment or this energy flow will cause a change in biodiversity.

2). Most of the organisms and biomass in the oceans are Microbes.

Most of the organisms and biomass in the oceans are microbes, which form the basis of all marine food webs. Microbes are the most important major producer of marine Indonesia. They have a very fast growth rate and life cycle, and produce large amounts of carbon and oxygen on Earth.

3). The marine ecosystem is determined by environmental factors and

a community of organisms that live there.

Marine ecosystems are determined by environmental factors and by the community of organisms that live there. Marine life is uneven through time or space due to differences in abiotic factors such as oxygen

and available nutrients, salinity, temperature, pH, light, pressure, substrate, and circulation.

4). Tides, waves, predation, substrate, and or other factors cause vertical zoning patterns along the coast

These factors can cause vertical zoning patterns in the open ocean. These factors are water density and pressure, light level, tidal and wave action and predation. Zoning patterns can affect the distribution and diversity of organisms.

b. The ocean and humans are inseparable and interrelated.

1) The oceans affect every human life.

The sea supplies fresh water (most of the rain comes from the oceans) and almost all of Earth's oxygen. The oceans moderate Earth's climate, affect our weather, and affect human health. The sea supports the livelihoods of more than three billion people, as well as the national economy. Human health and well-being depends on the services provided by ecosystems and their components: water, soil, nutrients and organisms. Therefore, a service ecosystem is a process by which the environment produces resources utilized by humans such as clean air, water, food, and materials.

Likewise, the way people value ecosystems is driven by a variety of social, cultural and economic factors that vary widely based on where people live. The sea serves as a highway for the transportation of goods and people and

plays a role in national security. It is a great source of inspiration, recreation and discovery. It is also an important element in the heritage of many cultures.

c. A vast, unexplored ocean.

1). Understanding the ocean is more than just a matter of curiosity

Exploration, experimentation and discovery are needed to better understand marine systems and their processes. Our survival depends on it. Humans began to explore and learn about the oceans from the earliest times of humanity. Archaeologists have found piles of shells, the ancient remains of "Clambake," dating from aged stones. Ancient spears and bone fish hooks have also been found along the coastlines of nearly every continent. While they were gathering food, people learned by experience which foods from the sea are good and which are harmful. For example, the tomb of the Egyptian pharaoh bears a warning against eating the poison of puffer fish. Ancient people used marine organisms for more than just food. Clam snails were used for necklaces at least 75,000 years ago. In using marine resources, coastal communities in nearly every culture develop practical knowledge stores about marine and marine life.

Researchers used the main ideas and supporting concepts in table 2.1 to train the oceanic literacy of students of SMPN 1 Paciran because it relates to the conditions of the Indonesian territory as a maritime country and also the Paciran region on the

north coast of the Java Sea, or it can be said that Paciran is a coastal area in Lamongan Regency.

3. Scope

Oceanic literacy is part of scientific literacy as well so that its scope also follows the scope of scientific literacy.

The indicators on the competency aspect (science process) based on the 2015 PISA assessment (OECD, 2017) are as follows:

a. Explain phenomena scientifically.
   This competency requires students to think about content that fits knowledge in certain situations and use it to interpret and explain phenomena of interest. Such knowledge may also be used to generate provisional explanatory hypotheses in contexts where there is a lack of knowledge or data.
   The ability to explain phenomena that occur in everyday life must be possessed by someone who is literate. Interpreting phenomena and predicting the possibility that will occur or changes that occur are the competencies of the above aspects that must be possessed.
b. Evaluating and designing scientific investigations.
   The ability to evaluate a discovery or investigation is a competency that someone who is said to have scientific literacy must possess. This competence requires a person to know about scientific investigations such as what things must be measured, variables that must be changed or controlled and decisions that must be taken to support obtaining accurate and precise data. In addition, it also requires the ability to evaluate the quality of the data, which, in turn, depends on

recognizing that the data are not always completely accurate.

c. Interpret data and evidence scientifically

The ability to interpret data and evidence is a competency that must be possessed by someone with scientific literacy. The evidence data will be used to draw conclusions. This ability will be able to interpret data from scientific evidence of its impact on the environment in their own language.

According to Kuhn (2010), this ability also requires a person to seek valid scientific information and can generate and evaluate arguments and also draw conclusions from available scientific evidence.

People with scientific literacy should also be able to recognize the importance of previous research when assessing the value of any given scientific investigation. Such knowledge is necessary for placing the job and assessing the importance of the job whatever the possible outcome.

In scientific literacy, there are four aspects that are interrelated with each other, these four aspects are:

Table 2.2 Four aspects of scientific literacy

No.	Aspect	Description
1.	Science Content (Knowledge)	The main understanding of the facts, concepts and theories that form the basis of scientific knowledge. Understanding the concept of natural phenomena and changes that occur as a result of human activities or to humans. The content according to PISA 2015 is physical systems, living

No.	Aspect	Description
		systems, and earth and space systems.
2.	Process Science (Competence)	PISA 2015 establishes three indicators for aspects of the scientific process, namely explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting scientific data and evidence.
3.	Science Context	The ability of students to apply understanding of a concept in everyday life, both personal, local / national, and global. The fields of science application in the context of scientific literacy according to PISA can be seen in table 2.1.
4.	Attitude	Attitudes in the 2015 PISA include an interest in science, taking a scientific approach to investigation, and being aware of the environment.

(OECD, 2017)

B. Student Activity Sheet

1. Worksheet as teaching material

Worksheet is a teaching material that serves as a guide for carrying out activities to gain knowledge (Indrianto, 1998). These activities must reflect process skills. worksheet contains guidelines for completing assignment and activities. These activities are closely

related to the competencies that students will achieve or have to master.

According to Widjajanti (2008), the preparation of worksheets must meet various requirements, namely didactic requirements, construction requirements, and technical requirements.

a. Didactic Terms

Regulating the use of universal worksheets that can be used properly for students. Worksheet emphasizes more on process, finding concepts, and most importantly in this worksheet there are variations of stimulus through various media and student activities.

b. Construction Terms

Requirements relating to the use of language, sentence structure, vocabulary, level of difficulty, and clarity must essentially be effective in the sense that it can be understood by all users, namely students.

c. Technical Requirements

Emphasize the presentation of the worksheets, namely in the form of writing, pictures, and their appearance in the worksheets.

There are other opinions that are stated by Surachman (1998: 46) which states that worksheets are teaching materials that can help and guide students in the learning process so that they are directed (guided discovery activities). The conclusion that can be drawn from the worksheet is that through the student worksheets students can carry out activities as well as get the material used to complete the activities requested in the worksheets.

According to Sudjana (Djamarah and Zain, 2000), the functions of WORKSHEET are as follows:

a. Tools to create an effective teaching and learning atmosphere.
b. A tool to improve learning so that it attracts students' attention more.
c. Helps in accelerating the learning process.
d. Encourage students to be more active in learning.
e. Creating a logical mindset in students.
f. To improve the quality of the learning process.

2. Direct Observation Worksheet

Worksheet direct observation is simple student worksheets on the interaction of living things. This worksheet is based on direct observation which is intended to train oceanic literacy.

According to research by Strang Craig, et al. entitled Can you be science literate without being ocean literate ?, learning based on direct observation or direct observation in practicing oceanic literacy in the context of biology can motivate learners, accelerate and deepen conceptual understanding because students directly observe and learn about it or in words Another self-experiment, so that by using direct observation as a basis for worksheets, students will be able to literate oceanic.

C. The Relationship between Worksheet and Oceanic Literacy

Based on the results of the scientific literacy survey including oceanic literacy in Indonesia that has been carried out by PISA (2015 PISA results) and the results of pre-research conducted by researchers, it shows that the oceanic literacy skills of students including students of SMPN 1 Paciran are still very low. The factor that causes the students to have low

oceanic literacy skills is the lack of teaching materials that teach students oceanic literacy. Teachers only rely on textbooks to explain the material interactions of living things, they do not even do practicum at all because the textbooks do not provide examples of student activities. Worksheet is an example of teaching materials that can be used to train oceanic literacy.

To practice oceanic literacy in students, students can use direct observation to make it clearer in obtaining and understanding a concept. Material in biological content used in research is the interaction of living things in marine ecosystems. This worksheet was developed with indicators to explain phenomena scientifically. Students using this worksheet will be able to explain how the interaction of living things in the marine ecosystem so that students will be able to recognize how the environmental conditions are. If students understand their environmental conditions, students can find out the impact that these interactions have on humans and vice versa. When students understand the impact, students can anticipate it by doing conservation.

D. Interaction Material Between Living Things

1. Environment

a. Environmental Concept

Environment is a collection of complex variables, which are around humans as well as living organisms. Soemarwoto (2004) defines the environment or the living environment as everything that exists in every living thing or organism and affects its life.The environment includes water, air and land which are interconnected that exists between and between water, air and land and humans and other living things such as plants,

animals and micro organisms. The environment also consists of an inseparable whole system based on physical, chemical, biological, social and cultural elements, which are interrelated individually and collectively in various ways.

b. Environmental Components

The main components of the environment are biotic and abiotic components. Abiotic and biotic factors form an ecosystem. Abiotic factors are the non-living parts of an environment. This includes things like sunlight, temperature, wind, water, soil and naturally occurring events such as storms, fires and volcanic eruptions. Biotic factors are the living parts of an environment, such as plants, animals and microorganisms. Together, they are the biological factors that determine the success of a species. Each of these factors impacts other factors, and a mixture of the two is necessary for an ecosystem to survive.

Abiotic factors can be climatic, weather-related, or edaphic, related to soil. Climatic factors include air temperature, wind and rain. Edaphic factors include geography such as topography and mineral content, as well as soil temperature, texture, humidity levels, pH levels and aeration. (Sumich, 1999). Climatic factors greatly influence which plants and animals can live in an ecosystem. The prevailing weather patterns and conditions determine the conditions in which the species will live. This pattern not only helps create the environment but also impacts water flow. Changes in any of these factors, such as those that occur during occasional fluctuations such as El Nino,

have an immediate impact and can have both positive and negative effects.

Figure 2.1 Biotic components in marine ecosystems
(Source: Marine Biology 7th Edition, 2007)

c. Level of Ecological Organization

The ecological organization in an ecosystem consists of the simplest to the most complex units. The units start from the individual, population, community and ecosystem. Each unit has its own uniqueness and characteristics.

1) Individual

Individuals are organisms that live alone and do not depend on the oragnism of others. Living beings are said to be individuals if the number is single. An example of an individual is a sea urchin.

2) Population

If an individual joins or consists of several individuals, the combination is called the population. The population itself does not have to include all members of an individual but if the number is more than one in the same organism

then it is said to be the population. For example, from the population there are 10 clown fish.

3) Community

When populations of different species occupy the same space, that is what is called community. The population of species in the community is not constant, meaning that it can be replaced by other species at a certain time and in a certain area. The population of this species can replace the population of other species in the community by modifying the physical aspects of the area, and the food supply.

4) Ecosystem

The reciprocal relationship that occurs in an area between living things and its environment can be said to be an ecosystem (Soemarwoto, 2004). The formation of the exoystem is due to the presence of biotic and abiotic components that interact with each other and form an order. Ecosystem is said to be balanced if there is order in it. The balance in question is a dynamic balance, meaning that the balance can change. The changes that occur are usually caused by humans.

Ecosystems also have very many types, but ecologists categorize them broadly as aquatic ecosystems (aquatic) and terrestrial (terrestrial) ecosystems.

2. Interaction Patterns

The nature of life in a particular habitat is determined in large part by the non-living or abiotic

parts of the environment, namely the physical and chemical environment such as salinity or basic type. Organisms are also influenced by other organisms - the environment, or biotic. Biological populations interact in a complex manner that makes organisms in the community dependent on one another. Individuals can have to adapt to biotic and abiotic components in the environment (Nybakken JW, 1992).

Individual organisms can adapt to varying degrees by changing their behavior, metabolism or other characteristics. One example is that seaweed adapts to a lack of light by increasing its chlorophyll content, thus making the organism more effective at capturing that little light (Castro and Huber, 2007). Another example of physiological adaptation occurred in Turbinaria mesenterine corals. These corals live in zone two zones, some live in areas where the light supply is more and some are where the light supply is low. When the coral lives in an area with a lot of light supply, it grows normally with a tapered shape. Meanwhile, when the coral lives in a low light area, the coral will grow flat.

Figure 2.2 Forms of Corals that live in that area lots of light
(Source: Marine Biology 7th Edition, 2007)

Figure 2.3 Form of coral living area less light
(Source: Marine Biology 7th Edition, 2007)

a. How Species Interact

Species do not live in a vacuum nor are they isolated from other species. Members of different species may have a strong effect on each other. Species can interact in many ways, all of which affect community organization.The interaction

between living things and between living things with abiotic components produces forms of interaction patterns, such as competition, predation, symbiosis, and anti-symbiosis. Each species has a special role, or ecological niche, in the community. The niche of a species is determined by a combination or almost every aspect of its lifestyle: what it eats, where it lives, when and how it reproduces, how it behaves, and so on (Castro and Huber, 2007).

1). Competition

Organisms must compete for resources not only with members of their own species. Competition between species is known as interspecific competition. When two species use the same resources and scarce resources, the species must compete just as if they were members of the same population. One of the species usually turns out to be better at the competition. If two species eat the exact same food, for example, one of the two will be better at catching it. Competition between species yields when both species use scarce resources. In competitive exclusion, one species wins the competition and eliminates the others
from the community.

Shortage of supply of any resource can lead to competition. The hermit crab (Calcinus laevimanus) relies on the shell of the snail that is left behind for protection. When they grow from their old shell or wear

out they have to move to a new shell, and sometimes there aren't enough shells around. These left-handed crabs (hermit crabs) fight over the shell they both want.

Figure 2.4 Forms of competition between people hermit crab species*(Calcinus laevimanus)* in fighting over the shells
(Source: Marine Biology 7th Edition, 2007)

2). Predation

Species do not always compete for food sources, but they also use each other as food sources. In other words, they ate each other. Predation is the act of one organism eating another. Organisms that eat are called predators, and organisms that are eaten are prey. One example of predation is when the purple-skinned cone shell (Conus purpurascens) engulfs its prey, the red-haired goby (Elacatinus punctculatus). The shells immobilize the fish by injecting a strong poison through the cavities, like spears coming from the radula.

Figure 2.5 An intermediate form of predation shells purple-skinned cone (Conus *purpurascens)* with the goby redhead (Elacatinus *punctculatus)*
(Source: Marine Biology 7th Edition, 2007)

3). Symbiosis

Co-evolution becomes more important as species interact more intimately. Members of different species can live in very close relationships, even with one within another. Such close relationships are examples of symbiosis, which literally means living together. The smaller partner in the symbiosis is officially called the symbiont and the larger one is the host, although sometimes the distinction is not clear. Biologists have traditionally divided symbiosis into different categories as to whether the organisms involved benefit or harm from the relationships that are made between living things. In a commensalistic relationship, one species gains shelter, food, or other benefits without affecting the other species in one way or another. One example of a form of commensalism is barnacles and whales.

Certain theories live only in whales. Barnacles get free shelter and rides. They forage by filtering water, and so far the whales do not feel disadvantaged or benefited by barnacles.

Figure 2.6 Forms of commensalism relationship between barnacles and whales
(Source: Marine Biology 7th Edition)

Sometimes there is a relationship between living things that is detrimental, one of which is called parasitism. For example the giant tapeworms that live in the intestines of whales are considered parasites because they take food and shelter from the whales and can weaken the whales because of their presence.

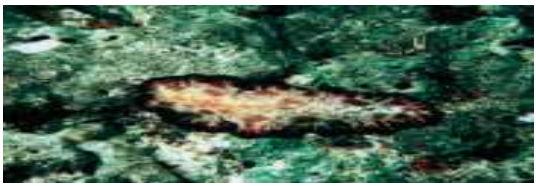

Figure 2.7 Forms of parasitism relationship between giant tapeworms and whales
(Source: Marine Biology 7th Edition)

Not all symbiotic relationships are detrimental, one of which is a relationship called mutualism. In a mutual relationship, both of them benefit from each other. In many places, minnows and prawns have a reciprocal relationship with larger fish known as the cleaning association. Sometimes partners depend on each other. Colorful crabs, for example, are not found anywhere else but in their coral hosts. The coral supply not only provides shelter but also produces mucus as food for crabs. While corals don't really depend on crabs, it benefits the corals because they help repel starfish and other coral predators.

Figure 2.8 Forms of mutualism relationships between Wrasse cleaners (Labroides) does its job on the moray eel (Gymnothorax)
(Source: Marine Biology 7th Edition)

3. Food chains and food webs

a. Definition

The food chain is the eating and eating events between living things in a certain order. In the food chain there are living things that act as producers, consumers, and decomposers.

Food webs are combinations of related food chains combined or combined, which overlap in an ecosystem.

b. Types of food chains

1) Predator Chain

The main foundation of the Predator Chain is green plants as producers. The predator chain starts from herbivorous animals as consumer I, followed by carnivorous animals that prey on herbivores as the second consumer and ends with carnivorous and herbivorous predators as the 3rd consumer.

2) Parasite Chains

Parasitic chain starts from large organisms to organisms that live as parasites. Examples of parasitic organisms include worms, bacteria, and parasites.

3) Saprophyte Chain

Saprophyte chain starts from dead organisms to decomposing bodies. For example, fungi and bacteria. The chains above do not stand alone but are related to one another to form food pharynx.

c. Examples of food chains and food webs

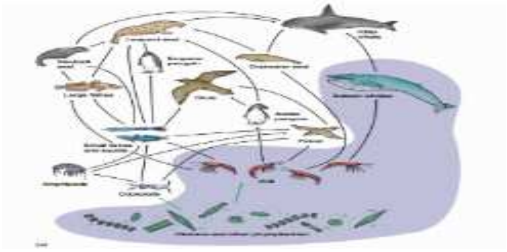

Figure 2.9 Examples of food chains and webs food in marine ecosystems
(Source: Marine Biology 7th Edition)

4. Conservation

a. Conservation of marine ecosystems

The threat of habitat destruction, overexploitation and pollution will cloud the future of the marine environment. The human population which continues to increase every year is a major factor in habitat destruction, and what will be at stake is the survival of our own species. One of the efforts to save an ecosystem that is starting to break down is conservation. Conservation efforts have been carried out locally, nationally and internationally. Many countries strictly regulate the type and amount of pollutants that may occur discharged at sea. Drilling for oil has been banned on some beaches, such as those from central California. Commercial fisheries have been regulated by the national government partly because of the creation of an exclusive economic zone, or EEZ, and by international commissions. The government has also established marine protected areas for the protection and management of areas of ecological significance. The United Nations Environment Program plays an active role in conservation through education, sponsoring projects, and even lobbying for legislation. Protection of coastal areas against waves of development progress is of extreme importance. The conflict between economic development and the preservation of coastal resources, although particularly intense in developing countries, is ubiquitous. Development must be sustainable, that is, it must meet the needs of today without affecting the ability of future generations to meet their needs. Many laws or regulations that have been passed by the government,

but there is still a lot of work to be done. The use of coastal resources must be carried out wisely, even if it is against the interests of developers, fishermen, surfers, power plant builders, beach visitors.

b. Habitat Restoration

Another strategy for improving environmental quality is to help habitats recover from changes caused by pollution and habitat destruction. Invaluable losses such as salt marshes and mangroves through landfilling or boat building can at least be partially compensated for by creating or restoring similar habitats elsewhere. This effort of course assumes that a new location meeting the physical requirements (such as tides, salinity, and media type) required for the healthy development of a biological community. Examples of successful habitat restoration include transplantation of cordgrass (Spartina), one of the dominant salt marshes plants, and mangrove seedlings. The introduced species of cordgrass, however, have taken over the habitats that native species normally inhabit.

E. Supporting Learning Theory

1. Behavioristic Theory

This theory is a theory that flows in one of the schools of psychology called behaviorism. Gage and Berliner are the ones who came up with this theory. The essence of behavioristic learning theory is a change in behavior from the results of the experiences that are obtained. The interaction of the stimulus and response is what makes behavioral changes in the learning process, so in the

learning process the right stimuli will be very helpful.(Munthe, 2009).

2. Social Learning Theory

This theory is a development of behavioristic theory. Albert Bandura is the person who developed this theory of learning. This learning theory emphasizes external reinforcement to understand how to learn from others, but cognitive explanations are still being used. This learning theory views that learning does not only come from within (internal drive) but also comes from outside, namely the environment (Dimyati and Mudjiono, 2006).

F. Relevant Research

1. Schoedinger, S., Cava, F., and Jewell, B. 2006. The Need for Ocean Literacy in the Classroom. The Science Teacher Article.

   In research Schoedinger (2006), states that topics related to the ocean that must be used to train oceanic literacy, one of which is the interaction of living things. This materialrequires students to learn how organisms work together and compete in ecosystems, organisms have the capacity to produce populations of infinite size but limited environments and resources, and humans modify ecosystems. This material is very suitable to be applied and refers to the important principles of oceanic literacy in Samudra 5 and 6.

   Fundamental concepts that conform to these standards lead students to learn into the oceans of habitats and the ways humans influence the oceans. One example of the material being taught is that the event teacher can highlight Harmful Algal Blooms (HABs), this topic also discusses Essential Principles 5 and 6. Focusing on HAB

is a good way to engage students because most of them have heard and know about These HABs. While learning about marine ecosystems, students will gain knowledge that empowers them to make informed decisions about their impact on the environment.

2. Strang C., DECharon, A., and Schoedinger, S. 2007. Can You Be Science Literate Without Being Ocean literate. Journal of Marine Education. 23 (1).

   Based on research by Strang (2007), it is stated that it is wrong

   One example of a method in practicing literacy for the 5th principle in the context of biology is direct observation and also investigative or inquiry activities.

3. Fauville, Geraldine. 2017. Question as Indicators Of Ocean Literacy: Students' Online Asynchronous Discussion With A Marine Scientist. International Journal of Science Education: 1-20.

   In this article, 61 high school students learn about ocean acidification through a virtual laboratory followed by virtual lectures and asynchronous discussions with a marine scientist on the online platform: VoiceThread. This study focuses on the development of students' marine literacy when asked to ask questions for scientists. Student questions were analyzed thematically to assess (1) the type of reasoning that could be seen as a place for student questions and (2) what possibilities for improving marine literacy emerged in this instructional activity. The results show how interacting with Scientists provides students with entry points into the natural world of science with its complexity, uncertainty and options outside the ideal forms in which natural science is often presented in schools. These activities offer an

affordable way of bringing marine science to school by providing the broad expertise of marine scientists. Students get the opportunity to mobilize their pre-existing knowledge in marine science.

4. Adams LG, Matsumoto G. 2009. Enhancing Ocean Literacy Using Real-Time Data. Oceanography 22 (2): 8-9.

   Based on research conducted by Admas (2009), it is known that an activity that can be done to train oceanic literacy is to carry out investigation-based activities on the material being taught. The inquiry-based activity addresses three of the seven principles of ocean literacy and enables students to investigate processes, make predictions, and learn about nutrient loading and its effects on marine ecosystems.

5. Fauville, G., Strang, C., Matthew A. Cannady & Ying-Fang Chen. 2018. Development of the International Ocean Literacy Survey: measuring knowledge across the world. Environmental Education Research: 1-23.

   In this study, it is stated that the researcher compiled a survey of instruments on oceanic literacy and has been tested (the first in English in the US, and the second in 17 languages in 24 countries. In addition to measuring the level of Marine Literacy around the world, the researcher also intends to inform the collaboration. based on other large-scale international research. The results of the survey conducted were that more than 50% of the students who participated in the survey had very low oceanic literacy skills, which is below 40%.

G. Framework of thinking

Hope

1. Literacy skills are the foundation for improving the quality of education in Indonesia.
2. Oceanic literacy is important for students in Indonesia to have because Indonesia is a maritime country the central region of the coral triangle (The Coral Triangle Center)
3. There are teaching materials that train students' oceanic literacy regarding the

Reality

1. Indonesia ranks 62 out of 70 participating countries in terms of scientific literacy.
2. Oceanic literacy has not been trained at SMPN 1 Paciran.
3. The teaching materials used by science teachers at SMPN 1 Paciran are textbooks and in textbooks, there are no activities for the interaction of living things for marine ecosystems.

Problem

Oceanic literacy has not been trained at SMPN 1 Paciran

Supporting Theory

1. Behavioristic theory
   The essence of behavioristic learning theory is a change in behavior from the results of the experiences that are obtained. The interaction of the stimulus and response is what causes behavioral changes in the learning process.
2. Social learning theory
   This theory is a development of behavioristic theory. This learning theory emphasizes external reinforcement to understand how to learn from others, but cognitive explanations are still being used. This learning theory views that

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5. Fauville, G., Strang, C., Matthew A. Cannady & Ying-Fang Chen. 2018. Development of the International Ocean Literacy Survey: measuring knowledge across the world. Environmental

Solution

Development of worksheets on the Interaction of Living Things to Train Class VII Oceanic Literacy

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CHAPTER III
RESEARCH METHODS

A. Types of research

The type of research used is research and development or Research and Development (R&D). This research is research that aims to develop worksheets in the form of direct observation worksheets or direct observations on the interaction of living things to practice oceanic literacy for seventh-grade junior high school students. This development was carried out according to the R&D (Research and Development) method (Sugiyono, 2018).

B. Trial Design

The trial design used by researchers is using design One Group Pretest-Posttest Design (Sugiyono, 2018).

O1	**X**	**O2**

Information:

O1 = Giving pretest to know students' prior oceanic literacy skills given learning treatment with using direct observation based worksheets

X = Treatment using worksheets direct Observation

O2 = Giving posttest to know the results oceanic literacy after being treated learning using worksheets direct observation based

C. Place and time of research

This development research was carried out in the Science Department of the State University of Surabaya in the odd semester of 2019/2020. These development activities include literature study, product design, design validation, and product revision. Furthermore, data collection and trial activities were carried out in the even semester of the 2019/2020 school year at SMPN 1 Paciran, Lamongan.

D. Research Objectives

The target of this research is worksheets on the interaction of living things to train oceanic literacy for seventh grade students of SMPN 1 Paciran, Lamongan. This worksheetwill be tested on 30 students of class VII-A (1 class).

E. Operational definition

1. Worksheet

This direct observation-based worksheets is a collection of sheets containing instructions and steps in observing the interaction of living things in marine ecosystems which aim to train oceanic literacy. This worksheet also contains questions related to oceanic literacy.

2. Oceanic Literacy

Oceanic literacy is an individual understanding of the oceans, the influence of the oceans on us and our influence on the sea so that students not only know about the processes that occur in the sea but also can understand and explain scientifically the processes that occur in the sea and their end. can do

conservation to maintain sea harmony. Oceanic literacy that is trained includes four aspects, namely a. the knowledge (content) aspect used focuses on living systems, especially in marine ecosystems and is in accordance with the 7 big ideas on oceanic literacy; b. aspects of competence (process) used are indicators of explaining phenomena scientifically; c. the context aspect used is the local / national context of marine ecosystem conservation efforts;

3. **The validity of the worksheet**

Validity is the result of an assessment given by the validator about the quality of teaching materials developed by researchers, namely worksheets to train students' oceanic literacy. The assessment score is based on a Likert scale, there is a scale of 1-5 with very poor, unfavorable, good enough, good, and very good criteria. Later, it will be seen that each validator gives what value and the trend. There are two kinds of trends here, namely valid (the validator gives a score of 4 or 5) and invalid (the validator gives a score of 1 to 3), so that from all aspects it can be concluded that the worksheet to train oceanic literacy is valid or invalid.

4. **Practicality of worksheets**

The practicality of this worksheet is the result of observations of the implementation of learning in the classroom, the implementation of the worksheet, student activities in learning using the worksheet, and student responses to the worksheet. Worksheet is said to be feasible or practical if the results of the assessment of the implementation of learning observations get a percentage value of ≥61%, the

implementation of worksheetin the three aspects of oceanic listening is the most dominant among other activities, the dominant student activity carried out by students is doing activities on the WORKSHEET, and student responses get a percentage value of ≥ 61%.

5. The effectiveness of worksheets

The effectiveness of this worksheet is the result that is assessed based on the students' oceanic literacy skills trained through the pretest-posttest activities and is said to be effective if the score obtained at N-gain is> 0.3 with moderate or high interpretation.

F. Research procedure

The following is a chart of the research procedure used:

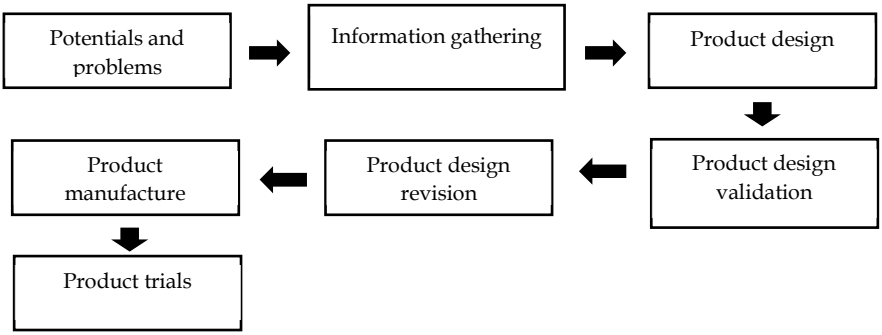


Figure 3.1 Research Procedures Research and Development Methods
(R&D)
(Source: Sugiyono, 2018)

Based on the above stages, the research procedures to be carried out include:

1. Potential Problems

This stage is done for analyzing the potential and problems obtained through interviews, observation, and conducting pre-research by distributing questionnaires about oceanic literacy. Based on the results of pre-research at SMPN 1 Paciran, the following information was obtained:

a. The results of interviews with science teachers found that oceanic literacy has not been trained, The teacher has never made direct observations about the interaction of living things, especially marine ecosystems, even though the school is located right in front of the sea, the teacher has never linked the interaction between living things with daily activities, especially about the importance of the sea, and the teacher also thinks that by reading books before the class starts, it is a form of literacy training.
b. The results of the student questionnaire showed that the students' knowledge of oceanic literacy was only 12.5%.
c. The lack of teaching materials used to train students' oceanic literacy. Science teachers only use K-13 textbooks to teach science material without any other companion teaching materials.
d. The use of laboratories that are not maximized in doing practicum, so that practicum is rarely done.
e. The use of natural potentials such as the sea in the area of SMPN 1 Paciran as a place for direct observation is not utilized, so students do not get direct experience of what they have learned in school.

Based on these potential problems, a teaching material is needed that can be used to train students in oceanic literacy. Worksheet is an example of teaching

materials, so researchers provide solutions by developing worksheets to train students' oceanic literacy.

2. Information Gathering

This stage involves gathering information that supports the development of worksheets so that they can overcome problems that exist in potential problems. The information needed to support this research is about the Paciran location to the closest sea area and it turns out that the Paciran area is the resultlocated on the coast of the North Coast of the Java Sea or it can be said that Paciran directly borders the Java Sea so that an insight into marine conservation is needed for the shiva living in the area. Collection of information on oceanic literacy, its aspects and indicators.These indicators are as follows:

Table 3.1 Core Competencies, Basic Competencies, and Indicators

Core Competencies	Basic competencies	Indicator
3. Understand and apply knowledge (factual, conceptual, and procedural) based on his curiosity about science, technology, art, culture related to visible phenomena and events.	3.7 Analyzing the interactions between living things and their environment and the population dynamics due to these interactions	3.7.1 Explain environmental concepts. 3.7.2 Identify the components of the environment. 3.7.3 Describe the units of living things in an ecosystem. 3.7.4 Analyze the interaction of biotic and abiotic components in the ecosystem.

Core Competencies	Basic competencies	Indicator
		3.7.5 Explain the concept of the food chain. 3.7.6 Describe the types of food chains. 3.7.7 Identifying differences in food chains and food webs. 3.7.8 Analyze energy flow and matter cycles in the environment. 3.7.9 Explain the concept of symbiosis between living things. 3.7.10 Identify the kinds of symbiosis. 3.7.11 Explain the concept of competition between living things. 3.7.12 Identify the kinds of competitions. 3.7.13 Explain the concept of predation between living things. 3.7.14 Analyze patterns of interactions between living things in ecosystems.

Core Competencies	Basic competencies	Indicator
		3.7.15 Analyze the influence of the interaction of living things on the number of populations. 3.7.16 Analyze the impact of human activities on the ecosystem. 3.7.17 Analyzing the efforts made to reduce the risk due to human activities on the ecosystem.
4. Trying, processing, and presenting in the realm of the concrete (using, unraveling, arranging, modifying, and making) and the realm of the abstract (writing, reading, counting, drawing, and composing) in accordance with what is learned in school and other sources in the same perspective /theory.	4.7 Presenting the results of observations on the interaction of living things with the surrounding environment	4.7.1 Conducting observations of abiotic and biotic components in the ecosystem. 4.7.2 Writing reports of observations of abiotic and biotic components in an ecosystem. 4.7.3 Make observations a video about the food chain in marine ecosystems. 4.7.4 Write reports on observations a video about the food chain in marine ecosystems.

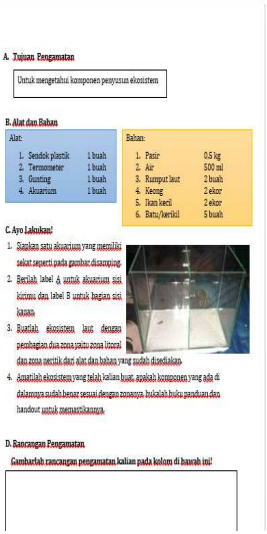
Core Competencies	Basic competencies	Indicator
		4.7.5 Conduct video observations about interaction patterns between living things. 4.7.6 Write reports on observations videos about patterns of interaction between living things. 4.7.7 Conduct observations on seagrass and benthic populations. 4.7.8 Write reports on observations seagrass and benthic populations. 4.7.9 Write down ideas in form posters about marine ecosystem conservation. 4.7.10 Undertaking conservation efforts to reduce the risk due to human activities on ecosystems through the campaign presentation project "Save our Seas, For

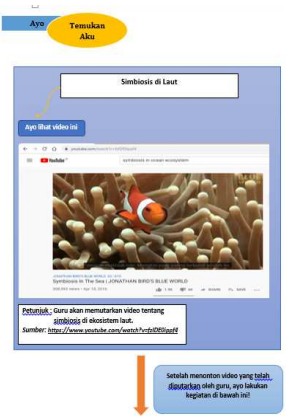
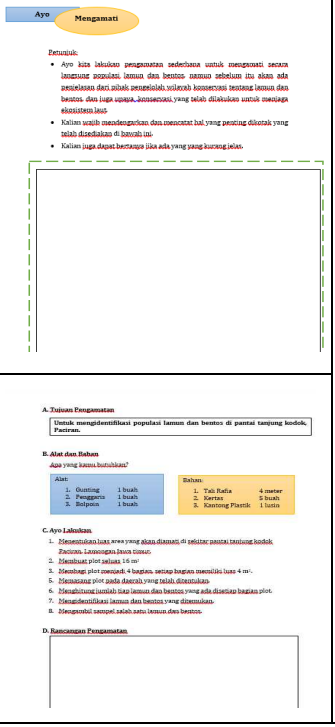
Core Competencies	Basic competencies	Indicator
		A better Planet, For A better You".

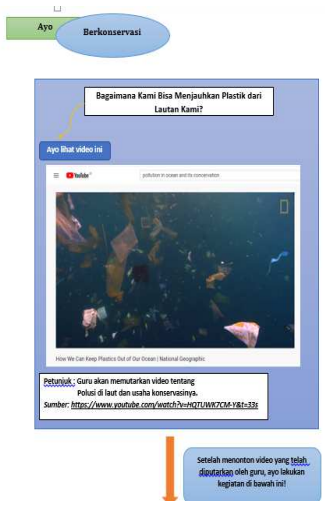
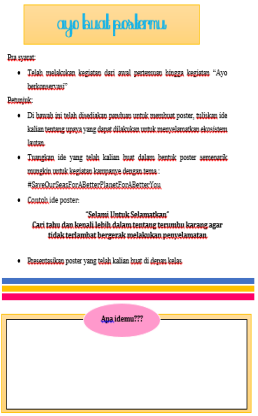
3. Product Design

The design of the worksheets includes the stages of preparing the worksheets. The preparation of the worksheets includes the preparation of the cover and contents of the worksheets, the content of the worksheets has three main parts, namely look into the ocean (look into the ocean) which consists of 3 activities (around you, cycle, and interaction or around you, cycles and interactions), the second part is oceanic recreation which consists of one activity, namely play with you, and the last part is oceanic recreation which consists of one activity, namely oceanic day. The total activities in the worksheet are five activities. The description of these activities can be seen in table 3.2 as follows:

Table 3.2 Description of the Worksheet Design

Part	Contents	Worksheet overview	Information
Look at the ocean	Activity 1	 A. Tujuan Pengamatan Untuk mengetahui komponen penyusun ekosistem B. Alat dan Bahan Alat: 1. Sendok plastik 1 buah 2. Termometer 1 buah 3. Gunting 1 buah 4. Akuarium 1 buah Bahan: 1. Pasir 0,5 kg 2. Air 500 ml 3. Rumput laut 2 buah 4. Kerang 2 ekor 5. Ikan kecil 2 ekor 6. Batu/kerikil 5 buah C. Ayo Lakukan! 1. Siapkan satu akuarium yang memiliki sekat seperti pada gambar disamping 2. Berilah label A untuk akuarium sisi kiri dan label B untuk bagian sisi kanan 3. Buatlah ekosistem laut dengan pembagian dua zona yaitu zona litoral dan zona neritik dan alat dan bahan yang sudah disediakan 4. Amatilah ekosistem yang telah kalian buat, apakah komponen yang ada di dalamnya sudah benar sesuai dengan zonanya, bukalah buku panduan dan handout untuk memastikannya. D. Rancangan Pengamatan Gambarlah rancangan pengamatan kalian pada kolom di bawah ini!	In activity 1 (Around you or around you) is focused on training students to understand, communicate, and make information about the environment and its components.
	Activity 2	 Ayo Merangkai Petunjuk: • Kamu sudah...melakukan kegiatan melihat video dibagian "Ayo temukan aku" dengan baik. Sekarang ayo kita merangkai komponen biotik dibawah ini untuk membentuk rantai makanan dan lacing-lacing makanan. • Berilah label dan tanda panah, untuk membuat gambar di bawah tersebut menjadi rantai makanan.	In activity 2 (Cycle or cycle) is focused on training students to understand, communicate, and make information about the food chain and energy flow in the ecosystem.

Part	Contents	Worksheet overview	Information
	Activity 3		In activity 3 (Interaction or interaction) is focused on training students to understand, communicate, and make information about forms of dependence between living things.
Ocenic Recreation	Activity 4		Activity 4 (Playing with You or playing with you) is focused on training students to understand, communicate, and make information aboutthe interaction of living things on their population and the impact of human activities on the ecosystem. In this fourth activity students will go directly to the sea to observe seagrass and benthic populations.

Part	Contents	Worksheet overview	Information
Oceanic Conserve	Activity 5	 	Activity 5 (Ocean Day) is focused on training students to understand, communicate, and make information about the efforts being made toreduce the risk due to human activities to the ecosystem (Conservation). A form of conservation carried out through the campaign presentation project "Save our Seas, For A better Planet, For A better You"

4. Product Design Validation

The design validation stage is carried out to assess the feasibility of the resulting product. The validation assessment is carried out by two expert lecturers, namely a material expert lecturer, a literacy expert lecturer, and one relevant science teacher.

Revisions are made if the worksheets have been validated by material expert lecturers, literacy expert lecturers, and science teachers. In the validation process, deficiencies were found, so the science lecturers and teachers gave input for revisions.At the design revision stage, this is carried out to update the worksheets design that has been made based on the suggestions given when validating the product design.

5. Product Trial

The trial phase was carried out to determine the feasibility of the worksheet. This worksheetwill be tested in class VII-A of SMPN 1 Paciran with a total of 30 students.

G. Research Instruments

1. Feasibility Instrument Based on Validity

a. Worksheet review sheet

The study sheet aims to obtain suggestions and criticism from expert lecturers and science teachers on the worksheets being developed.

b. Worksheet Validation Sheet

This validation sheet aims to obtain data on the quality of the developed worksheets. This sheet is in the form of a questionnaire. This assessment is used as a guide whether the worksheet is valid or not. The aspects of the assessment are given a range of values between 1 to 5 with the interpretation of the

assessment ranging from very poor, less feasible, quite feasible, feasible, and very feasible.

2. Feasibility Instrument Based on Practicality

a. Learning Implementation Sheet

The implementation sheet is used to determine whether the learning has been carried out as in the stages of the RPP that have been compiled. The observation sheet is filled in during the product testing process by placing a check mark (√) in the column that corresponds to the learning stages carried out by the researcher.

b. Student activity sheet in groups

The student activity sheet in this group will be filled in by the observer by giving a check mark (√) in the column that has been provided in accordance with the activities carried out by students and observed for 5 minutes during the learning process.

c. Student Response Questionnaire Sheet

The student questionnaire sheet aims to obtain student responses after using the worksheet. This questionnaire contains statements and will be filled in by students by placing a check mark (√) in the column provided.

3. Feasibility Instrument Based on Effectiveness

Oceanic Literacy Test Sheet

The oceanic literacy test has two parts, namely the pretest and posttest. The oceanic literacy test sheet that is used contains essay questions about the material interactions between living things in marine ecosystems which consist of three aspects, namely aspects of knowledge (content, material on the interaction of living

things in marine ecosystems), aspects of competence (processes, explaining phenomena scientifically), and context aspects (marine conservation).

H. Data collection technique

1. Validation Techniques

Validation is used to provide a value to the worksheets that have been made to train oceanic literacy. The results of this validation are the values that have been given by the validator which will then be used as a benchmark about the feasibility of the worksheet in terms of validity. Validation was carried out by two expert lecturers and one science teacher at SMPN 1 Paciran as validators.

2. Observation Technique

Observation aims to collect data about the implementation of learning using the developed worksheets and student activities in groups. Observations were made by three observers in the class while learning was taking place.

3. Questionnaire technique

This questionnaire technique was used to determine student responses to student worksheets. The questionnaire contains statements that refer to students' opinions about the feasibility of the worksheet.

4. **Test Technique**

Giving the test aims to obtain data on students' oceanic literacy skills. This test was administeredbefore and after the learning process using worksheets to train oceanic literacy in students.

I. Data analysis technique

1. Feasibility Analysis Based on Validity

a. Analysis of the study results

The results of the study are opinions and criticisms of the worksheets developed. The results are then reviewed to improve the worksheets.

b. Analysis of Validation Results

Data validation results from the developed worksheets are analyzed based on each component of the worksheet development assessment instrument based on the Likert scale in table 3.3 below:

Table 3.3 Criteria for Interpretation of Worksheet Validation Scores

Criteria	Value / score
Very Inadequate	1
Not worth it	2
Decent enough	3
Well worth it	4
Very Worth it	5

(Riduwan, 2016)

Then look at the variation in the score given by the validator in each aspect and then see the trend. Based on the criteria of table 3.3, worksheet is said to be valid if it has a tendency (validator score ≥ 4).

2. Feasibility Analysis Based on Practicality

a. Learning Implementation

The analysis of the results of the implementation of this learning is the result of observations of the learning process when the trial is limited using worksheets. The percentage of questionnaire data obtained is based on

the calculation of the assessment score, namely the implementation of the Guttman scale as shown in table 3.4 below:

Table 3.4 Guttman Scale

Implementation	Score
YES	1
NO	0

The following is the formula used to obtain a percentage:

$$Persentase : P(\%) = \frac{F}{N} \times 100\%$$

Information:

P = percentage of learning implementation

F = Number of answers to the implementation of yes or no from observer

N = total number of observers

The criteria for the implementation of learning when testing using worksheets are known from analyzing the results of the value of the learning implementation sheet. The interpretation of the scores used in this analysis is as follows:

Table 3.5 Criteria for Interpretation of Results Learning Implementation

Percentage (%)	Criteria
0-20	Very less
21-40	Less
41-60	Enough
61-80	Good
81-100	Very good

(Ridwan, 2016)

Based on these criteria, the implementation of learning using worksheets is said to be practical if the percentage value obtained is ≥ 61% with appropriate or very feasible criteria.

b. Student Activities in Groups

Student activity in groups was observed using student activity instruments and was carried out by 3 observers. The results of these observations were analyzed using the following formula:

$$Percentage = \frac{The\ number\ of\ frequencies\ of\ student\ activities}{Total\ of\ frequencies} \times 100\%$$

The average percentage of activities carried out by all students in one meeting can be obtained by the following formula:

$$The\ average\ percentage\ of\ each\ activiy\ = \frac{The\ total\ of\ all\ frequencies}{The\ total\ of\ students}$$

The results of student activities were analyzed from the number of activities carried out by students for 5 minutes and seen the aspects that most often appeared were carried out by students, so that It can be seen that the percentage of student activities that most often appears during learning activities using worksheets on the interaction of living things.

c. Student Response

To determine the feasibility of the worksheets, an analysis of student responses was conducted. The percentage of questionnaire data obtained is based on the calculation of the assessment score, namely the answers to the Guttman scale as shown in table 3.6 below:

Table 3.6 Guttman Scale

Answer	Score
YES	1
NOT	0

The following is the formula used to obtain a percentage:

$$Persentase : P(\%) = \frac{F}{N} \times 100\%$$

Information:

P = percentage of student answers

F = Number of yes or no answers from students

N = Number of students

Then the percentage value is converted with the following criteria:

Table 3.7 Criteria for Percentage of Student Responses

Percentage (%)	Criteria
0-20	Very less
21-40	Less
41-60	Enough
61-80	Good
81-100	Very good

(Riduwan, 2016)

Based on table 3.7, student responses are said to be good or very good if the percentage value is ≥ 61%.

3. Feasibility Analysis Based on Effectiveness

a. Oceanic Literacy Test

Oceanic literacy test using essays. Assessment of oceanic literacy is obtained from the pretest and

posttest scores. Students' oceanic literacy can be analyzed as follows:

$$\%\ oceanic\ Literacy = \frac{\sum student's\ score}{\sum maximum\ \ score} \times 100\%$$

Then the results are converted to oceanic literacy criteria as follows:

Table 3.8 Criteria for Oceanic Literacy

Percentage (%)	Criteria
0-20	Very less
21-40	Less
41-60	Pretty good
61-80	Good
81-100	Very good

(Riduwan, 2016)

In this study, the results of the pretest and posttest were then analyzed using an n-gain score to measure the results of oceanic literacy with the following equation (Hake, 1999):

$$< g > = \frac{S_f - S_i}{S_{maks} - S_i}$$

Information:

Sf = posttest score

Si = pretest score

Smax = maximum possible score

The results of normalized gain scores are in the following three categories (Hake, 1999):

Table 3.9 Normalized N-gain criteria

Normalized N-gain range	Gain Criteria
g <0.30	Low
0.3 ≤ g ≤ 0.70	Moderate
g> 0.70	High

Based on table 3.9, worksheet is declared effective if the N-gain value is> 0.3 with moderate or high criteria.

J. Research Matrix

No.	Formulation of the problem	Instrument	Method	Data source	Data analysis
1.	How is the validity of the WORKSHEET on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students?	a. Review sheet b. Validation Sheet	Validation	2 expert lecturers and 1 science teacher	Data validation results were analyzed descriptively quantitative, valid results if they have a tendency (validator score ≥ 4).
2.	How is the practicality of the WORKSHEET on the Interaction Material of Living Things to Train Oceanic Literacy for	a. Learning implementation observation sheet b. Student activity sheets in groups. c. Student response	a. Observation b. Questionnaire	a. Observer b. students	a. The data from the observations of the implementation of learning were analyzed descriptively and quantitatively. The developed student

No.	Formulation of the problem	Instrument	Method	Data source	Data analysis
	Class VII Junior High School Students?	questionnaire sheet			worksheetis considered practical if the percentage value of the feasibility of learning using worksheets reaches ≥ 61%. b. Student activities were analyzed descriptively and quantitatively. Student activities were observed every 5 minutes to find out the dominant student activity carried out by students c. Student responses to the developed worksheets were analyzed

No.	Formulation of the problem	Instrument	Method	Data source	Data analysis
					descriptively and quantitatively. The worksheets are considered practical if the percentage of student response scores reaches ≥ 61%.
3.	How effective is the WORKSHEET on the Interaction Material of Living Things to Train Oceanic Literacy for Class VII Junior High School Students?	Oceanic literacy pretest and posttest sheets.	a. Test	Students	The results of the pretest and posttest were analyzed using the N-gain, the worksheets were said to be effective if the N-gain was obtained in the medium or high category.

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CHAPTER IV
RESULTS AND DISCUSSION

This chapter presents the results of research and discussion that have been obtained from the development of worksheets on the interaction of living things to train the oceanic literacy of seventh-grade junior high school students. This research was conducted in class VII-A SMP Negeri 1 Paciran in the 2019/2020 school year. The development of this worksheet is made using the R&D (Research and Development) research model and is limited to the product testing stage. Previous researchers have reviewed and validated the developed worksheets. The worksheet review was carried out by the supervisor, while the worksheet validation process was carried out by two science education expert lecturers at the State University of Surabaya and one science teacher at SMP Negeri 1 Paciran. The worksheets developed include all material about the interaction of living things.

The data obtained from this study were the results of the analysis and validation of the worksheets, the results of the practicality of the worksheets, and the data on the effectiveness of the worksheets. The data on the practicality of the worksheets include observation data on the implementation of learning, data on activities of student worksheets, observation data on student activities in groups, and data on student responses. The data on the effectiveness of the worksheet include data on the percentage of oceanic literacy skills and the N-gain of oceanic literacy. The data obtained will be analyzed and used to answer the problem formulation.

A. Research Results

1. Feasibility of worksheets from the aspect of validity

a. Study Results

The worksheets developed are reviewed by the supervisor. The review activity is intended to get suggestions and constructive criticism. The results of the study of the developed worksheets are presented in table 4.1 as follows:

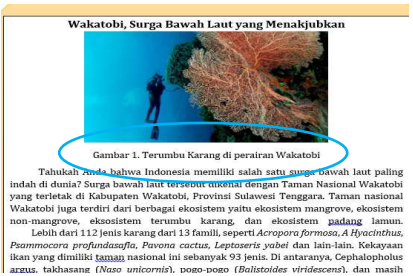
Table 4.1 Data on Worksheet Study Results

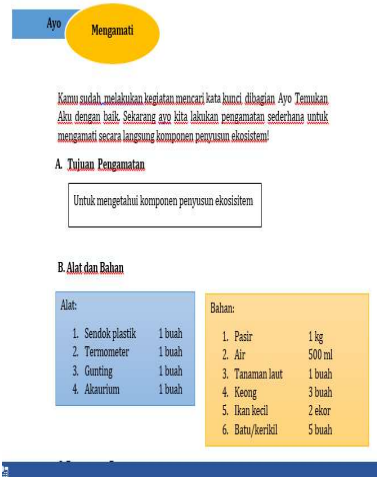
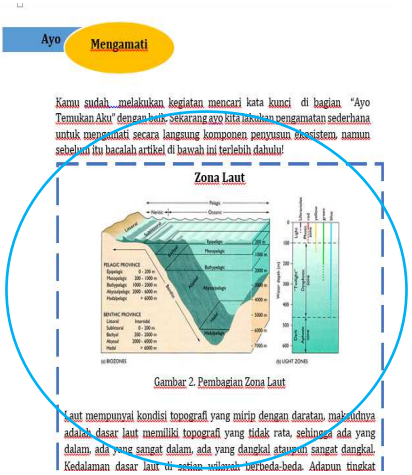
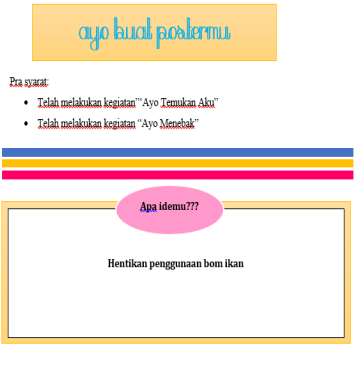
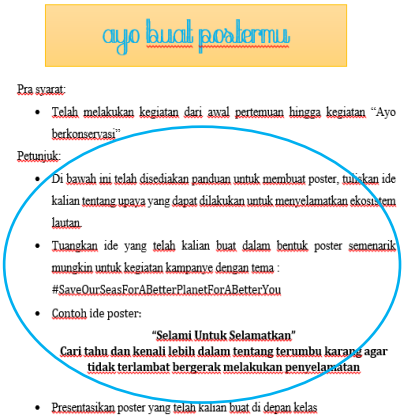
No.	Rated aspect	Suggestions and Comments
Didactic Terms		
1.	The suitability of worksheets with oceanic literacy and learning materials	- The questions on the worksheets in the first activity were not in the form of guiding questions, so they needed to be changed. - The activity of making posters should only be done once in a conservation activity
2.	Suitability of titles with worksheets	
3.	There are tools and materials needed in the activities in the worksheet	
4.	There is a procedure for implementing activities in the WORKSHEET	
5.	Worksheet activities can invite students to be actively involved in learning	
6.	Using examples and cases from the local environment	
7.	Worksheet contains activities to practice science content skills	
8.	Worksheet contains activities to practice science process skills	
9.	Worksheet contains activities to practice the scientific context.	
Construction Terms		- The instructions used to create the poster are incomplete and the instructions are confusing, so it should be more detailed and clearer
10.	The language used in the student worksheets is easy for students to understand	
11.	The sentences used in the worksheets do not have a double meaning	
12.	Language conformity with EYD	
13.	The order of activities in the WORKSHEET starts from simple things to more complex things	
Technical Requirements		- There is no caption on the worksheet - Illustrations should be added before practicum activities - The table of observations on the play with you activity needs to be put together and a plot description table is also added
14.	Pictures and illustrations in accordance with the phenomena that exist in the sea	
15.	The suitability of font selection on the worksheet	
16.	The suitability of the placement of images and writing on the worksheets	

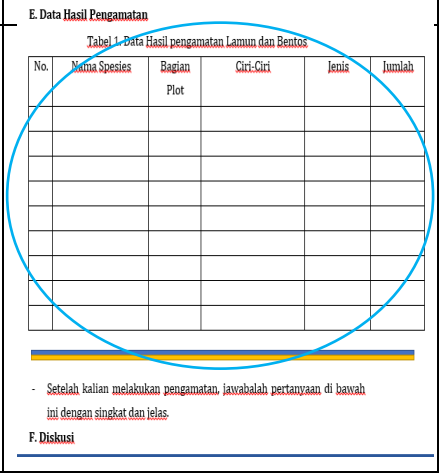
Based on the results of the study data in table 4.1, the researcher then revised the worksheets according to the suggestions and comments of the reviewers. The following

are the results of improvements from suggestions and comments on the developed worksheets which are presented in table 4.2:

Table 4.2 Results of Suggestions and Inputs for Worksheet

No.	Before	After
1.	The questions in the activities around you need to be converted into a guiding question. Pertanyaan! 1. Setelah kamu melakukan pengamatan, definisikan konsep lingkungan berdasarkan hasil pengamatanmu? 2. Berdasarkan hasil pengamatanmu, eksosistem apa yang telah kalian buat? Kemudian sebutkan dua ekosistem lain yang kalian ketahui! 3. Berdasarkan hasil pengamatanmu, jelaskan komponen penyusun lingkungan dan contohnya? 4. Analisislah satuan makhluk dalam eksosistem yang kamu temukan dalam pengamatanmu beserta contohnya? 5. Bagaimana pengaruh keberadaan komponen penyusun ekosistem laut terhadap kehidupan?	Changing the questions contained in the activities around you (around you) needs to be converted into a guiding question. F. Diskusi 1. Berdasarkan hasil pengamatanmu, apa saja komponen penyusun lingkungan dan berikan contohnya? 2. Berikan alasan mengapa contoh yang Anda sebutkan pada soal nomer satu termasuk komponen biotik? 3. Berikan alasan mengapa contoh yang Anda sebutkan pada soal nomer satu termasuk komponen abiotik?
2.	Need to add a caption  Wakatobi, Surga Bawah Laut yang Menakjubkan Tahukah Anda bahwa Indonesia memiliki salah satu surga bawah laut paling indah di dunia? Surga bawah laut tersebut dikenal dengan Taman Nasional Wakatobi yang terletak di Kabupaten Wakatobi, Provinsi Sulawesi Tenggara. Taman nasional Wakatobi juga terdiri dari berbagai ekosistem yaitu ekosistem mangrove, ekosistem non-mangrove, eksosistem terumbu karang, dan ekosistem padang lamun. Lebih dari 112 jenis karang dari 13 famili, seperti *Acropora formosa, A Hyacinthus, Psammocora profundasafla, Pavona cactus, Leptoseris yabei* dan lain-lain. Kekayaan ikan yang dimiliki taman nasional ini sebanyak 93 jenis. Di antaranya, Cephalopholus argus, takhasang (*Naso unicornis*), pogo-pogo (*Balistoides viridescens*), dan masih banyak lagi.	Add captions to images  Wakatobi, Surga Bawah Laut yang Menakjubkan Gambar 1. Terumbu Karang di perairan Wakatobi Tahukah Anda bahwa Indonesia memiliki salah satu surga bawah laut paling indah di dunia? Surga bawah laut tersebut dikenal dengan Taman Nasional Wakatobi yang terletak di Kabupaten Wakatobi, Provinsi Sulawesi Tenggara. Taman nasional Wakatobi juga terdiri dari berbagai ekosistem yaitu ekosistem mangrove, ekosistem non-mangrove, eksosistem terumbu karang, dan ekosistem padang lamun. Lebih dari 112 jenis karang dari 13 famili, seperti *Acropora formosa, A Hyacinthus, Psammocora profundasafla, Pavona cactus, Leptoseris yabei* dan lain-lain. Kekayaan ikan yang dimiliki taman nasional ini sebanyak 93 jenis. Di antaranya, Cephalopholus argus, takhasang (*Naso unicornis*), pogo-pogo (*Balistoides viridescens*), dan masih
3.	It is necessary to add illustrations related to practicum activities	Adding illustrations related to practicum activities

No.	Before	After
		
4.	It is necessary to add more complete instructions for poster making activities	Adding more complete instructions in poster making activities
		
5.	The table of observations on the play with you activity needs to be put together and a plot description table is also added	Make a table of observations in play with you activities and add a plot description table

No.	Before	
	Hasil Data Tabel 1. Data Hasil pengamatan Lamun No. | Nama Ilmiah | Ciri-ciri | Jumlah Tabel 2. Data Hasil pengamatan Bentos No. | Nama Ilmiah | Ciri-ciri | Jumlah Pertanyaan! 1. Bagaimana populasi lamun dan bentos yang Anda temukan?	

Based on table 4.2, some constructive suggestions and inputs for the developed worksheets have been described. These suggestions and input are used as improvements so that the developed worksheets will be better when used during trials.

b. Validation Results

The developed worksheets are not only reviewed but also validated. The validation process was carried out by two science education expert lecturers at the State University of Surabaya and one science teacher at SMP Negeri 1 Paciran. Validation activities are intended to assess the feasibility of the worksheets being developed and to get constructive suggestions and criticism. Validation activities carried out on the developed worksheets aim to find out about the feasibility of the developed worksheets. From the validation results, it will be known whether the worksheets developed are feasible or not suitable for use. The worksheet validation sheet used consists of three

aspects, namely (1) educational requirements, (2) construction requirements, and (3) technical requirements. The following are the results of the validation assessments that have been carried out by the three validators, which are described in table 4.

Table 4.3 Data on Worksheet Validation Results

Aspect	Score			Trend	Eligibility Category
	V1	V2	V3		
Didactic Terms					
The suitability of worksheets with oceanic literacy and learning materials	5	5	5	5	Very Worth it
Suitability of titles with worksheets	5	5	5	5	Very Worth it
There are tools and materials needed in the activities in the WORKSHEET	5	4	5	5	Very Worth it
There is a procedure for implementing activities in the WORKSHEET	5	4	5	5	Very Worth it
WORKSHEET activities can invite students to be actively involved in learning	5	4	5	5	Very Worth it
Using examples and cases from the local environment	4	4	5	4	Well worth it
WORKSHEET contains activities to practice science content skills	5	5	4	5	Very Worth it
WORKSHEET contains activities to practice science process skills	5	4	4	4	Well worth it
WORKSHEET contains activities to practice the scientific context	5	5	4	5	Very Worth it
	Trend			5	Very Worth it
Construction Terms	**V1**	**V2**	**V3**		

Aspect	Score			Trend	Eligibility Category
	V1	V2	V3		
The language used in the student worksheets is easy for students to understand	5	4	4	4	Well worth it
The sentences used in the worksheets do not have a double meaning	4	4	4	4	Well worth it
Language conformity with EYD	5	4	4	4	Well worth it
The order of activities in the WORKSHEET starts from simple things to more complex things	5	5	4	5	Very Worth it
	Trend			4	Well worth it
Technical Requirements					
Pictures and illustrations in accordance with the phenomena that exist in the sea	5	5	5	5	Very Worth it
The suitability of font selection on the WORKSHEET	4	5	4	4	Well worth it
The suitability of the placement of images and writing on the worksheets	5	4	5	5	Very Worth it
	Trend			5	Very Worth it

Description: V1: Validator 1 V2: Validator 2 V3: Validator 3

Based on table 4.3, it has been described about the data validation results carried out by the validator on the worksheets developed through trend analysis in every aspect. The tendency of the value for the didactic requirement aspect was 5 with a very feasible category, the construction requirement aspect was 4 with the proper category, and for the aspect of the technical requirement the score tended to be 5 with the very feasible category. The results of the validation

indicate that the worksheets developed to train oceanic literacy on the interaction of living things for seventh grade junior high school students are suitable for use as teaching materials in the learning process.

2. Feasibility of worksheets from a practical aspect

a. Learning Implementation

The data on the results of the implementation of learning in this study were obtained using a learning implementation observation sheet that was filled in by the observer when the teacher was carrying out the learning process. This observation sheet contains a column on implementation (implemented or not) accompanied by comments on observations by the observer. The observer consists of three people who are in charge of observing the late learning process for five meetings. The purpose of this observation is to determine the feasibility of learning by using the developed worksheets properly or not. In table 4.4, a recap of the data on the results of observation of the implementation of learning using the developed worksheets is presented, while for the data on the results of the observations of implementation beforerecap (original data) can be seen in attachment 4:

Table 4.4 Recap of the Learning Implementation Observation Data

Step	Meeting 1 (%)	Meeting 2 (%)	Meeting 3 (%)	Meeting 4 (%)	Meeting 5 (%)	Average	Learning implementation category
preliminary	100	100	100	100	100	**100**	**Very good**
Core	100	100	100	100	100	**100**	**Very good**
Closing	100	100	100	100	100	**100**	**Very good**
Average (%)	**100**	**100**	**100**	**100**	**100**	**100**	
Learning Implementation Category	**Very good**	**Very good**	**Very good**	**Very good**	**Very good**	**Very good**	

Based on table 4.4, it is known that the results of observations of the implementation of learning at five meetings got an average percentage value of 100% in the very good category. The observation data on the implementation of learning are also supported by notes or comments from observers at each meeting which can be seen in appendix 5. At the first meeting that discusses the environment and its components, preliminary activities get a percentage of 100% with a good category, core activities get percentage 100%Likewise with the closing activity which received a percentage of 100% in the very good category. At the first meeting, observational comments (can be seen in appendix 5) given by observers are at the stage when the teacher asks students to read the articles of all observerscommented that the teacher initially did not go around to students to make sure students read the article then to make sure the teacher went around and also conditioned students to read the article because some did not read the article. At the concluding stage of the practicum with students, observer 2 and observer 3 commented that the teacher always invited students to connect the material they had learned with everyday life and together find solutions to save the marine environment.

In the second meeting, which focused on analyzing videos about the food chain in marine ecosystems and human activities that can disrupt the food chain, it got a 100% percentage with details on each activity, namely the introduction, core, and closing, got a percentage of 100% with very good category At this meeting, during the teacher's stage of motivating observational comments given by observer 1, namely the teacher not only showed students a picture of an example of a food chain in marine ecosystems

but also invited students to discuss the food chains they know in marine ecosystems (especially near where students live) . For the stageWhen the teacher displayed a video about the food chain in marine ecosystems, according to observers 2 and 3 there were still some students who still didn't pay attention even though the teacher had gone around asking students to focus on the video. At the final stage in the core activity, namely concluding learning outcomes, according to observer 1 (observer notes can be seen in appendix 5) the teacher always connectswith the conservation efforts carried out to save the marine ecosystem that the students discussed during the worksheets.

For the third meeting, the percentage value in the preliminary, core and closing activities was 100% in the very good category respectively. Observer comment 1 when the teacher displays a video about interaction patterns is that the teacher has done this stage well, but there are some students who have not paid attention. For the activity of guiding students, observer 2 explained that the teacher had guided each group in doing the worksheets well. Finally, at the concluding stage, according to observer 3, the teacher always connects the results obtained with daily activities and asks students' opinions about efforts for conservation based on the material that has been learned.

At the fourth meeting, the percentage value of the preliminary, core, and closing activities was 100% in the very good category. The observer's comments at this meeting were namely at stagesThe teacher motivates the students by facilitating student interview sessions with conservationists about seagrass and benthos observers 1 and 2 mentioning that students record the information provided

by the concerts and students also look very enthusiastic in listening to explanations and also asking questions. Observer 3 mentions that during practicum guidance activities, the teacher provides guidance to students very well. Finally, in the last core activity, observer 2 explained thatThe teacher always connects the conclusions of the lesson with students' daily lives and also asks students for their opinions about the efforts being made to save seagrass and benthic populations.

The last meeting, namely the last meeting, received an average percentage of 100%. The preliminary activity received a percentage of 100% in the very good category, then in the core activity there were activities that were only at the fifth meeting, namely making posters and poster exhibitions. The core activity also received a percentage of 100% in the very good category. Finally, the closing at the fifth meeting also received a percentage value of 100% in the very good category. The observer's comments at the last meeting were observer 2 still found students who still did not pay attention to the video when it was played, then the observer also mentioned that during the poster presentation activities went well and the ideas about conservation efforts conveyed by the students were very diverse.

Based on the results of the observation percentage value of learning activities, it can be concluded that learning using worksheets developed to train oceanic literacy is practical because the percentage value is ≥ 61%.

b. Student Activities

The results of observations of student activities when using the developed worksheets were obtained by observing student activities that appeared for 5 minutes during the learning process until it was finished. The

observation process was carried out by 3 observers who observedstudent activity every 5 minutes for 5 meetings. The student activities observed at each meeting consisted of eight types of activity. These activities include paying attention to teacher explanations, reading and implementing guidelines in the WORKSHEET, carrying out activities on the WORKSHEET, discussing in groups, asking questions, expressing opinions, and presenting the results of group work.The following are the results of observations of student activities when using worksheets in the learning process presented in table 4.5:

Table 4.5 Data on Student Activity Observation Results

Code	Activity	Percentage (%)					Average
		Meeting 1	Meeting 2	Meeting 3	Meeting 4	Meeting 5	
A	Pay attention to the teacher's explanation	12.10	20	20.58	21.22	22.01	**19.18**
B	Read and implement the guidelines in the worksheet	4.86	7.29	7.29	5.27	6.24	**6.19**
C	Perform activities on the worksheet	33.86	35.62	39.79	38.29	38.89	**37.29**
D	Discuss in groups	10.69	11.45	12.04	12.60	13.01	**11.95**
E	Asking	5,55	8.95	10.41	12.45	12.95	**10.06**
F	Express opinions	1.24	1.67	1.67	2.49	2.21	**1.88**
G.	Present the results of group work	2.08	2.08	4.16	4.16	4.16	**3.32**
H	Irrelevant activities	29.62	12.94	4.05	3.52	0.53	**10.13**

Based on table 4.5, it presents the results of the activity observation data carried out by students during the learning process. The results of these data are the results of the accumulation of student activities that appear every 5 minutes during the learning process. From the five meetings, the activity that got the highest percentage was doing the activities in the worksheet with an average

percentage of 37.29% and the activity that received the lowest average percentage was the activity of expressing opinions, namely 1.88%. Data from the observation of student activities is also supported by observation notes by observers which can be seen in appendix 3. The observer notes that at meeting 1 when doing activities on the WORKSHEET, namely when reading the article there were some students who did not do these activities. At the second and third meetings, the observer's notes showed that during the video viewing activity there were still students who did not pay attention to the video that was being displayed. At the fourth meeting the students were very enthusiastic in asking about the efforts that can be made to protect the seagrass and benthos population, and at the meeting of five students were also very enthusiastic about the exhibition and poster assessment activities.

1). Student activities based on oceanic literacy skills

The results of observations of worksheet implementation activities on activities based on three aspects of oceanic literacy are obtained by observing student activities that appear for 5 minutes during the learning process which are limited to activities carrying out activities on the worksheet in the form of activities that practice content, process and context. The following is a recap of the data on the observation results of the worksheet implementation based on three aspects of oceanic literacy which are presented in table 4.6:

Table 4.6 Data on Results of Student Activity Summary Based on Oceanic Literacy Skills

Aspect	Meeting 1(%)	Meeting 2 (%)	Meeting 3 (%)	Meeting 4 (%)	Meeting 5 (%)	Average (%)
Content	41	53.3	63	49.3	54	**52.12**
Process	65	65.83	77.5	68.13	69.63	**69.21**
Context	70.06	75	88.3	79.03	85	**79.47**

Average(%)	**58.6**	**64.71**	**76.26**	**65.48**	**69.43**	

Based on table 4.6, it is known that at meeting 1 the highest percentage value of worksheet implementation activities was in the context aspect, which was 70.06%, for the process aspect activity was 65% and the lowest was the content aspect at 41%. At the second meeting, the activity on the content aspect was also the lowest at 53.3% and the lowest was the context aspect at 75%. For the third to fifth meeting, the lowest percentage of activity was in the content aspect and the highest was in the context aspect. Overall, the average value of the percentage of worksheet implementation activities at five meetings was that the context aspect had the highest value of 79.47% followed by the process aspect of 69.21% and the lowest was the content aspect, which was 52.12%. If you see the average worksheet implementation activities from each meeting, It is known that at the first to the third meeting there was an increase, starting from 58.6% then the second meeting was 64.71% and the third meeting was 76.26%, but there was a decrease in the fourth meeting from the third meeting, namely with an average percentage value of 65 , 48%, while for the fifth meeting it rose again with a percentage of 69.43%. Overall, at each meeting, the worksheet implementation activities from every aspect of literacy increased.

c.Student Response

Data Student responses to student worksheets in this development research were obtained through student response questionnaires that had been distributed to students. This student response questionnaire sheet was distributed to 30 students and contained 9 statements related to oceanic literacy. The results of the responses on

this questionnaire are yes and no answers. The following are the results of the student response data to the worksheets presented inTable 4.7:

Table 4.7 Student Response Questionnaire Results

No.	Statement	Percentage	Criteria
1.	Interesting worksheets display	96.7%	Very good
2.	Worksheet supports me to have a caring attitude towards the marine environment	100%	Very good
3.	Having observations on the worksheet made me excited to learn about the importance of the ocean for living things	100%	Very good
4.	I can relate the contents of the worksheets to the things I have seen in my daily life	96.7%	Very good
5.	The sentences and paragraphs used in the worksheets are clear and easy to understand	96.7%	Very good
6.	The choice of font, size and spacing makes it easier for me to read the worksheets	100%	Very good
7.	While I was learning to use worksheets, I was able to study the content well	100%	Very good
8.	Worksheet helps me to understand the concept of the interaction of living things	100%	Very good
9.	WORKSHEET helps me to design observations, explain the impact of an event on the marine ecosystem and draw	100%	Very good

	conclusions from observations		
Average		**98.9%**	**Very good**

In the student response questionnaire there is also a column of criticism and suggestions. This column aims to accommodate opinions in the form of criticism and suggestions from respondents regarding the worksheets that are developed to be even better. The following are the results of data criticism and suggestions from respondents which are presented in the image below:

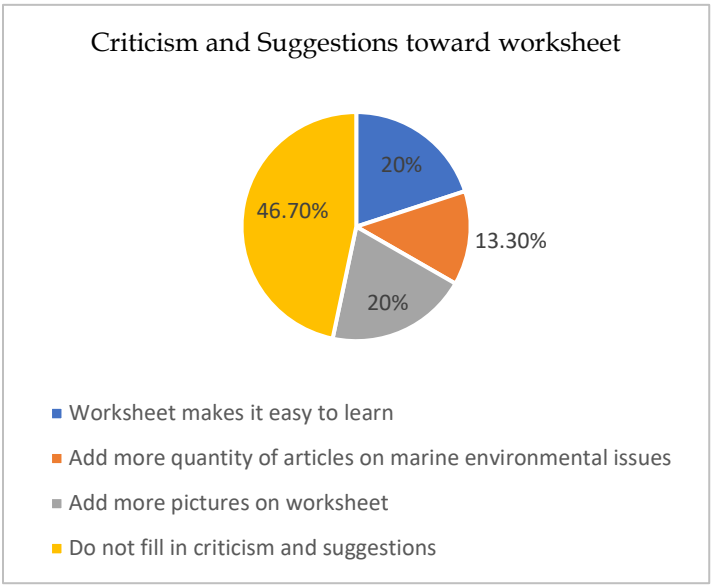


Figure 4.1 Results of Criticism and Suggestions

Based on the results of table 4.7, it is known that the average value of student responses to student worksheets as a whole is 98.9% in the very good category. Of the 9 statements in the questionnaire sheet for student responses to the student worksheets, only three did not get a 100% score.

The details of the average value for each statement, namely the appearance of the attractive student worksheets, received a response of 96.7% with a very good category, the statement of the worksheet supported to have a caring attitude towards the marine environment received a 100% response in the very good category, the statement could link the contents of the worksheet -the things that have been seen in everyday life get a response of 96.7% with a very good category, the statements of sentences and paragraphs used in clear and easy to understand worksheets get a response of 96.7% with very good categories, The statement regarding the choice of the font, size and space used made it easier for me to read the worksheeT received a 100% response in the very good category. The statement of students being able to study the contents of the student worksheets well received a response of 100% with a very good category, the statement that the student worksheets helped in understanding the concept of the interaction of living things received a response of 100% with a very good category, and finally the statement about the worksheets helped in designing observations, explaining the impact from an event in the marine ecosystem and drawing conclusions from the results of the observations received a response of 100% in the very good category.

Based on Figure 4.1 about criticism and suggestions, 53.3% of the 100% students provide criticism and suggestions while the rest do not provide suggestions and criticism of the worksheet. The criticisms and suggestions given were as many as 20% of students gave suggestions to improve the pictures on the worksheets, 13, 3% of students gave suggestions to add articles on marine environmental issues, and as many as 20% stated that worksheet made it easier to learn.

3. Feasibility of worksheets from the aspect of effectiveness

The feasibility of the worksheets based on the effectiveness aspect is obtained based on *n-gain*of every student. worksheet is said to be effective if the N-gain is in the medium or high category. This also indicates that there is an increase in students' oceanic literacy skills. The data on the results of oceanic literacy were obtained from the pre-test and post-test results. The pre-test is carried out at the beginning of the lesson to determine the students' initial oceanic literacy skills while the post-test is carried out at the end of the lesson after being given treatment using the developed worksheeT. The results of the pre-test and post-test data will also show the effect of student worksheets in the learning process to train oceanic literacy in junior high school students. The pre-test and post-test questions were assessed based on the literacy aspect described in the following tables:

Table 4.8 Pre-test Oceanic Literacy Percentage Data

Students	Score Per Aspect			Total Pre-test Score	Percentage(%)	Ability Category
	A1	A2	A3			
1	10	15	20	45	45	Enough
2	0	5	0	5	5	Very less
3	8	15	20	43	43	Enough
4	0	15	10	25	25	Less
5	5	0	0	5	5	Very less
6	0	15	10	25	25	Less
7	0	15	10	25	25	Less
8	0	0	10	10	10	Very less
9	5	0	10	15	15	Very less
10	8	15	20	43	43	Enough
11	0	5	0	5	5	Very less
12	5	0	0	5	5	Very less
13	0	5	0	5	5	Very less
14	0	5	0	5	5	Very less
15	0	15	10	25	25	Less
16	5	15	10	30	30	Less
17	5	15	15	35	35	Less

Students	Score Per Aspect			Total Pre-test Score	Percentage(%)	Ability Category
	A1	A2	A3			
18	5	0	10	15	15	Very less
19	10	5	10	25	25	Less
20	0	5	0	5	5	Very less
21	10	0	0	10	10	Very less
22	0	0	15	15	15	Very less
23	0	0	15	15	15	Very less
24	5	15	10	30	30	Less
25	5	5	0	10	10	Very less
26	0	5	0	10	10	Very less
27	5	15	15	35	35	Less
28	5	10	0	15	15	Very less
29	0	0	10	10	10	Very less
30	0	5	10	15	15	Very less

Information:

A1 : Content Aspects A2: Process Aspects A3: Context Aspects

Based on table 4.8, the data for the category of oceanic literacy skills when pre-test in table 4.9 can be described as follows:

Table 4.9 Pre-Test Oceanic Literacy Ability Data

Category of Pre-Test Oceanic Literacy Ability		
Category	**Percentage (%)**	**The number of students**
Very less	60	18
Less	30	9
Enough	10	3
Good	0	0
Very good	0	0

From table 4.8, the student pre-test results can also be analyzed based on the literacy aspect. The following are the results of data on oceanic literacy skills as seen from the literacy aspect presented in table 4:10:

Table 4.10 Data on Oceanic Literacy Capabilities for Each Aspect of Pre-*Test*

Category Average per Pre-Test Aspect		
Aspect	**Percentage(%)**	**Category**
Content	16	Very less

Process	18.3	Very less
Context	20	Less
Whole	18.7	Very less

Based on table 4.8, the students 'pre-test results can be translated into two data, namely data on students' oceanic literacy skills during the pre-test (presented in table 4.9) and data on oceanic literacy skills per aspect during the pre-test (presented in table 4.10). Table 4.9 shows that the dominant category is very poor with a percentage of 60% with 18 students in that category. For the poor category the percentage value is 30% with 9 students, the enough category gets a percentage of 10% with the number of students 3 people, while for the good and very good categories it gets a percentage of 0% which means that not a single student is in that category.

Result *pre-test* students were also analyzed for each aspect of literacy. The aspect that received the greatest percentage was the context aspect with a percentage of 20% with a low category followed by the process aspect with a percentage of 18.3% in the very poor category and the lowest was the content aspect with a percentage of 16% which was also in the very poor category.

The developed worksheets were tried out in 5 meetings. After conducting the trial, the researcher conducted a post-test to determine the student's score after treatment in the form of using worksheets in the learning process. The results of the students' post-test are presented in table 4:11 below:

Table 4.11 Oceanic Post-test Literacy Percentage Data

Students	Score Per Aspect			Total Posttest Score	Percentage(%)	Ability Category
	A1	A2	A3			
1	10	40	40	90	90	Very good
2	10	30	30	70	70	Good
3	20	35	40	95	95	Very good
4	10	40	40	90	90	Very good
5	10	30	30	70	70	Good
6	20	40	35	95	95	Very good
7	18	35	40	93	93	Very good
8	20	40	35	85	85	Very good
9	20	40	40	100	100	Very good
10	20	40	40	100	100	Very good
11	20	35	30	85	85	Very good
12	8	25	40	73	73	Good
13	18	35	35	88	88	Very good
14	5	15	40	60	60	Pretty good
15	20	35	40	95	95	Very good
16	10	20	40	70	70	Good
17	18	30	30	73	73	Good
18	10	40	40	90	90	Very good
19	20	30	40	90	90	Very good
20	8	40	40	88	88	Very good
21	20	30	40	90	90	Very good
22	8	30	40	78	78	Good
23	20	40	30	90	90	Very good
24	18	35	35	88	88	Very good
25	8	30	35	73	73	Good
26	20	40	35	95	95	Very good
27	20	40	40	100	100	Very good
28	10	40	40	90	90	Very good
29	8	40	40	88	88	Very good
30	20	35	40	95	95	Very good

Information:

A1: Content Aspect A2: Process Aspect A3: Context Aspect

Based on table 4:11, the data for the category of oceanic literacy skills during the post-test can be described in table 4:12 as follows:

Table 4:12 Oceanic Post-Test Literacy Ability Data

Oceanic Literacy Ability Category *Post-Test*		
Category	**Percentage (%)**	**The number of students**
Very less	0	0
Less	0	0
Enough	3,3	1
Good	23.3	7
Very good	73.4	22

From table 4:11, the results of the students' post-test can also be analyzed based on the literacy aspect. The following are the results of data on oceanic literacy skills as seen from the literacy aspect presented in table 4:13:

Table 4:13 Data on Oceanic Literacy Ability for Each Post-Test Aspect

Category Average per Post-Test Aspect		
Aspect	**Percentage(%)**	**Category**
Content	74.5	Good
Process	86.25	Very good
Context	93.33	Very good
Whole	86.23	Very good

Based on table 4.11, the results of students 'post-test can be translated into two data, namely data on students' oceanic literacy abilities during the pre-test (presented in table 4.12) and data on oceanic literacy abilities per aspect at post-test (presented in table 4.13). Table 4.12 can be seen that the dominant category is very good with a percentage of 73.4% with the number of students who occupy that category as many as 22 students. For the good category the percentage value is 23.3% with a total of 7 students, the enough category gets a percentage of 3.3% with 1 student, while for the

poor and very poor category it gets a percentage of 0% which means that not a single student is present. in that category.

Result post-test students were also analyzed for each aspect of literacy. The aspect that got the greatest percentage was the context aspect with a percentage of 93.33% with the very good category followed by the process aspect with a percentage of 86.23% with the very good category and the lowest one was the content aspect with a percentage of 74.5% which was also included in good category.

This shows that there is an increase in oceanic literacy skills. To determine the increase in oceanic literacy skills, it can be done by using the N-gain test calculation. The following is table 4:14 regarding the calculation of the N-gain test score.

Table 4:14 Oceanic Literacy N-gain Data Per Student

Students	**Score**		***N-Gain***	**Category**
	Pre-test	***Post-test***		
1	45	90	0.81	High
2	5	70	0.68	Moderate
3	43	95	0.91	High
4	25	90	0.86	High
5	5	70	0.68	Moderate
6	25	95	0.93	High
7	25	93	0.90	High
8	10	85	0.83	High
9	15	100	1.00	High
10	43	100	1.00	High
11	5	85	0.84	High
12	5	73	0.71	High
13	5	88	0.87	High
14	5	60	0.57	Moderate
15	25	95	0.93	High
16	30	70	0.57	Moderate
17	35	73	0.58	Moderate
18	15	90	0.88	High
19	25	90	0.86	High
20	5	88	0.87	High

21	10	90	0.88	High
22	15	78	0.74	High
23	15	90	0.88	High
24	30	88	0.82	High
25	10	73	0.7	Moderate
26	10	95	0.94	High
27	35	100	1.00	High
28	15	90	0.88	High
29	10	88	0.86	High
30	15	95	0.94	High
Average	**18.7**	**86.23**	**0.83**	**High**

Information:

N-Gain High: 24 students. N-Gain Medium: 6 students

From the results of daTa which is presented in table 4:10 about the percentage of literacy ability of each aspect during the pre-test and table 4:13 which presents the percentage data on the ability of each aspect at the time of the post-test, the researcher gets the N-gain result. This N-gain is used to determine how much increase in students' oceanic literacy skills based on literacy aspects after being given treatment in the form of using worksheets developed in the learning process.

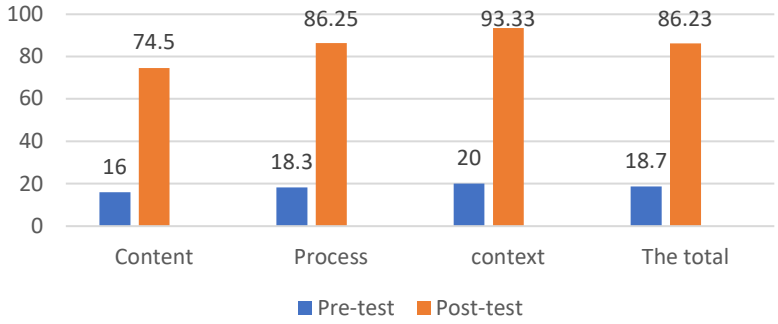


Figure 4.1 Improvement Diagram for Three Aspects of Oceanic Literacy

Based on table 4.14, it can be seen that the average N-gain value of students is 0.83 in the high category. The N-gain with the high

category was obtained by 23 students and for the low category there were 7 students. The highest N-gain score was 1.00 and the lowest was 0.57. Figure 4.1 shows the results of increasing oceanic literacy in every aspect of literacy. In the content aspect, the percentage value during the pre-test was 16%, while for the post-test it was 74.5% with an N-gain of 0.69 in the moderate category. In the process aspect, the percentage value during the pre-test is 18.3% and the post-test score is 86.25%, the N-gain score is 0.83 with the high category, while for the context aspect the percentage value for the pre-test is 20% and the post-test is 93.33% with the N-gain score obtained is 0.91 in the high category.

B. Discussion

The worksheets developed in this study are worksheets based on direct observation as the main activity for practicing oceanic literacy. There are three aspects in oceanic literacy, namely the content aspect (knowledge), the process aspect (competence), and the context aspect. This aspect itself is also related to the indicator of oceanic literacy itself, namelyable to understand important principles and basic concepts about the oceans (content), be able to communicate about the ocean in meaningful ways (competence), and be able to make informed and responsible decisions about the oceans and their resources (context). This worksheet consists of three major parts, namely look into the ocean (look into the ocean), oceanic recreation (ocean recreation), and oceanic conserve (ocean conservation).The look into the ocean (look into the ocean) consists of three activity themes which are divided into 3 meetings, namely around you (around you), cycle (cycle), and interaction (interaction). In every meeting in the WORKSHEET activity there are activities that train aspects of

content, process, and context, so not only one meeting only trains one aspect.

1. Worksheet Validation Results

Student activity sheets (worksheet) developed by researchers to train oceanic literacy of seventh grade junior high school students on the interaction of living things have been validated by three validators before the trial was conducted on 30 seventh grade junior high school students at smp negeri 1 paciran in the even semester of the 2019 academic year / 2020. terms of whichused in the worksheet validation process developed by researchers consists of three conditions, namely didactic requirements, construction requirements, and technical requirements. According to Rohaeti (2014), Worksheet is one of the teaching materials which has a large presence in the learning process, therefore the preparation of worksheets must meet various requirements, namely didactic, construction requirements, and technical requirements.

The assessment given by the validator on the didactic requirements is a tendency of 5 with a very feasible category. The indicators assessed on this didactic requirement include the suitability of student worksheets with learning materials and oceanic literacy, the suitability of the title with the worksheets, there are tools and materials needed in the activities and procedures for implementing activities in the worksheets, student worksheets can invite students to be actively involved in learning, worksheet contains three aspects of oceanic literacy, namely content, process, and context, and examples of cases used in worksheet come from the local environment.

The validator's assessment of the construction requirements is a trend of 4 with a feasible category. The indicators assessed on these construction requirements include the use and writing of language in the worksheets, sentence

arrangement does not cause double meaning, the suitability of the language used with EYD, and the order of activities in the worksheets starting from simple things to more complex things. Ningrum and Hidayat (2015) state that teaching materials that are designed with concepts that are easy to difficult or from concrete to understand abstract ones will be easier for students to understand. This is because students will find it easier to understand a certain concept if the explanation starts from something easy or something concrete, something that is real in their environment.

The assessment given by the validator for the technical requirements is a trend of 5 with a very feasible category. The indicators assessed on this technical requirement include pictures and illustrations in accordance with the phenomena in the sea, the suitability of font selection on the worksheets, and the suitability of the placement of images and writing on the worksheet. According to Prastowo's research (2014), the preparation of worksheets must pay attention to the size, page density, and layout of the image presentation. The size of the font used must be able to accommodate the learning needs set or can be easily read by students and the layout of the images should not interfere with the text in the worksheets.

Based on the results of the validation of the three requirements, it shows that the worksheets developed are suitable to be used as teaching materials in the learning process to train oceanic literacy for grade VII junior high school students.

2. Practicality

Practical aspects in research on the development of worksheets to practice oceanic literacy are assessed based on the results of observations of learning implementation, student activities, and student responses. Worksheet is said to

be practical if the results of observations of late learning and student responses get a percentage value of ≥ 61%, while for student activities if the most dominant is the activity of carrying out activities in WORKSHEET (Riduwan 2013).

a. Learning Implementation

The results of observations of the implementation of learning in the five meetings that have been conducted show that the implementation of learning is in the very good category with a percentage value of 100% but there are still notes or comments from observers on the implementation of learning that has been carried out by the researcher Aunurrahman (2014) explains that a well and optimal learning process will affect student learning outcomes because all learning objectives are achieved where learning objectives are the main goals of students.

At this first meeting during the activity of reading articles (practicing aspects of science content) there was a note from the observer that not all students read the article, this is in accordance with Nurhadi's statement (2015), that students tend to be lazy in reading activities in learning. The observer also explained that seeing that there were some students who did not read, the teacher initially did not go around to each group, finally went around and also conditioned by providing motivation for students to read articles because some did not read the articles. This is in accordance with the opinion of Khanifatul (2013), that providing motivation to students is one step so that students are enthusiastic in carrying out learning activities and making the learning process fun. Another factor that affects is the teacher who is still unable to condition the students as a whole because it is still the initial meeting and the teacher does not know the characteristics and

habits of students in class learning. The observer also provides notes when concluding the activities that the teacher has carried out, always connecting with daily life. This is consistent with the statement from Ratumanan in Tianto (2014), that the learning process that links the material studied with students' daily lives is an effective approach and is able to help students process information that has been finished in their minds, and compile their own knowledge of the world. social and surroundings. The observer also provides notes when concluding the activities that the teacher has carried out, which are always connected with daily life. This is in accordance with the statement from Ratumanan in Tianto (2014), that the learning process that links the material studied with students' daily lives is an effective approach and is able to help students process information that has been finished in their minds, and compile their own knowledge of the world social and surroundings. The observer also provides notes when concluding the activities that have been carried out by the teacher, which are always connected with daily life. This is consistent with the statement from Ratumanan in Tianto (2014), that the learning process that links the material studied with students' daily lives is an effective approach and is able to help students process information that has been finished in their minds, and compile their own knowledge of the world. social and surroundings.

At the fourth meeting, the percentage value obtained was the same as the three previous meetings, which was 100% in the very good category, meaning that all learning stages had been carried out. At the meeting there were activities that were different from the three

previous meetings in the learning process, namely students were invited to make direct observations to the sea.According to research by Strang Craig, et al (2007), said that learning based on direct observation or direct observation in practicing oceanic literacy in the context of biology can motivate learners, accelerate and deepen conceptual understanding because students directly observe and learn about it or in other words self experiment. In preliminary activities to motivate students, the teacher provides facilities for students in the form of direct interview sessions with conservationists. The interview activity contains information about seagrass and benthos, human activities that can endanger seagrass and benthic populations and efforts that can be made to overcome these impacts.

In the practicum observation of seagrass and benthos, the teacher helps guide students to work together and collaborate with their group friends, this is in line with the opinion of Arends (2012) which states that collaboration between investigation and dialogue with fellow groups can develop thinking skills and social skills. . The observer's comments on the core activity also stated that students were very enthusiastic about doing practicum activities, this was because it was new to themstudents to do practical work directly into the sea. This is also supported by the results of activity observations that at the fourth meeting the most dominant student activity was doing the activities on the WORKSHEET with a percentage of 38.29%. The observer's note also stated that the students were very enthusiastic about asking the teacher about efforts that could be made to protect the marine environment. This is also supported

by the data on the results of student activities, namely at the fourth meeting the activity of asking questions obtained the second highest percentage value of 12.45%.

At the last meeting, the learning process was carried out with an exhibition and poster assessment. This meeting as a whole also received a percentage score of 100% in the very good category.The learning process contains activities for making posters, presentations, exhibitions, and assessments. This activity aims to carry out conservation efforts. Based on the observation notes, it shows that in the activities of making posters, presentations, assessments, and exhibitions, students are very enthusiastic because this is the first time for students to make posters in science learning and exhibitions. This is also supported by the results of student activity observations that the most dominant student activity is doing worksheet activities which get the second highest percentage of 38.80%, then students are also actively asking in this meeting as evidenced by the activity of students asking if this meeting gets the highest percentage of five meetings, namely 12.95%. At the time of presenting the poster the students were also very enthusiastic, This is evident from the results of the activity of presenting the results of obtaining the highest percentage together with the third and fourth meetings at 4.16%. This poster exhibition activity is a teacher's innovation in the learning process so that student interest in learning increases, this is in line with Zamroni's opinion (2010) that innovation in the learning process can increase student interest in learning. If students' interest in learning increases, students will be easy to focus and enthusiastic in the learning process so that the process for practicing oceanic

literacy skills is maximized. This is in line with Zamroni's (2010) opinion that innovation in the learning process can increase student interest in learning. If students' interest in learning increases, students will be easy to focus and enthusiastic in the learning process so that the process for practicing oceanic literacy skills is maximized. This is in line with Zamroni's (2010) opinion that innovation in the learning process can increase student interest in learning. If students' interest in learning increases, students will be easy to focus and enthusiastic in the learning process so that the process for practicing oceanic literacy skills is maximized.

b. Student Activities in Groups

Observation of student activities in this study was carried out by three observers for 5 meetings. The results of observations of student activities are used to support the results of the implementation of learning and students' oceanic literacy skills. The activities observed in this study consisted of 7 activities, namely paying attention to the teacher's explanation, reading and implementing the guidelines in the worksheet, carrying out activities on the worksheet, discussing in groups, asking questions, expressing opinions, and presenting the results of group work.

The highest result of activity observation at the first meeting was doing activities on the worksheet with a percentage of 37.29% and the lowest was expressing an opinion of 1.88%. Based on the observer's notes (can be seen in appendix 8) it shows that even though the activity of doing worksheet is high, not all students do these activities when reading articles in activity 1. In addition, at this meeting the observer noted thatThe discussion in

groups goes on and is enthusiastic, especially when students make observation plans, Thing This is in line with the opinion of Nisa (2017), that learning using the practicum method makes students get direct experience so that it makes students interested and enthusiastic in learning. This practicum activity was also chosen to train oceanic literacy, especially for the process aspect because in the practicum activity students will practice to explain phenomena scientifically, design investigations, interpret data and evidence and draw conclusions. Noris and Philip (2003) explain that practicum activities are the most effective activities in training scientific literacy, especially aspects of the scientific process.

Student activities in expressing opinions get the lowest percentage, this is because students tend to be shy or lack confidence to appear in public to express their opinions, this is in line with the research of Susanto, et al. (2016) that the problems faced by students in a school environment are the most important thing is self-confidence, even though the learning process at school will be carried out well if students have self-confidence and good interpersonal communication between students and teachers or students and their peers.

In the second and third meetings, the observation notes showed that in viewing and analyzing the video there were still some students who did not pay attention. According to Kurniasih, et al (2018), students' attention in the learning process can be disturbed by social factors such as the presence of a person while studying, talking with classmates. This is in accordance with the results of observations of irrelevant student activities who get a decent percentage of around 10.13%. Activities that are

not relevant are activities that have nothing to do with the learning process carried out by students.

The dominant activity carried out at the meeting the fourth is to carry out activities on the worksheet with a percentage of 38.29%. This activity is always dominant in every meeting. At this meeting the student's activity focuses on making observations. On overdue the results showed that the students were very enthusiastic about doing new things, in this case direct observation of the sea. This observation activity aims to make students get new experiences so that the lessons they get through something they think are interesting are not easy to forget. According to Djamarah (2006), explaining that learning is a process for students in building ideas or understanding, so teaching and learning activities should provide an unforgettable experience so that students will not easily forget the material being taught.

Students give *feedback* which was positive for researchers at the fourth meeting, therefore the student's questioning activity got a large enough percentage at this meeting and had an increase from the previous 3 meetings, namely 12.45%. This is also supported by the observational note that students are very enthusiastic about asking the teacher about efforts that can be made to protect the marine environment.

The feedback given by the students shows that students have started to progress to become oceanic literates. This is supported by the results of student responses that 20% of students said that the WORKSHEET that was added made it easier to learn oceanic literacy. UNESCO (2013) explains that someone who is said to have a marine literacy is when they are

able to understand the importance of the oceans for humans and then are able to communicate and make informed and responsible decisions about the oceans and their resources.

The results of observations of student activities also showed that the activity of expressing opinions was an activity that obtained the lowest average percentage of 1.88%. Even though it gets the lowest percentage, the percentage increases at each meeting. This is supported by the activities in the worksheet which at each meeting encourage students to be more active in expressing their opinions, especially at meetings four and five. According to Kesuma (2011), character building of students requires habituation, so it must be done repeatedly.

Based on the explanation above, it is known that the dominant activity that students emerge is doing activities on the worksheets, so it can be concluded that the worksheets developed are practical.

1). Ocular literacy skills-based student activities

Oceanic literacy skills-based activities are based on aspects of oceanic literacy, namely content, process, and context. From the results of observations of implementation activities, it is known that in the five meetings the percentage value of implementation activities on the content aspect is the lowest, which is 52.12%. This result is also supported by the observation notes during the observation of student activities as a whole (can be seen in appendix 6) that when reading the article at meeting 1 which is included in the activity to practice aspects of student content there are still students who do not carry out

these activities.Nurhadi (2015), explains that students tend to be lazy in reading activities in learning.
The percentage value of worksheet implementation activities in the content aspect has increased at the first meeting to the third meeting. This is due to the activities on the worksheets that are used to practice different aspects of the content. At the first meeting, the content activity tends to be boring because it only reads articles, while at the second and third meeting the activity on the content aspect is watching videos. Latip and Permanasari (2015) explain that the use of video or multimedia in the learning process can increase student interest in learning and is also an attempt to create meaningful learning where this is a vision of scientific literacy, namely equipping students with concepts and applying the concepts that have been obtained. in everyday life.

In the whole meeting, the average percentage value of each aspect of oceanic literacy has increased, but at the third meeting the average value of the percentage of all aspects has the highest value, namely 76.26% even though the observation notes show that there are still some students who do not pay attention to the video but the percentage value of the content aspect increased from the second meeting, this proved that the quality of the video content chosen by the teacher at the third meeting was better and more interesting than the second meeting which was the main activity in practicing the content aspect, and it was also proof that the selection of content and also The right media will support the success of

learning as seen from the enthusiasm of students in learning.

c. Student Response

This student response is an assessment of the last practical aspect which aims to determine the student's response to the developed worksheets. This questionnaire sheet contains 9 statements accompanied by a column of criticism and suggestions to make it easier for students to write their opinions on the developed worksheets. Based on the results of student response data to student worksheets, it is known that the overall percentage average is 98.9% so it can be said that student worksheets are very well used in the learning process to train oceanic literacy for seventh grade junior high school students. Worksheets developed are said to be very good if they get a percentage of ≥ 61% (Riduwan, 2013).

The important points in the statements that have student responses are numbers, 2, 8, and 9 (can be seen in table 4.5). This is because at this point emphasizes the use of student worksheets to practice every aspect of oceanic literacy in students. Point 2 contains a statement about the WORKSHEET supporting students to have a caring attitude towards the marine environment (context) getting a percentage of 100%. For point 8 which contains statements about WORKSHEET helping to understand the concept of interaction of living things (content), it gets a percentage of 100% and finally point 9 which contains WORKSHEET statements helps to design observations, explain the impact of an event on the marine ecosystem and draw conclusions from the results of the observation (process) got a percentage of 100%. According to the OECD (2016),

In the questionnaire distributed to students, 53.3% of the 100% gave suggestions and criticisms of the developed worksheets. This is because students are not required to provide criticism and suggestions and also because of limited time. From a percentage of 53.3%, it is known that as many as 20% of respondents said that the student worksheets were easy to understand, this was in line with the validation results on the construction requirements aimed at agr. Worksheet was easily understood by students who had a tendency to score 4. The worksheets developed in this study were made from stages simple to complex so that students easily understand it and students can also practice oceanic literacy, This is in accordance with the statement of Ningrum and Hidayat (2015) that teaching materials in this case worksheets designed with concepts that are easy to difficult or from concrete to understand the abstract will be easier for students to understand. This is because students will find it easier to understand a certain concept if the explanation starts from something easy or something concrete, something that is real in their environment. This opinion is also supported by Bruner's statement about compiling and presenting material from easy to difficult stages that will affect students in absorbing and transferring learning (Budiningsih, 2008). something real is in their environment. This opinion is also supported by Bruner's statement about compiling and presenting material from easy to difficult stages that will affect students in absorbing and transferring learning (Budiningsih, 2008).

Something real is in their environment. This opinion is also supported by Bruner's statement about

compiling and presenting material from easy to difficult stages that will affect students in absorbing and transferring learning (Budiningsih, 2008).

As many as 13.3% of the 53.3% gave suggestions that there should be more articles on marine environmental issues. This response shows that students have an interest in learning issues about the marine environment and of course present them in learning so that learning becomesmeaningful because it is based on context (phenomena that actually occur around students' environment). According to Zo'bi (2014), the use of socio-scientific issues can develop students' potential in making solutions from various aspects of life, including aspects of science, culture, morals, and other cases. Based on research conducted by Mazfufah (2017) learning that uses sociological science has a significant effect on students 'scientific reasoning abilities and also makes students actively involved in the learning process so that it can help achieve students' scientific literacy.

20% of the 53.3% students gave suggestions to reproduce the pictures on the worksheets. The responses given by these students indicate that students are interested in teaching materials that have many (visual) images.According to Arsyad (2011), visuals or images in teaching materials used in the teaching and learning process can generate new desires and interests, generate motivation and stimulation of teaching activities, and even carry psychological influences on students.

Based on the results and explanations above, it can be said that the worksheets developed to train oceanic literacy can be declared practical.

3. Effectiveness

The aspect of effectiveness in research on developing student worksheets to practice oceanic literacy is assessed based on the results of increasing students' oceanic literacy which can be seen from the pre-test and post-test scores that have been done. The pre-test is done to determine the students 'early oceanic literacy skills while the post-test is used to determine the students' final oecanic literacy skills after being given treatment in the form of using oceanic literacy worksheets in the learning process.

Based on table 4.8, it is known that the students' pre-test scores showed unsatisfactory results, namely in the absence of students who were categorized as good and very good. Table 4:11 shows the data about the students' post-test scores, from the results it is known that as many as 22 students were in the very good category, 2 students were in the good category, and 1 student was in the fairly good category. This shows that there is an increase in oceanic literacy skills after being given treatment in the form of using worksheets in the learning process or in the sense that worksheets are effective in training oceanic literacy for junior high school students.

The effectiveness of the developed student worksheets can be seen from the improvement of the students' pre-test and post-test results. This increase was seen based on the overall student N-gain score obtained, which was 0.83 in the high category. Hake in Suriasah (2019) states that WORKSHEET is said to be feasible based on the effectiveness aspect if it gets an N-gain> 0.3. Scientific literacy which includes oceanic literacy has

three aspects. These aspects are content aspects (knowledge of the sea and its resources), scientific processes (explaining phenomena or events that occur in the sea) and context aspects (directing marine ecosystem conservation activities (UNESCO, 2013). In the content aspect, the percentage value obtainedwhen the pre-test was 16% while for the post-test it was 74.5% with an N-gain of 0.69 in the moderate category. In the process aspect, the percentage value during the pre-test is 18.3% and the post-test score is 86.25%, the N-gain score is 0.83 with the high category, while for the context aspect the percentage value for the pre-test is 20% and the post-test is 93.33% with the N-gain score obtained is 0.91 in the high category. Based on the explanation above, it can be concluded that the lowest N-gain score is in the content aspect and the highest n-gain is in the context aspect.

There are several factors that influence the low value of the content aspect among the three aspects such as activities carried out by students and learning implementation. Based on the results of observations of the implementation of learning, it is known that for five-thirds the percentage value obtained is 100%, which means that all stages in learning activities are carried out, but based on observers' comments at meeting 1 when the teacher asks students to read articles on the worksheet (to practice aspects science content) teachers initially they did not go around to each group to make sure students read the article then to make sure the teacher went around and also conditioned students to read the article because some did not read the article, this shows that there were some students who did not carry out the teacher's orders to read the article. These results are also

supported by the activity data of student worksheets from five meetings, namely the percentage value of activity for the content aspect is the lowest of the three aspects, namely 52.12%, then the results of observations of student activity observations as a whole at the first, second, and third meetings, namely at during the activity of doing worksheets in the reading and viewing video activities (to practice science content), There were some students who did not carry out these activities even though the overall activities carrying out activities on the worksheet had the highest percentage at 5 meetings, namely with an average of 37.29%. From the explanation above, it can be concluded that the literacy aspect that received the lowest n-gain of 0.69 was the content aspect although it was still in the medium category.

At this first meeting during the activity of reading articles (practicing aspects of science content) there was a note from the observer that not all students read the article, this is in accordance with Nurhadi's statement (2015), that students tend to be lazy in reading activities in learning. Sumadi (1993) also states that students will adapt first to a new learning atmosphere. This confirms that at the beginning of the meeting students still need to adapt because the teacher and the learning atmosphere faced is different from before. In the context aspect, it can be seen that the learning stage that trains this aspect gets a 100% percentage in every meeting and with the support of observational comments that when discussing the importance of marine conservation efforts the students are very enthusiastic and also at the last meeting which really emphasized practicing the context aspect, In the poster making activities, presentations, assessments and

poster exhibitions the students were very enthusiastic. This is also supported by the results of the WORKSHEET implementation activities that the activities in the context aspect of the five meetings have the highest average percentage value of 79.47%.

From the explanation above, it can be concluded that the worksheets developed by researchers are effective for training junior high school students' oceanic literacy. At each meeting, all aspects will be trained so that students can have optimal oceanic literacy skills. Osman et al (2007) argue that if these literacy aspects are owned and strengthened again in science learning, the characteristics of scientific literacy will be embedded in students. Based on the explanation above, if students really explore these aspects, students will have knowledge of marine affairs, then be able to take action on marine issues that occur, this is in line with the explanation of Cava et al (2005), that understanding the sea important to understand and for the purpose of conserving the oceans and protecting the planet on which we live.

This is also stated in UNESCO (2013) which explains that someone who is said to have marine literacy or oceanic literacy is when they are able to understand the importance of the ocean to humans, are able to communicate about the importance of the sea in a meaningful way, and are able to make informed and responsible decisions about oceans and their resources.

Direct observation of seagrass and benthos in the sea is one of the activities to practice aspects of the scientific process. According to research by Strang Craig, et al. (2007), explained that learning based on direct

observation can deepen concept understanding because students directly observe and learn about it or in other words self-experiment.Inquiry-based activities allow students to investigate processes, make predictions, and learn to make wise actions about phenomena or circumstances that occur (Adams, 2009).

The worksheets developed by researchers also contain articles related to the diversity of marine resources including biotic and abiotic components so that students can find out how large Indonesia's marine resources are. It is hoped that from this article students will have the attitude to protect marine resources and also learn about conservation efforts so that at any time if there is damage to the marine ecosystem in the area near where they live, they will understand what to do. However, what is prioritized is still efforts to prevent it from overcoming. Strang and Schoedinger (2007), explain that a person who has marine literacy must not only understand about the sea but also have a good attitude towards the marine environment and do not violate marine values, as well as behave well towards the environment. The opinion of Strang and Schoedinger is also in line with the government's objective, especially by the Minister of Committees in Hindrasti (2018) that society must make wise and right decisions on the environment or in being able to do conservation, one of the things he emphasized was the handling of plastic waste that threatens Indonesia's seas.

Based on the explanation above, it can be concluded that the worksheets developed by researchers are feasible based on the aspect of effectiveness.

CHAPTER V
CLOSING

A. Conclusion

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

1. Worksheets developed on the interaction of living things for practicing oceanic literacy for junior high school students is declared valid with the very feasible category based on the average trend obtained, which is 5.
2. Worksheets developed on the material for the interaction of living things practicing oceanic literacy for junior high school students is stated to be practically based on practical aspects seen from the implementation of learning, student activities, and student responses. The implementation of learning gets a percentage of 100% with a very good category, the activity of students in the group as a whole which dominantly appears is doing activities on worksheet, student activities based on oceanic literacy skills have increased from the first meeting of 58.6% to the fifth meeting which is equal to 69, 43%, and student responses get a percentage of 98.9% in the very good category.
3. Worksheets developed on the material for the interaction of living things train junior high school students' oceanic literacy is declared effective based on the effectiveness aspect in terms of the increase in the results of the oceanic literacy test results during the pre-test and post-test. The results showed that the n-gain score was obtained from the test it obtained an average of 0.83 in the high category.

B. Suggestions

Based on research that has been done by researchers about developing worksheets to train oceanic literacy, here are some suggestions put forward by researchers for further research:

1. Teachers are advised to use worksheets developed by researchers as teaching materials to train oceanic literacy for seventh-grade junior high school students on the interaction of living things.
2. Based on the results of the study, it is better to strengthen the content aspect that more videos are used because students have more emphasis on watching videos than reading articles.
3. For further research it is suggested to further strengthen oceanic literacy skills so that it prioritizes contextual learning context (bringing students to real life) rather than just conventional learning.
4. For further research, additional articles related to the issue of the local marine environment can be added to activities at the worksheet to practice aspects of science content.
5. It is necessary to add direct observation to the sea on other topics such as observation of algae, mangroves, interactions of biotic, and abiotic components and others.
6. In poster exhibition activities to practice aspects of the science context, a poster campaign through social media is necessary so that it is not only done in class.
7. In further research, it is hoped that researchers can use other materials to practice oceanic literacy such as earth material and others.

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DEVELOPMENT OF INTERACTIVE MULTIMEDIA BASED ON ARTICULATE STORYLINE ON LIQUID PRESSURE MATERIALS FOR 8TH GRADE TO IMPROVE STUDENT LEARNING OUTCOMES

ESSAY

PRILY NUR INDASARI
NIM 15030654008

STATE UNIVERSITY OF SURABAYA
FACULTY OF NATURAL SCIENCE AND MATHEMATICS
SCIENCE EDUCATION STUDY PROGRAM
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CHAPTER I
INTRODUCTION

A. Background of The Study

A curriculum is a learning tool which has purpose, content, and method for a teacher doing his/her certain lesson (Permendikbud No. 68, 2014). The curriculum that is used in Indonesia is Curikulum 2013. This curriculum is a revised version of the previous curriculum (KTSP). Curikulum 2013 is used to make students in Indonesia prepare themselves to challenge the future.

Kurikulum 2013 has high hopes for its learning process to be more interactive and meaningful for the students so that the students will be active while studying (Permendikbud No. 22, 2016). Based on Permendikbud No. 22 (2016), for improving learning's efficiency and effectiveness, the teacher could use the technology which suitable with students' condition and situation. In Junior High Schools' Curriculum 2013, the subject for physics, chemistry, and biology taught in one subject as an integrated science.

According to Sujana (2017), natural science is a science that studies the universe and its contents, as well as the events that occur in it which is developed by experts through a series of scientific processes that are carried out carefully. Based to Sujana (2017), it is very important to teach science in schools, one of the reasons is that the laws in science can be used and useful in everyday life, for example, the application of hydrostatic pressure to water dams, application of Archimedes Law on submarines and application of Pascal's Law on hydraulic tools taught in the subchapter Liquid Pressure.

Saputri (2018) said that in carrying out the learning process of liquid pressure, supporting media is needed such as learning media that can visualize the phenomena that students will observe so that students can more easily understand the information conveyed by the teacher. The use of various media in the teaching and learning process is also supported by the 2013 Curriculum listed in the Regulation of the Minister of Education and Culture Number 68 of 2013, where one of the improvements to the mindset is a single tool learning pattern into multimedia tool-based learning.

Based on pre-research conducted at SMPN 1 Sidoarjo, the media that is often used in liquid pressure is Microsoft PowerPoint. According to the science teacher himself, the use of PowerPoint media was not optimal because it only contained text and images, while the video was rarely used. This is because not all teachers are familiar with the use of video in the teaching and learning process. Even though the use of video can be useful to explain the application of liquid pressure, such as how a submarine works. Besides, students' motivation in learning can increase with the presence of videos (Darmawan, 2013). According to the science teacher, the media that is used today cannot make students active because the students are only observing.

In addition to interviews with science teachers, questionnaires were also distributed to 31 students of grade VIII SMP. The results obtained were that 87% of students thought that science lessons were sometimes difficult to understand. This is evidenced by the acquisition of the average IPA UN results at SMPN 1 Sidoarjo in 2017/2018 decreased from the previous year, from 80.01 to 75.57. According to Ornek, Robinson & Haugan (2008), This learning difficulty is caused by several factors, namely (1)

Low motivation and interest in learning science, (2) Not studying the material that he has obtained, (3) Lack of students' initial knowledge. Meanwhile, according to students, learning difficulties are caused because the discussion of the material in the science book is deemed incomplete, concurs with Djamarah in Khoiriah (2016). One of the causes of the low cognitive abilities of students is the teaching materials used in teaching.

Interactive multimedia itself consists of several elements such as text, graphics, animation, video, and sound which are integrated into one media (Andresen & Brink in Rusli, 2017). Therefore, the use of interactive multimedia will involve several senses, such as ears, eyes and hands. Therefore multimedia is an effective method for teaching science and will improve student learning outcomes (Kapri, 2017). There are five interactive multimedia presentation models/formats, they are tutorials, drills, simulations, experiments, and games (Daryanto, 2013). Based on the results of the pre-research, learning outcomes in the realm of knowledge have not been optimal, proven by the average National Science UN from 2016 to 2017 was decreasing, besides that students also need other learning resources to complete the explanations given by the teacher and textbooks. Therefore, an interactive multimedia model that is suitable to be applied is a tutorial.

There is much software that can be used to create interactive multimedia, one of them is an Articulate Storyline. Articulate Storyline is a powerful piece of software for building interactive e-learning modules. The Articulate Storyline display is similar to PowerPoint but offers more facilities. Articulate Storyline can be used to generate simulations, quizzes, drag-and-drop elements, screen recordings, and many other e-learning objects that users can

interact with. This software can be used if users want to create interactive and unconventional learning modules (UC Libraries, 2018).

The development model used was ASSURE and a one-shot case study trial design. Meanwhile, the research that will be carried out aims to produce feasible media theoretically and empirically by using the R&D development model and one group pretest-postest design trial design. While the developing media will be equipped with a glossary so that it can make it easier for students to remember the definitions and new terms such as hydrostatic pressure. Besides, various online sources are linked in the media so that students can use them if needed.

Based on the description that has been described above, to overcome the difficulties of students in learning science material in schools, a study was conducted on "Development of Interactive Multimedia based on Articulate Storyline on Liquid Pressure Material for Class VIII Junior High School to Improve Student Learning Outcomes".

B. Formulation of The Problem

Based on the background that has been described, the formulation of the problem in this study is "What is the feasibility of Interactive Multimedia based on Articulate Storyline on Liquid Pressure Material for Class VIII SMP?". These common problems can be detailed as follows:

1. What is the theoretical feasibility of Interactive Multimedia based on Articulate Storyline on Liquid Pressure Material for Class VIII Junior High School?
2. How is the empirical feasibility of Interactive Multimedia based on Articulate Storyline on Liquid

Pressure Material for Class VIII SMP on student learning outcomes?

C. The objective of The Study

Based on the formulation of the problem that has been described, the objectives of this study are:

1. Produce interactive multimedia based on Articulate Storyline on the material of liquid pressure for class VIII SMP that is theoretically and empirically feasible.
2. Describe the theoretical feasibility of interactive multimedia based on Articulate Storyline on liquid pressure material for grade VIII SMP.
3. Describe the empirical feasibility of interactive multimedia based on Articulate Storyline on liquid pressure material for grade VIII SMP on student learning outcomes.

D. Term Definition

1. Interactive Multimedia Based on Articulate Storyline
   Interactive multimedia is a learning medium that integrates several media formats and can be operated by the user alone. The media developed in this study is interactive multimedia developed using Articulate Storyline authoring software.
2. Learning outcomes
   Learning outcomes are the results/achievements obtained by students after carrying out a Teaching and Learning Activity (KBM). Learning outcomes include aspects of attitudes, aspects of knowledge, and aspects of skills. Learning outcomes in this study were obtained through test sheets, namely the pre-test and post-test on the knowledge aspect.

E. Product Specification

Product specifications resulting from the development of instructional media in this study are files with the "exe" extension. The file can be operated via a laptop/computer electronic device. The media developed contains learning material in the form of visual images, text, video and animation to support the material explanation. Besides, the file includes musical instruments and attractive layouts for students.

F. Significance of The Study

The benefits of the research carried out are as follows:

1. For students
   The interactive multimedia based on the Articulate Storyline that was developed is expected to make it easier for students to understand the material in a fun way.
2. For teachers
   Provide alternative options for teachers who want to use instructional media by utilizing technology and help maximize the teaching and learning process in the classroom.
3. For schools
   Provide interesting learning media, so that the quality of education in the learning process can be improved.
4. For researchers
   Adding experience and knowledge in the development process and the learning process using interactive learning media.

G. Assumption

In this study, researchers assume that:

1. Students fill out questionnaires and answer sheets honestly.
2. Observers provide an objective assessment.

H. Scope and Limitation

Research limitations in this study are limited to the following:

1. This research is limited to the stage of development studies, to be precise at the trial stage with as many as 28 test subjects.
2. The material listed in the interactive multimedia is liquid pressure.
3. Research on student learning outcomes is only on the aspect of knowledge, namely in the domains of knowledge C1-C4 which is measured through pretest and posttest.

CHAPTER II
LITERATURE

A. Learning Media

Media comes from the word medius which means "middle" or "introduction". A media is said to be a learning media if the media carries information that contains teaching intentions, while the understanding of learning resources is anything that can help students learn and show their competence (Arsyad, 2016: 7). In using learning media, you will be familiar with the terms material, equipment, hardware and software. Material is something that is used to store messages, for example, pictures and films. While the software is information contained in a material. Equipment and hardware have the same meaning, namely a tool that functions to convey information stored in the material, for example, videotape recorders and projectors (Arsyad, 2016: 16-17).

1. The Importance of Learning Media

Teaching is an effort made by the teacher to make students learn or guide students on how to learn. Meanwhile, changes in a person's behaviour as a result of experience are called learning. According to Sanjaya (2015: 198), the experience can be obtained from direct or indirect experience. If students get experience through direct activities or in actual situations, it is called direct experience. Therefore, the use of media in the learning process has enormous benefits. This is because not all learning experiences can be obtained directly / real so that in this case the learning media is useful for students so that they can more easily

understand the material presented by the teacher (Sanjaya, 2015).

2. The Function of Learning Media

   According to Arsyad (2016: 29), learning media is essentially indispensable in the learning process by teachers or educators because it has the following benefits:

   a. Clarify the information conveyed so that the process and student learning outcomes can be improved.
   b. Increase student motivation
   c. Overcoming the limitations of the senses, space and time
   d. Provide the same experience to every student about natural phenomena that occur and allow students to interact directly with learning resources

3. The Types of Learning Media

   The grouping of various types of media, when viewed from the point of view of the development of Information and Communication Technology (ICT), can be grouped into two, namely traditional media and cutting-edge technology media (Arsyad, 2016: 35).

B. Interactive Multimedia

According to Darmawan (2013: 38), Interactive multimedia has more value when compared to ordinary print media because it can make students active to learn with high motivation due to student interest in multimedia systems that can display text, images, videos, sound, and animation.

C. Articulate Storyline

The articulate storyline is a powerful piece of software for building interactive e-learning modules. The Articulate Storyline display is similar to PowerPoint but offers more facilities. Articulate Storyline can be used to generate simulations, quizzes, drag-and-drop, screen recordings, and many other e-learning objects that users can interact with. This software can be used if users want to create interactive and unconventional learning modules (UC Libraries, 2018). According to Minkova (2016), Articulate Storyline is software that is easy to use but has many functions. This software can build highly interactive learning with templates, storyboards, animation, multimedia support, character illustration, simulation, screen recording, and advanced editing features. Articulate Storyline can be published in several options, namely as flash (SWF), HTML5, or for iPad. Based on some of the opinions about the Articulate Storyline above, it can be said that Articulate Storyline is a software used to create interactive multimedia and can be published online and offline.

Some of the advantages of Articulate Storyline according to Commlab India (2018) are that users do not need experience in using authoring or coding software, what is needed is familiarity with using PowerPoint. According to See and Teetor (Yasin, 2017), the advantages of Articulate Storyline are that it enhances the learning experience by allowing students to receive feedback. The articulate storyline provides an easy-to-use free-form tool for organizing interactive quizzes, such as drag and drop quizzes.

Here are some Articulate Storyline Features based on Commlab India (2018),

1. Can change the appearance of the presentation (template)

This software allows users to design presentation templates as desired. Users can input several media such as video, audio, animation, and flash. Users can also add hotspots, interactive tabs, other interactive buttons, characters, scroll and timeline and can record laptop screens.

2. Create a quiz

Every lesson there is always an assessment to find out whether students have understood the material or not, so it is important to make a quiz in the media. Articulate Storyline provides various types of questions for the quiz that can be used easily. Users can make highly interactive and effective assessments and provide appropriate feedback to students because users can take advantage of the features of this Articulate Storyline. For example, true/false quizzes, multiple choices, drag and drop, and matching.

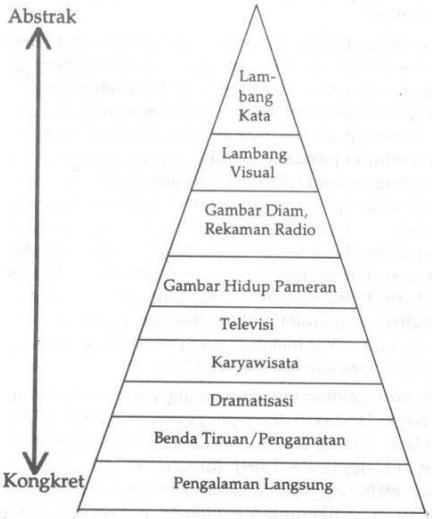
D. The Theoretical Basis for the Use of Learning Media

According to Bruner, there are three main levels of learning mode, namely direct experience (enactive), pictorial experience (iconic), and abstract experience (symbolic) (Arsyad, 2016: 10). Enactive experience means "doing", for example in understanding the meaning of the word "knot", students learn directly to make knots. In iconic experiences, the meaning of the word 'knot' is learned through a picture/film. In symbolic experiences, students learn by reading or listening to the meaning of "knot" and try to match the meaning of the word "knot" in the mental image or with the experience of tying a knot. These three levels of learning mode or experience level interact/relate to each other to gain experience in the form of new knowledge, skills or attitudes.

Paivio's dual coding hypothesis concept is also a theoretical basis for the use of interactive multimedia in the learning process. According to the concept of the dual coding hypothesis, there are two memory systems in humans. First, to process verbal symbols which are then stored in the form of image proportions. Second, to process non-verbal images which are then stored in the form of verbal propositions. Based on this, the learning process will be better if students are invited to take advantage of more than one sensor device. This is because the more sensory organs used to receive and process information, the more likely it is that the information will be understood or retained in memory (Arsyad, 2016: 11). According to Dale in Arsyad (2016: 13), approximately 75% of a person's learning outcomes are obtained through the sense of sight, 13% through the senses with and about 12% through other senses. The completeness of features in interactive multimedia can involve the use of several sensory tools of students, so that the imagination, creativity, fantasy, and emotions of students can develop in a better direction. Various studies have shown that the learning process by involving more than one sense is more effective than with only one sense and the learning material delivered by the teacher is more memorable (Rusman, 2015: 71).

Edgar Dale's cone is also a theoretical basis for the use of media in addition to the two concepts above. Edgar Dale's cone contains media that can be used in learning, the higher (peak) the cone in figure 2.1, the more abstract the media used in conveying messages. The basis for the development of the Edgar gale cone is the level of its abstractness, namely the number of senses that participate in receiving information. If a message is written in a word symbol, the level of abstractness of the message will be higher and the senses

involved in receiving the message will also be more limited, namely the eyes or ears (Arsyad, 2016).



E. Learning Outcomes

A process of changing a person's behaviour due to his interaction with the environment is called learning. These changes can be seen in one or several aspects of behaviour, namely knowledge, understanding, habits, skills, appreciation, emotional, social, physical, character and attitude. While the acquisition/achievement of a goal is called an outcome, so that learning outcomes are the results/achievements obtained by students after carrying out a Teaching and Learning Activity (KBM). Learning outcomes can also be said to be a measure of how far the learning objectives are achieved by students.

According to Permendikbud number 53 of 2015, the scope of assessment of learning outcomes by educators includes aspects of attitudes, aspects of knowledge, and aspects of

skills. Assessment of learning outcomes serves to determine the level of competency mastery, monitor student learning progress and improve the learning process (Permendikbud No. 53, 2015).

1. Attitude Assessment

   According to Alimuddin (2014), attitude competence is a disclosure of the values that a student has and is manifested in behaviour. Attitude assessment aims as a reflection of the progress of individual learners' attitudes. There are two scopes in the attitude assessment, namely the assessment of spiritual attitudes which include appreciating and living up to the teachings of the religion adopted, then the assessment of social attitudes, namely honesty, discipline, responsibility, tolerance, cooperation, courtesy, and self-confidence. Attitude assessment techniques can be done through observation/observation by the teacher (Permendikbud No.53, 2015).

2. Knowledge Assessment

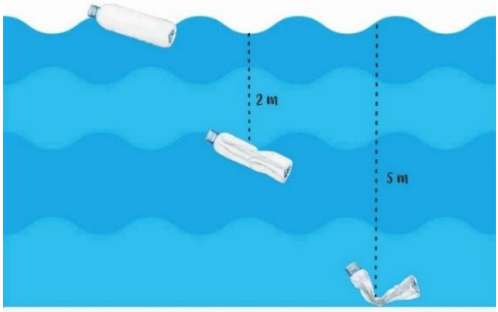
   Knowledge assessment is an assessment of intellectual potential which includes factual, conceptual, procedural, and metacognitive knowledge. The areas of student knowledge that are assessed are remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5) and creating (C6) (Anderson & Krathwohl in Alimuddin, 2014).

3. Skills Assessment

   The scope of the assessment of the skills aspect is in the concrete and abstract domains. In

the concrete realm, it includes activities using, parsing, assembling, modifying, and creating. Whereas in the abstract realm, it includes writing, reading, counting, drawing, and composing activities (Alimuddin, 2014). Based on Permendikbud No. 53 2015, skills assessment techniques that can be done, namely through the assessment of practices, products, projects, portfolios, or other techniques according to the competencies being assessed.

F. Liquid Pressure Material



It can be seen in the picture above that an empty bottle that is brought into the sea will get more damaged with greater depth. This is due to the pressure on the liquid or it is called hydrostatic pressure. The deeper the location of a part of the liquid, the greater the hydrostatic pressure (Giancoli, 2001: 327). Gravity causes pressure in the liquid. The weight of the water particles will press the particles underneath. Therefore, the deeper a person dives, the greater the volume of water above the diver so that the pressure that the water exerts on the diver's body increases. The pressure exerted by water is in all directions. This is felt by the diver's body being pressed

from all parts of their body. The amount of pressure in all directions at a point is the same (Giancoli, 2001: 326).

The amount of hydrostatic pressure can be calculated by,

$$Ph = \rho \times g \times h$$

Dengan:

Ph = Hydrostatic Pressure (N/m^2)

m = Mass (kg)

ρ = density (kg/m^3)

g = Gravity acceleration (m/s^2)

h = height (m)

V = volume (m^3)

Dam water is the application of hydrostatic pressure. Observe at the bottom of the water dam, where it has a wider area. This is to withstand the amount of water pressure at the bottom.

1. Archimedes Law

The weight of an object seems to decrease when it is in the water but this does not mean that the object's mass is lost, but is caused by the buoyancy (Fa). This buoyancy force pushes objects upwards or in the opposite direction to the weight of the object (Zubaidah, 2017). The weight of the object in the water is called the apparent weight (w_ba), where the magnitude is equal to the actual weight (w_bu) minus the buoyancy (Fa) (Giancoli, 2001: 335), mathematically it can be written,

$$w_{ba} = w_{bu} - F_a$$

$$F_a = w_{bu} - w_{ba}$$

F_a = Buoyancy Force (N)

w_{bu} = Object Weight in the air (N)

w_{ba} = Object Weight in water (N)

Buoyancy was discovered by Archimedes. Archimedes is a mathematician, scientist, engineer, inventor, and astronomer from Greece who is estimated to have lived around 287 to 212 BC. Archimedes' law reads "If an object is immersed in a liquid, then it will get an upward force equal to the weight of the liquid being pushed out by the object". Mathematically, it can be written,

$$F_a = \rho_{cp} \times V \times g$$

F_a = Buoyancy Force (N)

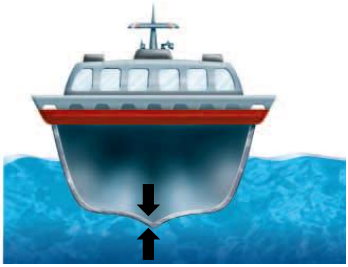
ρ_{cp} = liquid density(kg/m^3)

g =gravity acceleration(m/s^2)

V_{cp} = Volume that is moved (m^3)

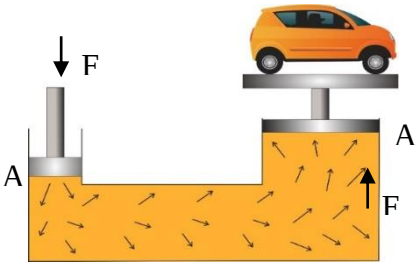
w_{cp} = Weight that is moved (N)

(Zubaidah, 2017)



One of the Archimedes' law applications is ships. Marine ships are usually made of steel/iron but can float on the sea because there is air in the hull of the ship which causes the density of ships to be smaller than the density of seawater. In addition, ships are also designed to be wide enough to be able to move a volume of water equal to the weight of the ship.

2. Pascal Law



The hydraulic machine functions to lift vehicles to be washed in a car wash. With this machine, workers car parts that are difficult to reach can be cleaned. The working principle of hydraulic machines is based on Pascal's Law which reads "The pressure exerted on liquid in a closed room will be continued in all directions with the same amount" (Zubaidah, 2017).

Because the pressure that is passed on is the same, so that

$$P_1 = P_2$$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

F_1 = Force in area 1 (N)
F_2 = Force in area 2 (N)
A_1 = Area 1 (m^2)
A_2 = Area 2 (m^2)

If A1 is applied a force, it will cause pressure which is continued in all directions until it can lift the car in A2.

G. Relevancies Research

Relevant studies that support the research to be carried out include Dr Umesh Chandra Kapri in 2017 entitled "Impact of Multimedia in Teaching of Science". The study aims to

analyze the impact on grade 9 students' achievement in science material after participating in learning with conventional and multimedia teaching methods. The results showed that the use of multimedia in teaching science material proved better than conventional methods. Teaching using multimedia is said to be effective because not a single student is under a very low level of achievement after participating in multimedia-based learning so it is clear that multimedia is an effective method of teaching science material.

Renyta Ayu Cahyaningtyas (2017) who developed interactive learning media for excretion system material. The software used to develop the media is Macromedia Flash. The media developed was declared theoretically feasible with a percentage of 88.89% and empirically feasible with a percentage of 84.83%, and the results of learning completeness reached 91.11%.

The next relevant research is the research of Hanifah Kamila (2018) which aims to produce interactive multimedia valid tutorial models on the material of the human circulatory system. Media was developed using Adobe Flash software. The media developed obtained a percentage of 93.94% in the validity aspect, 93.59% practicality and student learning outcomes that increased by 0.76 or in the high category.

The third relevant research is Ferit Vey Priyonggo's research (2018) which aims to produce valid, practical and effective interactive multimedia using Macromedia Flash. Based on the results of the research, the media developed obtained a validity percentage of 92.31%, a practicality percentage of 95.83% and effectiveness of 100% with an N-Gain of 0.76.

The research of Apin Nasifah Yasin (2017) is the next relevant research which aims to produce interactive multimedia based on Articulate Storyline that is theoretically feasible on reproductive material. The results showed that multimedia got theoretical feasibility of 3.94. In addition, the completeness of the learning objectives obtained was 95.47%.

Based on the four relevant studies above, several ideas can be taken to complement further research. However, the research to be carried out still has differences with existing relevant research. One of them is in research conducted by Yasin (2017), in which Yasin develops interactive multimedia on theoretically feasible human reproduction material. The development model used was ASSURE and a one-shot case study trial design. While the research that will be carried out aims to produce interactive multimedia that is theoretically and empirically feasible by using the R&D development model and one group pretest-postest design trial design. Meanwhile, the media developed will be equipped with a glossary so that it can make it easier for students to remember the definitions of important and new terms for students such as hydrostatic pressure. Also, various online sources are linked in the media so that students can use them if needed.

CHAPTER III
RESEARCH METHODOLOGY

A. Type of Research

This research uses research and development method. Research and development method consists of ten stages (Sugiyono, 2013: 298). However, this research is limited to the product trial stage.

B. Place and Time of Research

This research was conducted at SMP Negeri 1 Sidoarjo, Jl. Raya Ponti, Wismasarinadi, Magersari, Sidoarjo. This research was conducted in January 2019.

C. Research Design

This research uses research and development method that adopted from Brog and Gall.

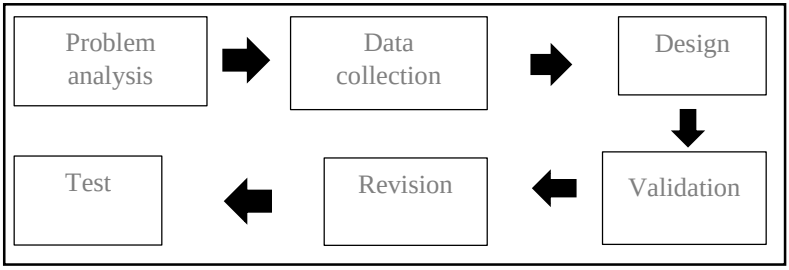


Figure 3.1. R&D Model stages of development
Source: Sugiyono, 2013

1. Problem Analysis

   Research can start with a problem. Problem is a deviation between what is expected and what is actually happening (Sugiyono, 2013: 298-299). Distributing questionnaires, teacher interviews, and school observations were carried out to identify the problems. The questionnaires were distributed to 8th grade and it

was found that 87% of students had difficulty to learn science because it is hard to imagine the logic or process and the explanation in the book is incomplete. Therefore, they need other sources for learning. However, only 15 students who have learned science use other learning resources such as website or multimedia interactive.

Based on interview with science teacher, the learning media that is often used in class is powerpoint. The use of the PowerPoint is not optimal because it does not yet integrate other media formats such as video or animation. The application of liquid pressure is closely related to everyday events, so a video/animation is needed to visualize these events.

Through observations, it is known that there is LCD in each class, so that learning using interactive multimedia can be done.

2. Data Collection
   a. The curriculum used in SMPN 1 Sidoarjo is the 2013 curriculum
   b. The basic curriculum (KD) used is KD 3.8 understanding the pressure of substances and its application in everyday life, including blood pressure, osmosis, and capillarity of the transport tissue in plants.
   c. Indicators

      3.8.3 Describe the liquid pressure

      3.8.4 Describe the application of hydrostatic pressure in everyday life

      3.8.5 To analyze the effect of depth on hydrostatic pressure

      3.8.6 Explaining Archimedes Law

3.8.7 Describe the application of Archimedes Law in everyday life.

3.8.8 To analyze the effect of density on the position of objects

3.8.9 Explaining Pascal's Law

3.8.10 Describe the application of Pascal's Law in everyday life.

3.8.11 Calculating the strength of the tool for lifting objects by applying the Pascal's Law equation.

d. Learning materials

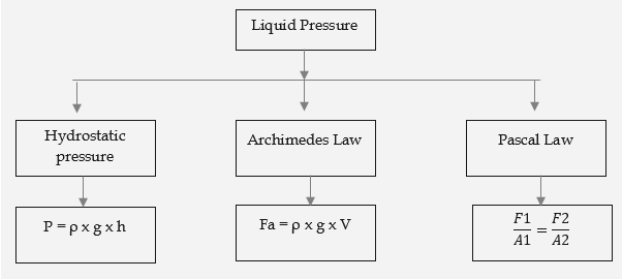


Figure 3.2. Concept Chart
Source: Zubaidah, 2017

3. Design

The procedure for interactive multimedia development according to Darmawan (2013):

a. Determining the Interactive Multimedia Model

There are five models: tutorials, drills, simulations, experiments, and games. Students need other learning resources that can display videos and animations so that tutorial model is suitable for this research.

b. Flow chart

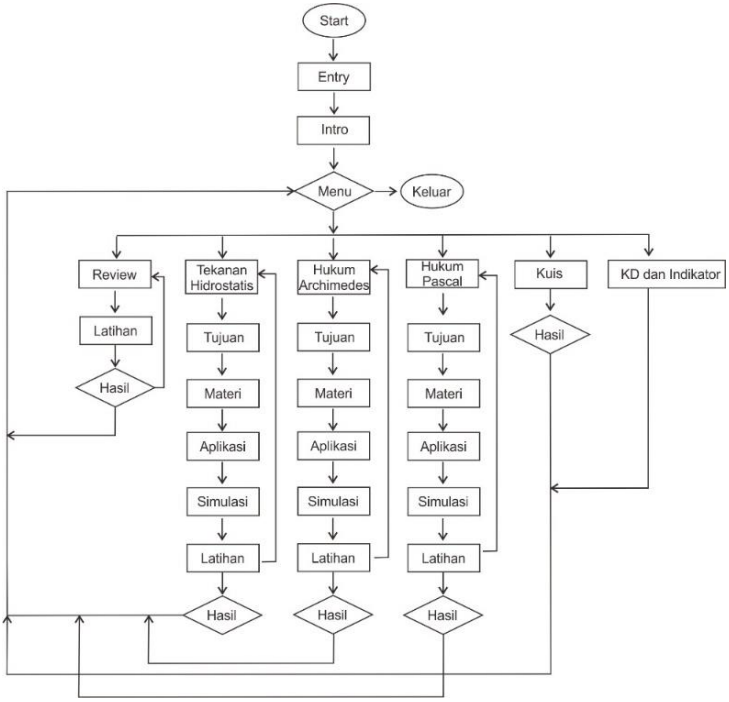
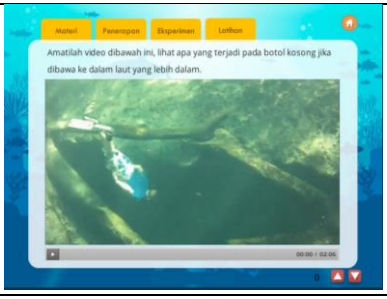
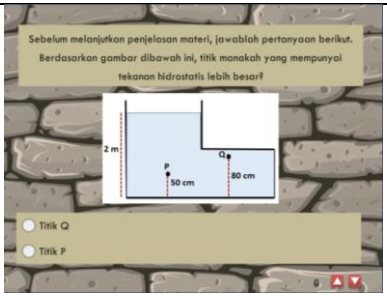
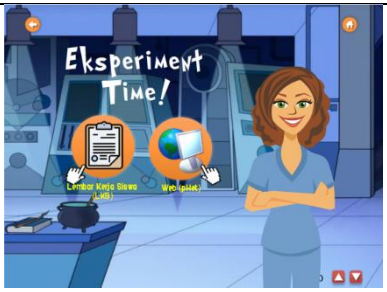
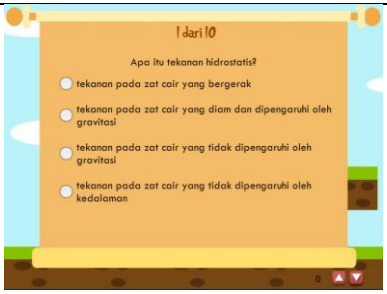


Figure 3.3. Flow chart of Multimedia Interactive
Source: personal documentation

c. Story Board

Table 3.1 Story Board of Multimedia Interactive

No.	Slide	Keterangan
1		Home screen consists of : • Title • Insert name box • Volume up and down button Audio: Backsound (bensound-jazzcomedy.mp3)
2		Menu Display consists of: • Learning material buttons
3		KD and indicators display consists of: • Close button • Volume up and down button
4		Content display consists of: • Learning material buttons • Video, texts or animation • Home button

No.	Slide	Keterangan
5		Learning objectives display consists of: • Character • Text
6		Quick Quiz display consists of: • Text • Picture
7		Eksperimen display consists of: • Character • Experiment link
8		Quiz display consists of: • Text or picture

No.	Slide	Keterangan
9		Result display consists of: • Score • Review Quiz • Retry Quiz

d. Graphic and Animation Collection

Table 3.2. Component of Multimedia Interactive

No.	Component	Details
1	Picture	1. The effect of chicken and duck feet surface on pressure 2. The effect of Bulldozer track surface area on pressure 3. Hydrostatic pressure 4. Various kinds of connected vessels 5. Weighing fish in the air and sea 6. Hydraulic jack 7. Water dam 8. Submarine parts 9. Pressure on blood vessels 10. How the tensimeter works 11. Various tensimeter 12. Heart parts
2	Animation	1. The vessel is connected 2. How the hydraulic machine works 3. How the hydraulic jack works

No.	Component	Details
3	Video	1. The effect of shoe surface area on pressure 2. An experiment to bring bottles into the depths of the sea 3. The Archimedes Principle 4. Objects float, float, and sink 5. How ships can float 6. How a submarine works 7. Car garage by applying Pascal's Law 8. How the hydraulic brake works 9. An experiments breaking the bottom of a glass bottle by applying Pascal's Law
4	Music	1. Music instrument

e. Programming and Finishing

The software used for programming is Articulate Storyline 2. Interactive multimedia will be made into an application file (exe) and named Draft 1.

4. Validation

Draft 1 will be discussed with the supervisor. If there is an improvement, the revision of Draft 1 is called Draft 2. Draft 2 will be displayed at the proposal seminar and if it gets a suggestion it needs to be corrected to Draft 3. This draft will be assessed by the validators, two lecturers and one science teacher.

5. Revision

If the validation results still need improvement, it must be revised and produce draft 4. This draft 4 is called prototype that will be used for product testing. At this

stage, the theoretical feasibility of learning multimedia will be obtained.

6. Test

This stage aims to obtain information on whether the new learning process (using interactive multimedia) is more effective and efficient than the old learning process.

D. Experimental Design

This research uses one grup pretest-posttest design.

Table 3.3. One grup pretest-posttest design schematic

Pretest	Treatment	Posttest
O_1	X	O_2

Information:

O_1 = Pretest to identify students' initial knowledge.

X = Treatment using media.

O_2 = Posttest to determine the increase in student knowledge. (Sugiyono, 2013:303)

E. Subject of Research

The subjects in this study were 28 students consisting of 15 female students and 13 male students in class VIII-D in the 2018-2019 of academic year.

F. Type of Data

The type of data in this research is qualitative and quantitative data. Qualitative data were obtained from suggestions given by media experts during media validation. Quantitative data were obtained from media validation, student response questionnaire, test sheet, and student activity observation sheets.

G. Definition of Key Terms

1. Interactive Multimedia based on Articulate Storyline

The learning media was created using Articulate Storyline software. The learning media contains images, animations, and videos so it is called multimedia and users can operate the learning media by themselves.

2. The Theoretical Feasibility of The Interactive Multimedia
   The theoretical feasibility of learning media can be reviewed through media format and material aspects. The learning media is feasible theoretically if it gets a percentage of ≥ 61%.
3. The Empirical Feasibility of The Interactive Multimedia
   The empirical feasibility of the media can be reviewed through practicality and effectiveness. The learning media is feasible empirically if it gets a percentage of ≥ 61% and N-gain score of >0,3.

H. Research Instruments

1. Theoretical Feasibility
   a. Media Validation Sheet
      Media validation sheets are used to obtain an assessment of interactive learning media. The validation sheet is filled in by media experts, material experts and science teachers.
2. Empirical Feasibility
   a. Learning implementation sheet
      The learning implementation sheet is used to obtain observational data about the implementation of learning using interactive multimedia.
   b. Student activity observation sheet
      Student activity observation sheets are used to obtain observational data about student activities when using interactive multimedia.

c. Student response questionnaire sheet

Student response questionnaire sheets were used to determine student responses to interactive multimedia.

d. Test sheet

Test sheets (pretest and posttest) are used to determine student learning outcomes before and after learning using interactive multimedia.

I. Method of Data Collection

1. Theoretical Feasibility
   a. Questionnaire method

   The questionnaire method for theoretical feasibility consists of a media validation questionnaire.
2. Empirical Feasibility
   a. Questionnaire method

   The questionnaire method for empirical feasibility consists of a student response questionnaire. Student response questionnaires were given to students after learning using interactive multimedia based on the Articulate Storyline.

   b. Observation method

   This method is used to obtain data about the implementation of learning and student activities when using interactive multimedia based on the Articulate Storyline.

   c. Test method

   The test method consisted of pretest and posttest. The results of the pretest and posttest were used to determine student learning outcomes which were analyzed using the N-Gain score.

J. Method of Data Analysis

1. Theoretical Feasibility
   a. Analysis of Validation Results
      1). Converting qualitative data into quantitative data based on the Linkert scale criteria adapted from Riduwan (2016:39).

Table 3.4. Likert Scale

Answer	Score
Excellent	4
Good	3
Poor	2
Very Poor	1

      2). Calculating the average score of each component of the assessment aspect

Presentase (%) = $\frac{Total\ Score}{Maximum\ Score}\ x\ 100\%$

      3). Converts the mean score into a interpretation scale. Learning media is said to be feasible if all aspects in the questionnaire get a percentage of ≥ 61%.

Table 3.5. Score Interpretation Criteria

Score (%)	Criteria
0-20	Not Feasible
21-40	Less Feasible
41-60	Moderately Feasible
61-80	Feasible
81-100	Highly Feasible

(Modified from Riduwan, 2016:41)

2. Empirical Feasibility
   a. Analysis of Implementation of Learning
      1). Converting qualitative data into quantitative data based on the Linkert scale criteria on table 3.4
      2). Calculating the respone of each component of the assessment aspect

      Presentase (%) = $\frac{Total\ Score}{Maximum\ Score}\ x\ 100\%$

      3). Converts the mean score into a interpretation scale on table 3.5. Learning media is said to be feasible if the implementation of learning get a percentage of ≥61%
   b. Analysis of Student Respone
      1). Converting qualitative data into quantitative data based on the Guttman scale adapted from Riduwan (2016:43).

Table 3.6 Guttman scale

Answer	**Score**
Yes	1
No	0

      2). Calculating the respone of each component of the assessment aspect

      Presentase (%) = $\frac{Total\ Score}{Maximum\ Score}\ x\ 100\%$

      3). Converts the mean score into a interpretation scale on table 3.5. Learning media is said to be feasible if the implementation of learning get a percentage of ≥61%.

   c. Analysis of Student Activity
      1). Calculating the respone of each component of the assessment aspect

Presentase (%) = $\frac{Total\ Score}{Maximum\ Score}\ x\ 100\%$

2). Converts the mean score into a interpretation scale on table 3.5. Learning media is said to be feasible if the implementation of learning get a percentage of ≥61%.

d. Analysis of Student Learning Outcomes

The increase in student learning outcomes is obtained by using the N-Gain formula.

$$g = \frac{Sposttest - Spretest}{Smax - Spretest}$$

Information:

g	: gain score
Sposttest	: posttest score
Spretest	: pretest score
Smax	: maximum score

The gain score obtained is then analyzed using the following criteria adopted from Hake (1999). Multimedia is said to be effective if the N-Gain score is > 0.3.

Table 3.7 N-Gain Score Criteria

Gain Score	Criteria
(<g>) ≤ 0,3	Low
0,3 < (<g>) ≤ 0,7	Medium
(<g>) > 0,7	High

K. Research Matrix

Table 3.8 Research Matrix

No.	Research Purpose	Characteristics Observed	Data Collection Instruments	Data Source	Method of Data Collection	Method of Data Analysis
1	Describe the theoretical feasibility of interactive learning media on liquid pressure for 8th grade	Interactive multimedia feasibility	Validation media sheet	Media expert, material expert, and science teacher	Validation questionnaire method	Validation data were analyzed descriptively quantitatively. The media is feasible if the validator's assessment on each criterion reaches a percentage of ≥61%.
2	Describe the empirical feasibility of interactive learning media on	Implementation of learning	Implementation of learning sheet	Observer	Observation method	The data from student activity using the media were analyzed descriptively quantitatively. If

No.	Research Purpose	Characteristics Observed	Data Collection Instruments	Data Source	Method of Data Collection	Method of Data Analysis
	liquid pressure for 8th grade					the implementation of learning gets a percentage of ≥ 61% then the media is feasible
		Student activity	Student activity sheet	Observer	Observation method	The data from student activity using the media were analyzed descriptively quantitatively. If the implementation of learning gets a percentage of ≥ 61% then the media is feasible

No.	Research Purpose	Characteristics Observed	Data Collection Instruments	Data Source	Method of Data Collection	Method of Data Analysis
		Student respone	Student response questionnaire sheet	Student	Student response questionnaire method	Validation data were analyzed descriptively quantitatively. The media is feasible if each criterion reaches a percentage of ≥61%.
		Learning outcomes	Test sheet	Student	Test method	The test results were analyzed using N-Gain to determine the increase in learning outcomes after using the media. Multimedia is said to be effective if

No.	Research Purpose	Characteristics Observed	Data Collection Instruments	Data Source	Method of Data Collection	Method of Data Analysis
						the N-Gain score is> 0.3.

CHAPTER IV
RESULTS AND DISCUSSIONS

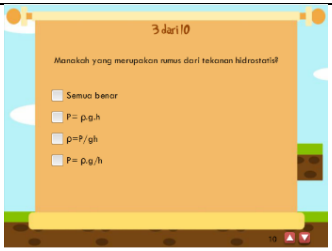
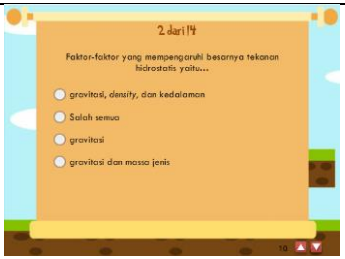
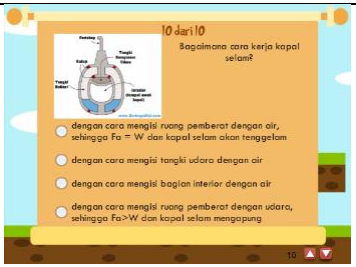
A. Results

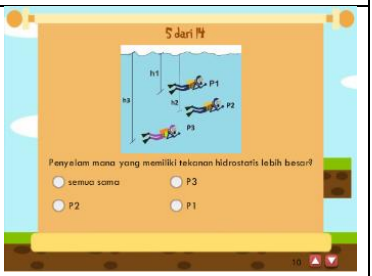
1. The Result of Theoretical Feasibility

a. Suggestions and Feedback

The 1st draft of interactive multimedia was discussed with supervisor to receive suggestions before presented at the seminar.

Table 4.1 Revision of 1st Draft

Revision	1st Draft	2nd Draft
The questions in interactive multimedia were changed according to indicators and learning objectives		 Indicator: identifies the factors that affect hydrostatic pressure
	No picture	 Indicator: describe the application of hydrostatic pressure

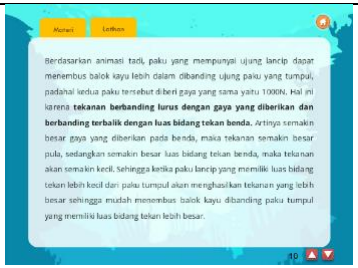
Revision	1st Draft	2nd Draft
	No picture	 Indicator: analyzes the effect of depth on hydrostatic pressure

There are 9 indicators that have been made, but there are two indicators that have not been included in the quiz questions and one question that is not precise enough to represent the indicators.

This 2nd draft was then displayed at the proposal seminar in order to get input from lecturers.

Table 4.2. Revision of 2nd Draft

Revision	2nd Draft	3rd Draft
The preliminary material was changed to make it more relevant to daily life.		

Revision	2nd Draft	3rd Draft
Simplify sentences so that there are not too many words.		

b. Validation

The 3rd draft is then validated to obtain the theoretical feasibility before being tested.

Table 4.3. The Result of Media Validation

No.	Aspect	V1	V2	V3	Total	%	Kategori
Media Format Aspect							
1	Media operation	4	4	3	11	91,67	Highly Feasible
2	Graphic quality	4	3	4	11	91,67	Highly Feasible
3	Audio quality	3	3	4	10	83,33	Highly Feasible
4	Video quality	4	4	4	12	100	Highly Feasible
5	Animation quality	3	4	4	11	91,67	Highly Feasible
6	Image quality	4	4	4	12	100	Highly Feasible
7	Media interactivity	4	4	3	11	91,67	Highly Feasible
Material Format Aspect							

8	The accuracy of the material	4	4	4	12	100	Highly Feasible
9	Grammar	3	3	4	10	83,33	Highly Feasible
10	Bibliography	4	4	4	12	100	Highly Feasible
Modus							Highly Feasible

Information:
V1 : 1st validator
V2 : 2nd validator
V3 : 3rd validator

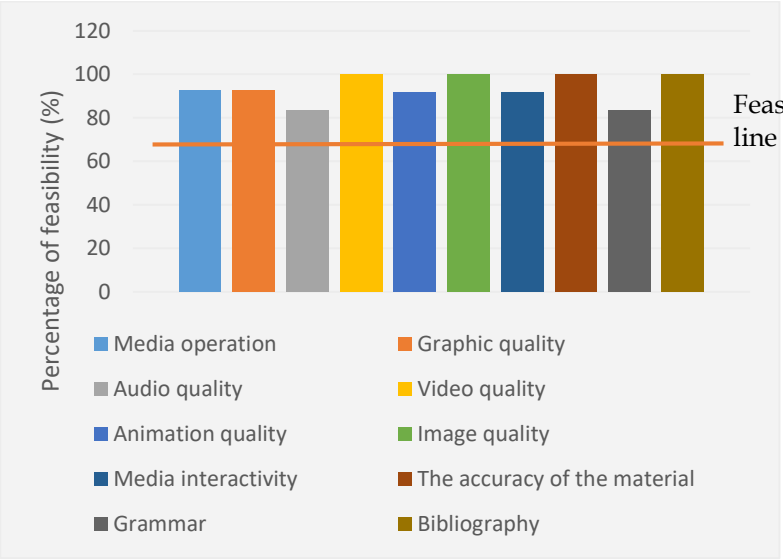


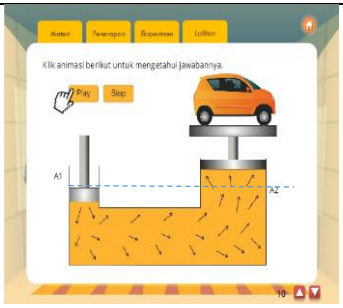
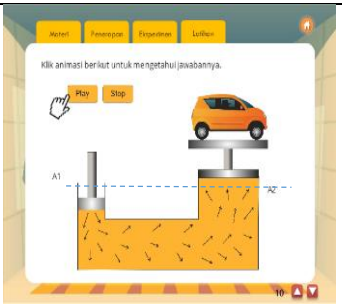
Figure 4.1. The theoretical feasiblity bar chart

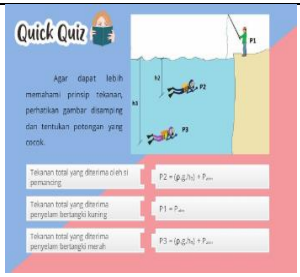
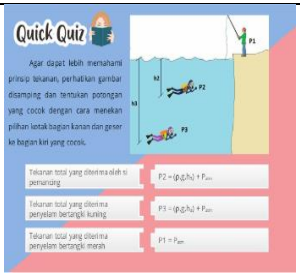
Based on chart 4.1, it is known that all categories get a proportion above the theoretical feasibility line which is 61%.

c. Revision

Based on the media validation, the 3rd draft need to be revised before being tested to students.

Table 4.4 Revision of 3rd draft

Revision	3rd draft	4th draft
Add a base below the cube		
Change the car lift distance to be smaller than the piston press distance.		

Revision	3rd draft	4th draft
Change the colour of blackboard		
Change the opacity of the background		
Add an instruction to click the button		
Add an instruction of how to solve the quiz		

2. The Result of Emperical Feasibility on Practicality Aspect
    a. Implementation of learning

       The percentage of learning implementation increased at the first meeting to the third meeting. At the first meeting the percentage was 94.58%, at the second meeting it was 95.66% and at the third meeting it was 97.66%. Learning using interactive multimedia based on the Articulate Storyline can be done very well.

Table 4.5 Observation Result of Learning Implementation

No.	Aspect	Score						Average per Aspect	Criteria
		1st Meeting		2nd meeting		3rd meeting			
		P1	P2	P1	P2	P1	P2		
I	Preparation	100	100	100	100	100	100	100	Very good
II	Implementation								
	Preface	87,5	93,75	100	84,38	100	90,63	92,71	Very good
	Core	93,75	89,58	95,83	93,75	93,75	95,83	93,75	Very good
	Closing	87,5	100	87,5	100	100	100	95,83	Very good
III	Time management	100	100	100	100	100	100	100	Very good
IV	Class situasion	83,33	91,67	91,67	91,67	91,67	100	91,67	Very good
Average per meeting		94,58		95,66		97,66			
Modus									Very good

b. Student activity

The dominant activity that appears at the 1st, 2nd, and 3rd meetings is learning material through interactive multimedia (code B).

Table 4.6 Results of Observation of Student Activities

Code	Activity	Precentage(%)			
		1st meeting	2nd meeting	3rd meeting	Average
A	Listening and paying attention to the teacher's explanation	16,19	17,86	17,26	17,10
B	Studying material through interactive multimedia	30,13	30,13	31,85	30,70
C	Asking	0,22	0,22	0,89	0,44
D	Giving opinions	0,67	0,89	1,79	1,12
E	Do the worksheet	24,55	25,00	18,15	22,57
F	Doing experiments	18,53	15,18	20,83	18,18
G	Take a quiz	9,60	10,71	9,23	9,85

3. The Result of Emperical Feasibility on Effectiveness Aspect

a. Student respone

The average percentage of students response for interactive multimedia is 91.21% with very good criteria. This shows that the use of interactive multimedia provides a positive response for students and is accepted by students.

Table 4.7 Results of Student Response Questionnaire

No.	Statement	(%)	Criteria
1	Interactive Multimedia based on Articulate Storyline is a new thing for me	82,14	Very good
2	Interactive Multimedia based on Articulate Storyline makes learning fun	100	Very good
3	Interactive Multimedia based on the Articulate Storyline is interesting because it provides text, images, animation, and audio	96,43	Very good
4	Interactive Multimedia based on Articulate Storyline can increase my enthusiasm for learning	92,43	Very good
5	The language used in the media is easy to understand	85,71	Very good
6	Interactive Multimedia based on Articulate Storyline makes it easier for me to study liquid pressure	100	Very good
7	Pictures, videos, and animations support the delivery of the material	96,43	Very good
8	After using Interactive Multimedia based on Articulate Storyline, I can describe the pressure on liquid and its application in daily life	96,43	Very good
9	After using Interactive Multimedia based on Articulate Storyline, I was	85,71	Very good

No.	Statement	(%)	Criteria
	able to investigate the pressure of a liquid at a certain depth		
10	After using Interactive Multimedia based on Articulate Storyline, I can describe Archimedes Law and its application in daily life.	92,86	Very good
11	After using Interactive Multimedia based on Articulate Storyline, I can analyze the effect of density on the position of objects	92,86	Very good
12	After using Interactive Multimedia based on Articulate Storyline, I can describe Pascal's Law and its application in daily life.	85,71	Very good
13	After using Interactive Multimedia based on Articulate Storyline, I can calculate the output force on the piston using Pascal's Law equation	78,57	Good
Rata-rata		**91,21**	Very good

b. Student learning outcomes

Student learning outcomes are measured using pretest and posttest. At the pretest, none of the students reached the KKM score. However, after participating in learning using interactive multimedia, 24 students were able to achieve the KKM score. The KKM score for science subjects is ≥80.

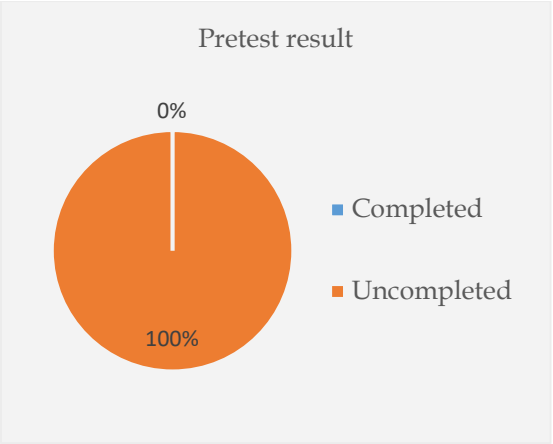


Figure 4.3. Completeness of pretest

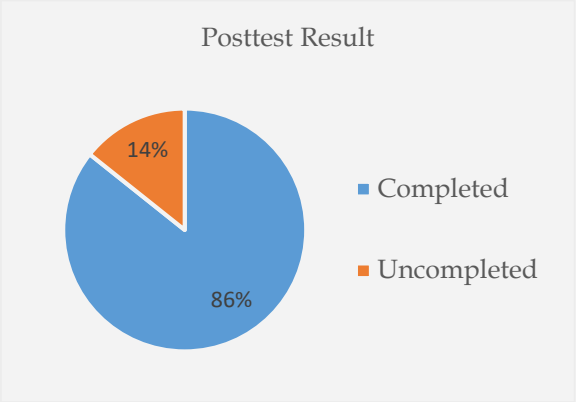


Figure 4.4 Completeness of posttest

The average posttest score is 85.34, which is greater than the average pretest score 58,45. The increase in learning outcomes is then used to find the amount of N-Gain using the Hake formula. The

result of the calculation of the N-Gain score is 0.68 with moderate criteria.

Table 4.8. Average of increasing learning outcomes

Serial number	Score			Criteria
	Pretest	Posttest	N-Gain	
1	62	87	0,66	Medium
2	71	93	0,76	High
3	71	93	0,76	High
4	56	87	0,7	Medium
5	58	87	0,69	Medium
6	58	71	0,31	Medium
7	58	71	0,31	Medium
8	58	80	0,52	Medium
9	78	87	0,41	Medium
10	51	80	0,59	Medium
11	49	87	0,75	High
12	51	93	0,86	High
13	40	87	0,78	High
14	58	87	0,69	Medium
15	51	80	0,59	Medium
16	58	93	0,83	High
17	58	80	0,52	Medium
18	58	80	0,52	Medium
19	71	100	1	High
20	69	87	0,58	Medium
21	58	87	0,69	Medium
22	58	100	1	High

Serial number	Score			Criteria
	Pretest	Posttest	N-Gain	
23	51	87	0,73	High
24	58	100	1	High
25	51	73	0,45	Medium
26	51	98	0,96	High
27	51	87	0,69	Medium
28	51	69	0,37	Medium
Average	**58,45**	**85,34**	**0,68**	Medium

B. Discussions

1. Validity

The modus of validation results in interactive multimedia is very feasible. The percentage of the operating aspect of the media is 91.67%. This shows that interactive multimedia can be operated easily by users. One of the software engineering assessment criteria approved by the LIPI, Pustekkom, and Ilmukomputer.com teams is reusability, which is easy to use and simple to operate.

The percentage of graphic quality is 91.67%. This indicates that the layout is proper. Animation, images, and videos can be played without an error. The layout that is commonly used is the grid method. Navigation can be placed on the top or left side and content placed in the center area.

The percentage of audio quality is 83,33%. This indicates that the audio does not interfere user concentration and the button sound is heard clearly. According to Coser (Wahyuningtyas, 2016), the audio

background used must be music that calms mind and helps students concentrate.

Figure 4.5. Layout

The percentage of video quality is 100%. This indicates that the video is attractive and supports learner to study easily. Information will be easier to remember if students use many sensory when receiving information, such as when viewing videos that contain audio-visuals (Arsyad, 2016: 12).

The percentage of animation quality is 91,67%. This indicates that the animations are displayed clearly, animation speed is appropriate, and animation supports delivery of content. According to Wibawanto (2017: 7), animation can help present photos of objects that are too complex.

The percentage of image quality is 100%. This indicates that the images are in high resolution, easy to understand, and support the delivery of the material. According to Arsyad (2016: 109), the main purpose of image is to visualize the concept.

The percentage of interactivity aspect is 91,67%. This indicates that the media is equipped with navigation button that support student to use the media. According to Rusman (2015: 64), an important characteristic of interactive multimedia is that students not only pay attention to media or objects but are also required to interact, for example clicking buttons or taking quizzes.

The percentage of content accuracy is 100%. This indicates that the contents are relevant with the concept of liquid pressure for junior high school and learning indicators. It is often found that the content of the media is irrelevant with learning objectives and quizzes in several multimedia learning products (Ariasdi, 2008).

The percentage of grammar is 83,33%. This indicates that the language is easy to understand and communicative and the terms used in the media are consistent. According to Darmawan (2013: 138), interactive multimedia with tutorial model must be able to overcome material that has too many sequences because it makes students bored to read it completely.

The percentage of bibliography is 100%. This indicates that the bibliography has been listed in the media and the references are for the last 10 years.

The media is feasible if each aspect get a proportion of ≥ 61, so that multimedia based on the Articulate Storyline is theoretically feasible.

2. Empirical Feasibility on Practically Aspect
   a. Implementation of learning

      The learning process using interactive multimedia has been carried out well. This is known based on

the data on the learning implementation sheet. The modus of learning implementation for the three meetings are very good. Learning will be effective if the media is able to stimulate students to take an active role in the learning (Qosyim, 2017).

Based on table 4.5, the aspect that gets the lowest average is class situation at the first meeting with a percentage of 87.5%. This is because learning activities using interactive multimedia are new to students so that at the first meeting the teacher must guide students to open menus in interactive multimedia.

b. Student activity

There are 7 positive activities that are observed, listening and paying attention to the teacher's explanation, studying material through multimedia, expressing opinions, doing LKPD, doing practicum, and take a test. All of these activities appear in learning activities using interactive multimedia.

The dominant student activity during the learning process is learning using interactive multimedia. According to Sudjana & Rivai (Arsyad, 2014: 28), through learning media students can do more learning activities not only listening to teacher but also observing or doing something such as watch a video or animation.

This observing activity can lead students to ask questions about things that have not been understood. Asking activity gets the lowest percentage compared to other activities, but it does

not affect the learning process. The learning process remains student-centered.

Interactive multimedia is equipped with pHet simulations so that students can do experiment through the computer. The percentage of activities doing practicum at the first, second, and third meetings are 18.53%, 15.18%, and 20.83%. The difference in the percentage is due to the different difficulty level of worksheet.

Interactive multimedia is also equipped with worksheet (LKPD). The worksheet contains experimental procedures and some questions. Students will present their discussion. In this activity, student activities such as expressing opinions emerged. In this phase, teacher acts as a facilitator who provides feedback as reinforcement of correct answers. Another activity that students can do when using interactive multimedia is doing quizzes.

Based on table 4.6, it is known that the learning process has teacher-centered activities of 17.10% and student-centered of 82.86%. Interactive multimedia is empirically feasible on practicality aspect.

3. Empirical Feasibility on Effectiveness Aspect
   a. Student response

      Student responses are measured using a student response questionnaire. The percentage of student positive responses is 91.21% with very feasible criteria.

Statement number 1 is interactive multimedia is new for students. It gets score of 82.14%. This is in relevant with the results of pre-research that science teachers have never used interactive multimedia that integrates text, images, video and animation elements in the learning process so that this something new will attract students' attention.

Statements 2, 3, and 4 relate to statement number 1. Through interactive multimedia it creates a pleasant learning atmosphere; learning becomes interesting because it provides material text, images, animation, and audio; and it can increase students' enthusiasm for learning. Statement 2, 3, and 4 get very good criteria.

Statement number 5 is about the ease of language in the media. This statement earned a score of 85.71% with very feasible criteria. According to Ariasdi (2008), multimedia learning is different from electronic textbooks. Learning multimedia is designed to allows students learn independently.

Statement number 6 regarding the ease of studying liquid pressure using interactive multimedia. This statement gets a score of 100%. Statement number 6 is also supported by statement number 7. Statement number 7 is about the elements of images, videos, and animations support the delivery of material. It gets a percentage of 96.43%. According to Sudjana (Arsyad, 2016: 28), with the learning media, the learning material will have a clearer meaning so that it is easier for students to understand and allows them to master and achieve learner goals. It also supports statements number 8

through 13 on the student response sheet. Statement number 8-13 related to the student's ability to understand the material of liquid pressure after using the interactive multimedia. Those statements get very good criteria.

b. Learning outcomes

The learning outcome data were obtained using test sheets, pretest and posttest. The results of the pretest and posttest show that the interactive multimedia is effective. Based on the results of the pretest, there were no students who were able to achieve the KKM score determined by the school. The highest score on the pretest results was 78, while the KKM on the liquid pressure material was 80. However, after obtaining the science material using interactive multimedia, 24 out of 28 students were able to achieve the KKM on the posttest.

Improved learning outcomes can be seen in the N-Gain obtained by students. Interactive multimedia is effective if the average N-Gain reaches >0.3. there are 17 students obtained moderate N-Gain scores with a range of 0.37 - 0.70 and 11 students obtained high N-Gain scores with a range of 0.73 - 1. The difference of N-Gain score influenced by high pretest results so that the increase that occurs is not as much as those who get low pretest results. In addition, according to Sudjana (2007: 116) there are 6 individual differences in students. One of them is intellectual development. The ability to understand and dig up information on each student is not the same, there are students who are able to understand the material more quickly and the otherwise.

The average N-Gain result is 0.68 which indicates that learning outcomes of all students increase. This is relevant with Kamila's (2018) research that interactive multimedia can improve learning outcomes with N-Gain 0.76.

This learning outcome is affected by the interactive multimedia. Dominant activity of students is learning material through media which is 30.70% (table 4.6). This dominant activity is supported by Piaget's theory of development, students' cognitive development depends on being active in interacting with the environment (Wasonowati, 2014). In addition, this interactive multimedia supports student-centered activities such as doing worksheet. This is in accordance with Vygotsky's theory, knowledge is built by students through activities that emphasize cooperative learning, activity-based learning, and discovery (Nur, 2008). This student-centered learning can occur because of the interactive multimedia. Based on the validation results, it is known that interactive multimedia based on the Articulate Storyline is very feasible. The validation results are supported by the results of student responses who get a positive response of 91.21% with very feasible criteria. This shows that students enjoy the learning process using interactive multimedia. In addition, interactive multimedia can attract students' interest in learning material through media. It is proved by statement number 3 that get a percentage of 96.43% (table 4.7). According to Slameto (Fajriani, 2017) interest is a feeling of preference in activity, without

being asked. There are several roles of interest in learning suggested by Sadirman (Fajriani, 2017), creating and causing concentration in learning, causing joy or feelings of pleasure in learning, strengthening students' memories about lessons that have been given by the teacher, giving positive learning attitudes and constructive, and reduce students' boredom of lessons. Based on research conducted by Fajriani (2017), there is a relationship between interest in learning and student learning outcomes.

Based on the test results, it is known that interactive multimedia based on the Articulate Storyline is empirically feasible on effectiveness aspect. Interactive multimedia get a positive response of 91.21% and N-Gain of 0.68.

CHAPTER V
CONCLUSION AND RECOMMENDATION

A. Conclusion

1. Interactive multimedia is theoreticially feasible basen on the validation results. There are two aspects that are assessed, media format aspects and media material aspect. Media format aspect gets a percentage of 92,86% and media material aspect gets a percentage of 94,44%.
2. Interactive multimedia is empirically feasible. The learning implementation at the first meeting to the third meeting gets a percentage of 94.58%; 95.66%; and 97.66%. The implementation learning using interactive multimedia is very good. The dominant student activity is learning material through the media with an average percentage of 30.70%. Interactive multimedia received a positive response from students of 91.21% with very good criteria. The average increase in learning outcomes (N-Gain) for all students was 0.68 with medium criteria.

B. Recommendation

1. For students

   Interactive multimedia helps students understand the material more easily, so that students are expected to be more careful in using interactive multimedia so that no information is overlooked.
2. For schools and teachers

   Interactive multimedia improves student learning outcomes, so it is hoped that this interactive multimedia will be an alternative choice for teachers who want to use learning media for liquid pressure material.

3. For researchers
   Interactive multimedia needs to be equipped with examples of questions and solutions, vidoes with text and java file.