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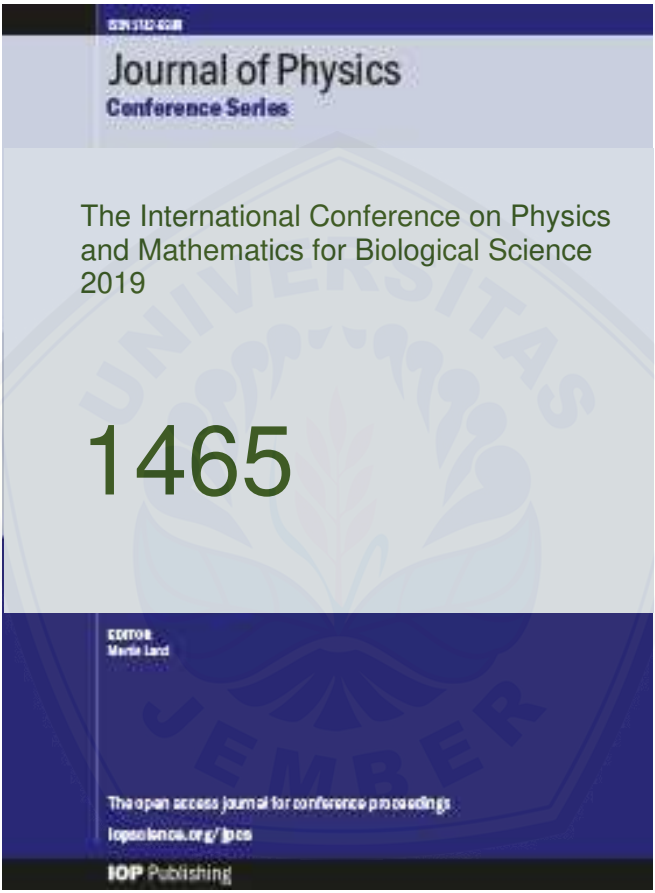

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The International Conference on Physics and Mathematics for Biological Science 2019

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The International Conference on Physics and Mathematics for Biological Science 2019

Dwi Wahyuni

Editor in Chief of International Conference on Physics and Mathematics for Biological Science 2019
E-mail: dwiwahyuniwiwik.fkip@unej.ac.id

On behalf of the organizing committe, we would like to thank all of the participants who have taken part in "The International Conference on Physics and Mathematics for Biological Science 2019 (ICOPAMBS 2019)". This special undertaking is the 1st International conference organized by the Department of Mathematics and Basic Science, Faculty of Teacher Training and Education in University of Jember 31 August - 1 September 2019. It is carried out to welcome participants from various countries, from multitudes of interests comprising of Physical Science, Biomedicine, Biotechnology, and Applied Mathematics. Its ultimate mission is to become an annual international forum where civil society organization and representative, university students, academics and researchers, scholars, scientist, teachers and practitioners from all around the globe can share and exchange ideas germane to theoretical and practical knowledge about Physics, Mathematics, Biological Science, and their applications. The conference strives to present and discuss the latest trends on research contributing to the sharing of novel theoretical, methodological and empirical insights and better understanding in the area of Physics, Mathematics, Biological Science, and science education. The conference encompasses the following themes: (1) Physical Mathematics, Computational Physics, and applications, (2) Mathematical modelling for Material Physics, semiconductor materials, and Applications, (3) Bioinformatics and Computational for Biomaterials, (4) Graph Theory, Combinatorics, and Applications, (5) Applied Statistics, (6) Polimer, Biomaterials and applications, (7) Mathematical modelling for Biological Sciences, (8) Environmental science, Biotechnology, and applications (9) Geophysics and Earth Sciences, (10) Development of Sofware engineering for Physics, Mathematics and Biological Sciences

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The participants of this ICOPAMBS 2019 were 203 participants consisting research students, academics and researchers, scholars, scientist, teachers and practitioners from many countries. The selected papers to be published on IOP Conference Series: Journal of Physics are 78 papers.

On behalf of the organizing committee, finally we gratefully acknowledge the support from the University of Jember of this conference. We would also like to extend our thanks to all lovely participants who have been joining this unforgettable and valuable event.

Dr. Dwi Wahyuni, M.Kes

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The committees of the International Conference on Physics and Mathematics for Biological Science would like to express gratitude to all Committees for the volunteering support and contribution in the editing and reviewing process.

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All papers published in this volume of *Journal of Physics: Conference Series* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

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Student worksheet based on inquiry with vee map to improve writing skills in physics learning

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Student worksheet based on inquiry with vee map to improve writing skills in physics learning

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Abstract. Writing activity is an essential scientific practice in learning physics. Writing activities can enhance conceptual knowledge and develop students' scientific literacy. Excellent writing skills reflect good learning outcomes and critical thinking skills. Writing includes a variety of complex skills that involve grammar, spelling, and punctuation, as well as the right language style. Complex skills are the demands of the curriculum and must be part of the learning target. Even so, students' writing activities are still relatively low in this case, students are still unable to write structured and reconstruct sentences accurately. Therefore, to help improve this writing skill, the researcher uses a guided inquiry model accompanied by worksheet assisted by Vee map. Vee maps are integrated in an inquiry step that can guide students to facilitate writing activities. Vee maps consist of several conceptual components, including knowing, focus questions, and doing. This worksheet contains a Vee diagram that aims to make it easier for students to fill in the sheets and student understanding of the material. This study concludes that worksheet assisted by Vee maps can be used to construct of scientific writing in high school students' physics lessons.

1. Introduction

Writing is an important scientific practice [1] which covers a variety of complex skills involving correct grammar, spelling and punctuation as well as good language style where this is needed throughout the curriculum. Writing is a way to vent what is in someone's mind and pour it on the paper as a result of critical thinking, design ideas in a concept and stimulate to build understanding. [6] Writing in meaningful learning must bridge new information and old knowledge structures, as well as direct metacognitive. [14] also explained that students' writing skills only increased in learning biology, whereas in physics and chemistry learning did not increase. Likewise with Sinaga's research [15], he said that students' writing skills were very low. The root of the problem lies in the inability of students to represent material into writing.

Scientific writing is one important aspect of learning because this skill can be an indication of learning success and is very useful for students when entering the real world (work) [9]. Writing is an activity that not everyone can do well, therefore writing skills need a special guidance so that the resulting writing is maximal. One way to guide students can develop their writing skills so students are directed by meaningful learning or by way of thinking. When literacy activities are driven by inquiry, students simultaneously learn how to read and write science texts and do science [12]. When literacy activities are driven by inquiry, students simultaneously learn how to read and write science texts and do science [12]. Inquiry learning is a learning activity that maximally involves all students' abilities to search for and investigate something (object, person or event) systematically, critically, logically, analytically so that they can formulate their own findings with confidence [13]. As said by [11], learning models are in accordance with the nature of physics, and provide opportunities for students to conduct investigations / experiments in shaping physics knowledge / concepts. One learning model that emphasizes science process skills, thinking ability, and emphasizes scientific inquiry is a guided inquiry learning model.

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One effort to achieve the learning objectives well is needed assistance that supports the learning process. [9] say that the assistance that teachers can provide to overcome student difficulties during the discovery process is by giving inquiry-based Student Worksheets (LKS) accompanied by scaffolding that will guide students to write scientifically. Student worksheets based on scaffolds diagrams are learning tools that are able to teach a capability that is the center of attention of the 21st century, namely the ability of scientific explanation [7]. The use of inquiry models as meaningful learning support will be more stable if a help is inserted, one of which is to stimulate students' knowledge, reasoning and writing ability by using scaffolding in the form of *Vee maps*. The purpose of scaffolding is to increase students' knowledge and skills in physics concepts using various modes of representation. One of them is using *Vee maps* to improve their writing skills.

Vee Map is a tool specifically designed to develop students' scientific thinking skills [3]. *Vee Map* can be used to guide students in conducting their laboratory activities, facilitating reflective thinking and learning when they plan and conduct their own investigations [10], then wrote the results of the laboratory activities into a written report as in the research of [2], that the *Vee map* was used to assist them in writing the results of the laboratory experiment report.

After reading the description above, the lack of writing skills is the goal of the research the author made. There is a problem formulation in this study, how is the influence of *Vee maps* on guided inquiry learning models on the ability to write the physics skills of high school students? So the purpose of this study is to examine the effect of *Vee Maps* on guided inquiry learning models on students' writing skills.

2. Methodology

This type of research is a qualitative research with instructional design to develop Student Worksheets (LKPD). Student Worksheets are equipped with Vee map scaffolding developed by Knaggs and Schneider [8], with several steps namely Students see the Vee map listed on the Student Worksheets then fill in gaps questions at each stage several stages, namely identification of problems, Background, make a problem statement, determine variables, make hypothesis, experiments steps, data, result and conclusion. Student Worksheets with the help of Vee map are aimed at senior high school MIPA students with static fluid subjects which include hydrostatic pressure, pascal law, and archimedes law. This research was conducted to improve students' writing physics skills to fulfill one of the 21st century competencies. This instrument uses a form of expert commentary and assessment of the parts of the Student Worksheet that still need to be corrected or given notes by the expert as a basis for revision.

3. Results

In this study, products produced in the form of worksheets assisted by Scaffolding Vee maps are useful to help improve students' writing skills, because all this time the Student Worksheets used are rarely used to specialize in writing skills but only to see learning outcomes such as Worksheets Mind Mapping-based students aiming to find out the strength of student retention [5] in addition there is also a Student Worksheet based on collaborative creativity to enhance students' scientific arguments [13], thus the researcher wants to develop a Student Worksheet that integrates scaffolding by directing students' writing skills.The following Vee map design was developed by Knaggs and Schneider [8]. The Contribution of the Student Worksheet is that it can be used by educators as a teaching instrument.

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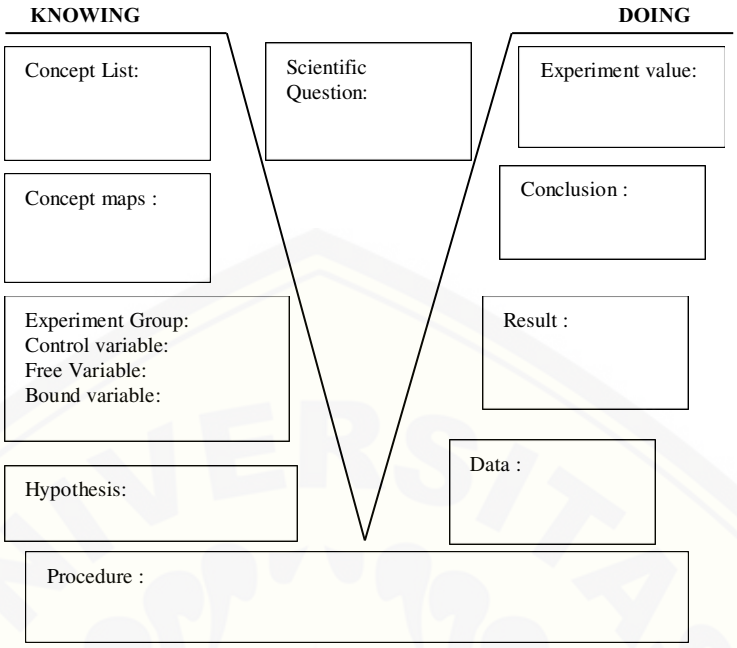

Figure 1. *Vee maps* design was developed by Knaggs and Schneider [8]

Then, the researchers developed the Vee maps design with reference to the previous design, which is as follows

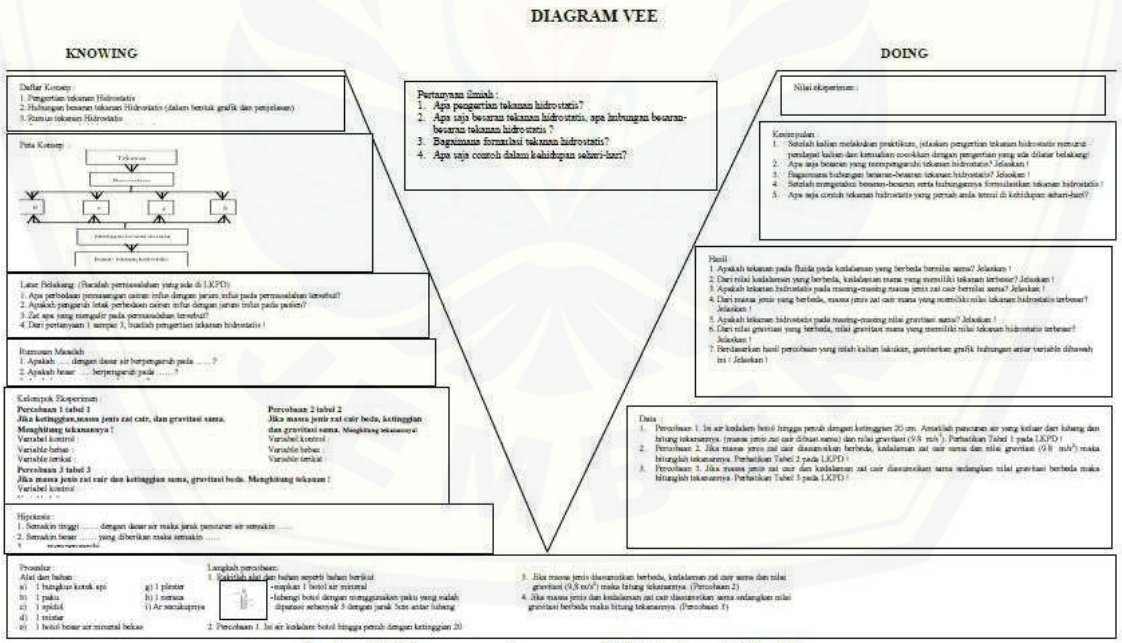

Figure 2. *Vee maps* design for worksheet

Vee maps above has several stages that function to help make it easier for students to write practical reports. The Vee maps component that has been developed by Knaggs is modified into several stages so that a few steps are inserted which correspond to the stages on the Student Worksheet in general .The parts of Vee maps are explained in detail below: The components of this worksheet assisted by *Vee maps* are background, problem formulation, determining variables, determining hypotheses,

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procedures, data, results and conclusions. Before students fill in *Vee maps*, students can read the problem identification found in the worksheet.

3.1. Identification of problems

In this stage, there is a problem located in the worksheet given to students. Students are expected to be curious about the material to be studied and have a sense of enthusiasm to learn new material.
So, that students have curiosity this stage is designed by giving a story related to events that have often been experienced or that commonly occur in daily life so they can read while imagining the events that occur in the story. The following is an example of the identification of problems found in the worksheet.

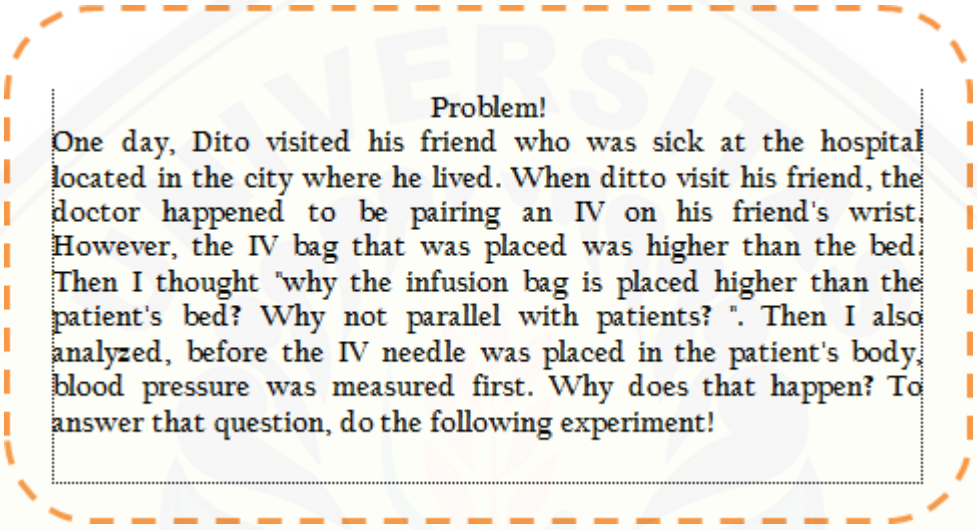
Problem!
One day, Dito visited his friend who was sick at the hospital located in the city where he lived. When ditto visit his friend, the doctor happened to be pairing an IV on his friend's wrist. However, the IV bag that was placed was higher than the bed. Then I thought "why the infusion bag is placed higher than the patient's bed? Why not parallel with patients? ". Then I also analyzed, before the IV needle was placed in the patient's body, blood pressure was measured first. Why does that happen? To answer that question, do the following experiment!

Figure 3. Identification of problems in worksheet

with these problems, students are expected to make a background and formulation of problems that are appropriate for doing the practicum. With the aim that students more focus and understand on what will be learned and done in practical.

3.2. Background

The background of this problem aims to make students know what experiments they will do, the concepts contained in the material and the purpose of doing practicum. To make it easier for them to write backgrounds, students are given questions in the hope that they make the background coherent and clear. The following are examples of questions that help create a background for the worksheet.

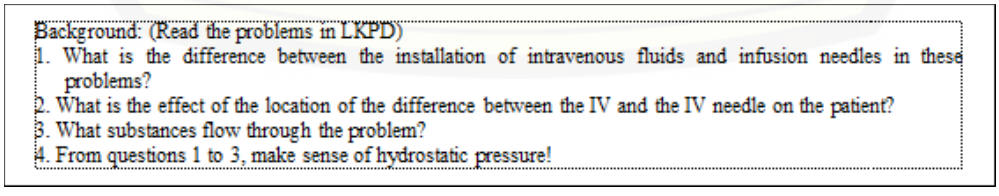
Background: (Read the problems in LKPD)
1. What is the difference between the installation of intravenous fluids and infusion needles in these problems?
2. What is the effect of the location of the difference between the IV and the IV needle on the patient?
3. What substances flow through the problem?
4. From questions 1 to 3, make sense of hydrostatic pressure!

Figure 4. Background in worksheet

After they read a number of questions in the background box found in the worksheet, students fill in the answers on the stages sheet that has been provided based on the sequence of stages. The background becomes stage 1 of this worksheet. Following is the worksheet answer sheet stage 1

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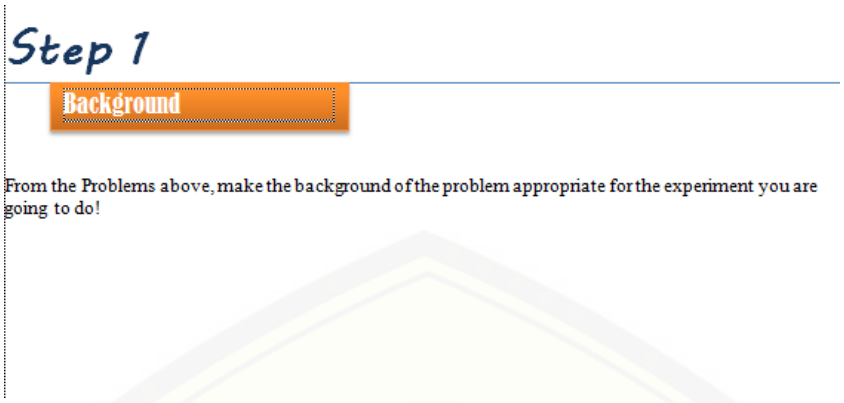

Figure 5. Step sheet 1 in worksheet

3.3. Make a problem statement

The formulation of this problem aims to make the experiments that will be conducted in accordance with the objectives of the practicum. The formulation of this problem is used as a reference for practicum. The formulation of the problems contained in the worksheet is done by filling in the gaps of question contained in Diagram V in the worksheet. Students are guided by several questions so that students more easily determine the formulation of the problem. The following is an example of the problem formulation contained in the worksheet.

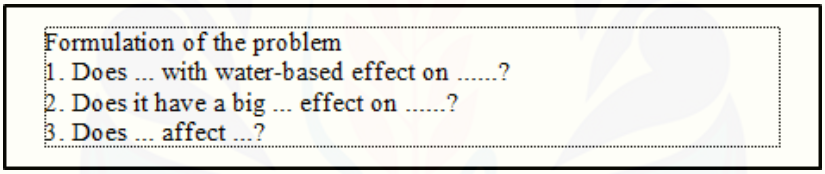

Figure 6. Make a problem statement in worksheet

Gaps in the sentence contained in the formulation of the problem will make it easier for students to know what the problem statement should be written by students. Students write the complete problem formulation on the step 2 sheet provided on the worksheet. Here is an example

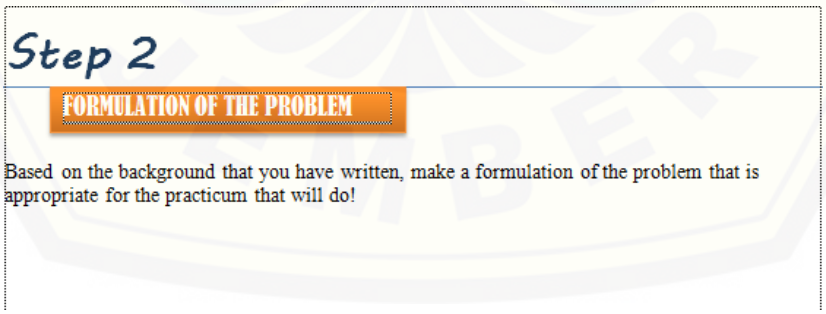

Figure 7. Step sheet 2 in worksheet

3.4. Determine variables

Variables are attributes in a study. This variable is very important in a study because it aims to base the method of collecting data and as a hypothesis testing tool. The variables contained in this practicum are the control variable, the dependent variable and the independent variable. Before determining the variables, make sure that students understand the meaning of each variable so that students can easily determine the type of variable contained in each statement. To determine variables,

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in this worksheet a statement is given which varies. Here is an example to determine the variables that are in worksheet.

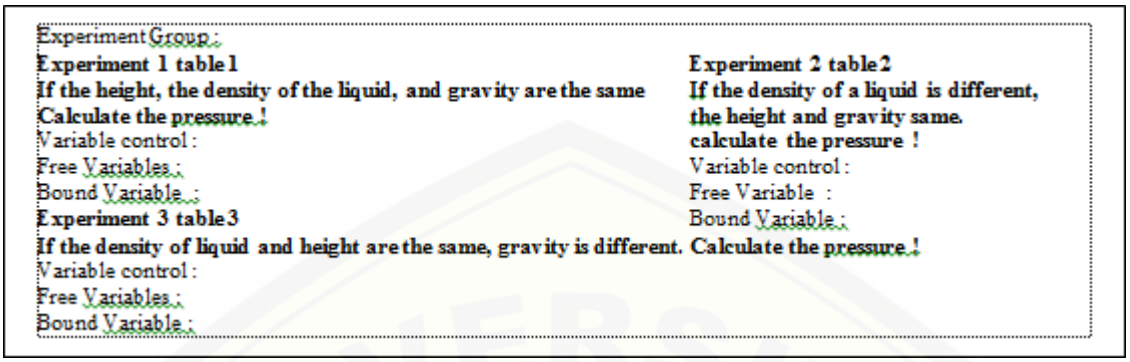

Figure 8. Determine variables in worksheet

The statement above is in Diagram V which is contained in the Worksheet. Then, students rewrite each statement and the variables are equipped with answers on the sheet that reads stage 3. The following is an example of step 3

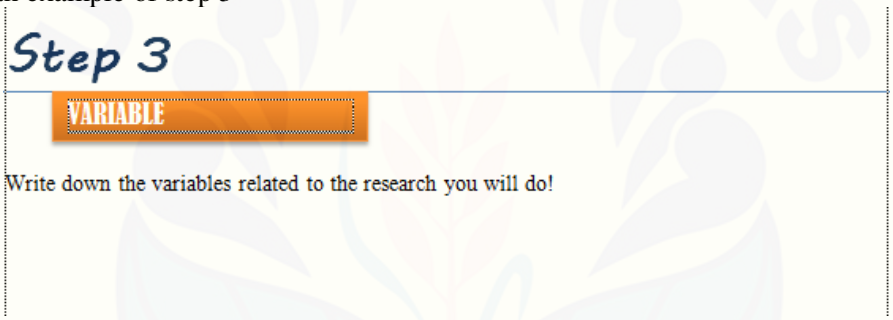

Figure 9. Step sheet 3 in worksheet

3.5. Make Hypothesis

The research hypothesis is a temporary answer to what will be done in the practicum. How to determine the hypothesis in this practicum is by answering the questions given in Diagram V contained in the worksheet. How to determine hypotheses refers to the formulation of problems that have been made so that they are mutually sustainable. With this hypothesis, students are expected to be able to experiment according to what is in the hypothesis they wrote. The following are examples of questions in Worksheet.

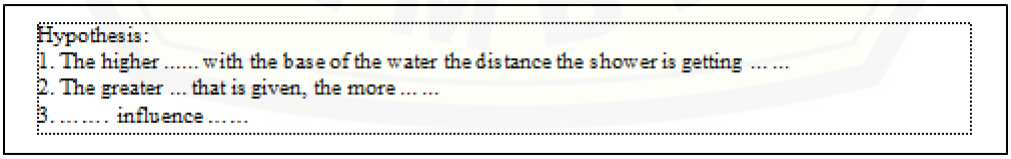

Figure 10. Make Hypothesis in worksheet

After filling in the mortar questions, students write the hypothesis as a whole on the stage 4 sheet provided in the worksheet, so students can get used to writing. Here is an example

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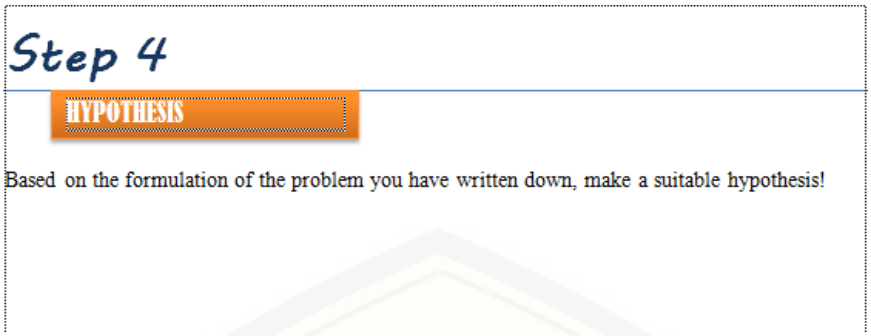

Figure 11. Step sheet 4 in worksheet

3.6. Experiment Steps

The experimental steps in the worksheets are written coherently so that students can do practicums correctly and appropriately. The experimental steps are written in the worksheet both in Diagram V and in the step sheet available in the worksheet with the aim that students more clearly read the lab work, because the practical steps will be a tool to answer all questions in the next step. The following are examples of experimental steps found in worksheet.

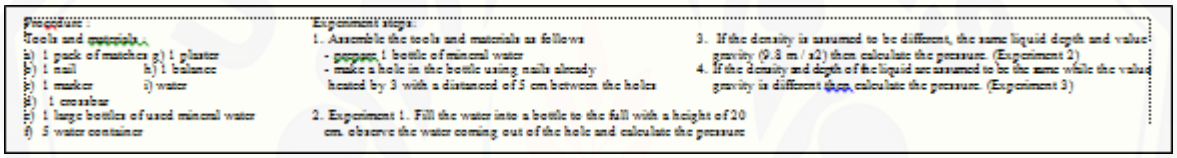

Figure 12. *Experiment Steps* in worksheet

The procedures and work steps can be seen again on the step sheet 5. The following is an example

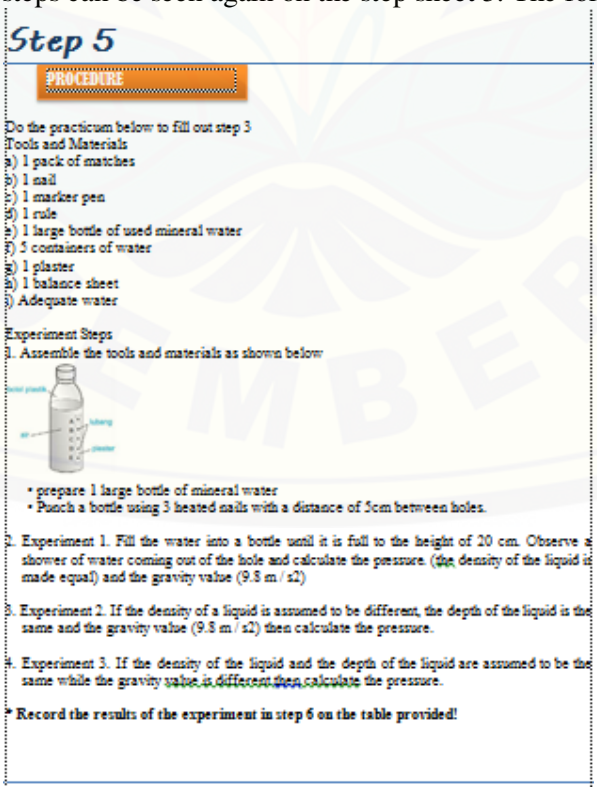

Figure 13. Step sheet 5 in worksheet

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3.7. Data

At this stage, students fill in the data they have obtained in the tables that have been provided in the step sheets in the worksheet. Guidelines for filling out the table can be seen in Diagram V which contains statements about the experiments that students have done, so students first read the data box on the Vee maps sheet then open on the stage sheet containing data tables in accordance with many statements. The following are examples of statements contained in the worksheet.

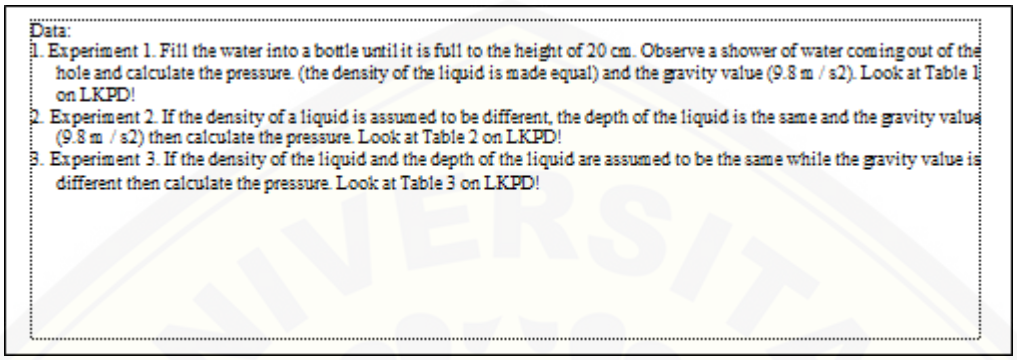
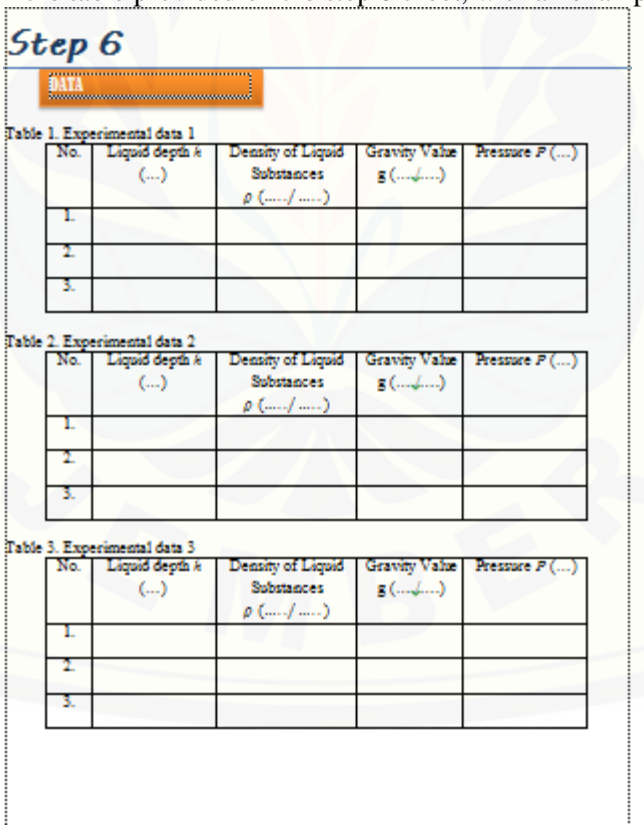

Data:
1. Experiment 1. Fill the water into a bottle until it is full to the height of 20 cm. Observe a shower of water coming out of the hole and calculate the pressure. (the density of the liquid is made equal) and the gravity value (9.8 m / s2). Look at Table 1 on LKPD!
2. Experiment 2. If the density of a liquid is assumed to be different, the depth of the liquid is the same and the gravity value (9.8 m / s2) then calculate the pressure. Look at Table 2 on LKPD!
3. Experiment 3. If the density of the liquid and the depth of the liquid are assumed to be the same while the gravity value is different then calculate the pressure. Look at Table 3 on LKPD!

Figure 14. Data in worksheet

The data can be written in the table provided on the step 6 sheet, with an example below


Step 6

DATA

Table 1. Experimental data 1

No.	Liquid depth *h* (...)	Density of Liquid Substances ρ (...../.....)	Gravity Value g (...../.....)	Pressure *P* (...)
1.				
2.				
3.				

Table 2. Experimental data 2

No.	Liquid depth *h* (...)	Density of Liquid Substances ρ (...../.....)	Gravity Value g (...../.....)	Pressure *P* (...)
1.				
2.				
3.				

Table 3. Experimental data 3

No.	Liquid depth *h* (...)	Density of Liquid Substances ρ (...../.....)	Gravity Value g (...../.....)	Pressure *P* (...)
1.				
2.				
3.				

Figure 15. Step sheet 6 in worksheet

3.8. Results

This stage contains an answer from the data that students have obtained after practicum. Students write answers from data analysis based on the contents of the table and the appropriate questions contained in the worksheet then develop according to their sentence and grammar and their understanding. at this

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stage students are expected to be able to write well and collapsed so that their understanding can be poured out through their writing in the form of practical reports. Examples of the results contained in the worksheet are as follows.

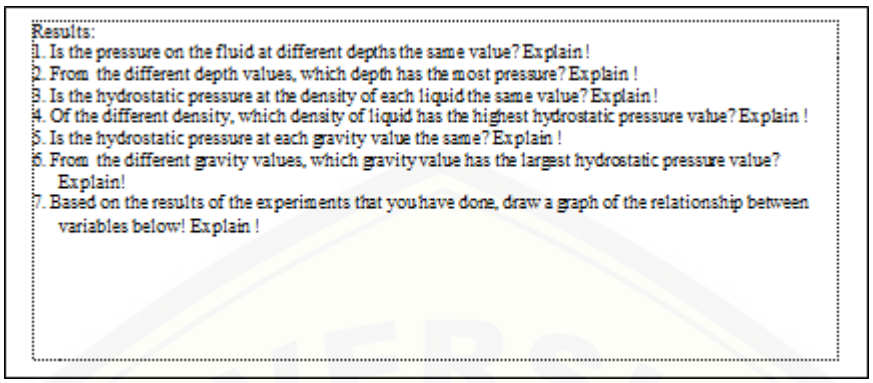

Figure 16. Rresult in worksheet

The answers to the questions in the results column can be written on the step sheet 7. The answers are expected to be written in a series and detailed according to the order in which the questions have been asked so that the results of the writing they get are clearly ordered and coherent. The following is an example of step 7

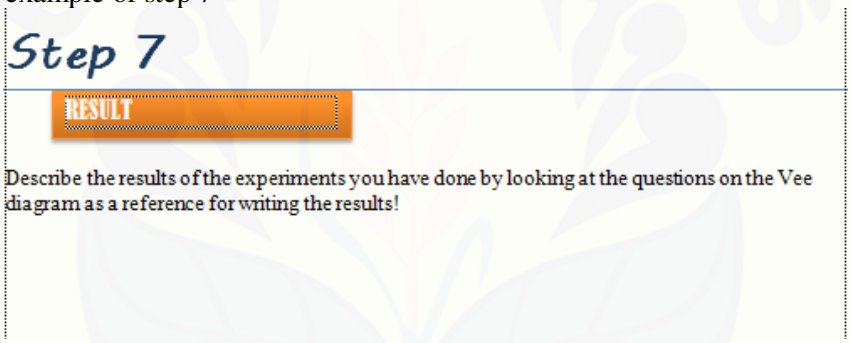

Figure 17. Result in worksheet

3.9. Conclusion

The conclusion in this worksheet is filled by looking at the list of questions in Diagram V in the worksheet. Students make conclusions by answering questions and then developing their answers in accordance with their own sentences on the stage sheet in the worksheet. Examples of making conclusions on the worksheet are shown as follows.

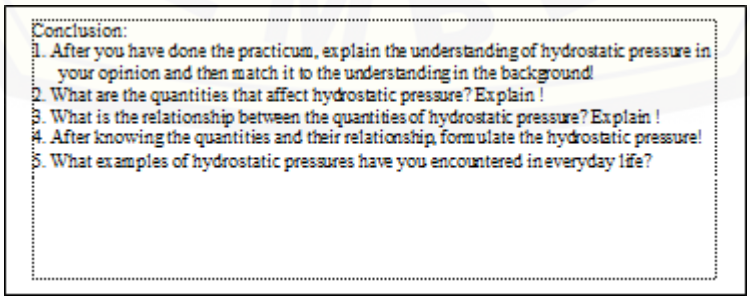

Figure 18. Conclusion in worksheet

The answer to the question is written on the page 8 which is the answer sheet of the conclusion stage, it is expected that students can write well and coherently by developing answers and synchronizing with students' sentences. Here is an example

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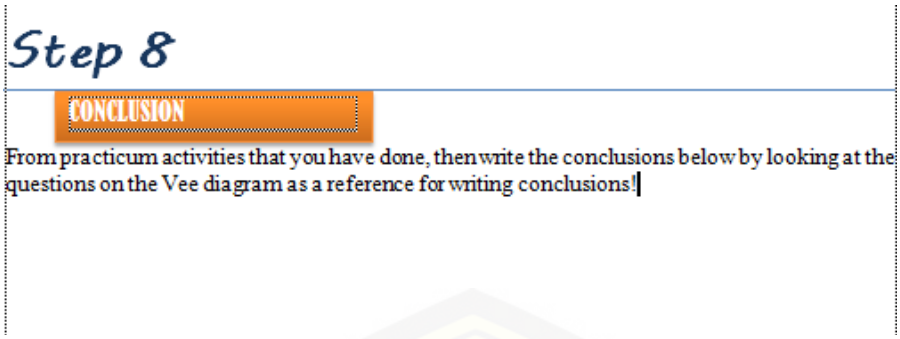

Figure 17. Conclusion in worksheet

4. Discussion

The researchers developed an assistance to improve students' writing skills. This assistance is in the form of a scaffolding vee map that is useful to guide students to make writing easier as a practical report. *Vee map* are inserted in the student worksheet. Inquiry-based Student Worksheets accompanied by scaffolding questions that encourage the subject of static fluids are media that facilitate students in the learning process and are used to practice scientific writing skills in high school physics [9]. This Student Worksheet is used in a group way but for work done individually. Students read and study worksheets first before working on them and then write them in practicum reports in accordance with the questions that are on students. This worksheet has a Vee map in it, it aims to guide students to make it easier to work at each stage of the worksheet and make it a practical report. The Vee map design used in this study was developed by Knaggs and Schneider [8]. The parts of the Vee map consist of: The components of this worksheet are assisted by the Vee map:background, problem formulation, determining variables, determining hypotheses, procedures, data, results and conclusions.

5. Conclusion

Based on the results and discussion, the conclusion is worksheet based on inquiry with *Vee map* consists of several stages, namely: problem identification, problem formulation, determining variables, proposing hypotheses, experimental steps, data, results, and conclusions. This Student Worksheet uses scientific writing indicators developed by Grimberg [4] consisting of observations, measurements, comparisons, analogies, clarifications, statements, cause / effect, induction / generalization, deduction, investigative design, and argumentation. Referrals from various sources say that Student Worksheets accompanied by Scaffolding and inquiry-based can be used to help improve students' writing skills

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