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The Effect of Inquiry Laboratory with Group Discussions Method on Improving of Students' Learning Outcomes

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Abstract: This study aims to determine the effect of laboratory-based inquiry learning models with group discussion methods in improving student learning outcomes. The research subjects were students of the 2012/2013 biology education who took the vertebrate zoology course. The sample used in this study was taken using a cluster random sampling technique of 2 classes. The concept discovery observation data in the form of quantitative data obtained through cognitive test sheets consisting of 25 questions and tested using the t test with a real level $\alpha = 0.05$. Based on the results of data analysis shows that there is an influence of laboratory-based inquiry learning models on diversity of vertebrate animals.

Keywords: laboratory learning, student learning outcomes, inquiry.

Abstrak: *Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran inkuiri berbasis laboratorium dengan metode diskusi kelompok dalam meningkatkan hasil belajar mahasiswa. Subjek penelitian adalah mahasiswa pendidikan biologi angkatan 2012/2013 yang menempuh matakuliah zoology vertebrata. Sampel yang digunakan dalam penelitian ini diambil dengan menggunakan teknik cluster random sampling sebanyak 2 kelas. Data pengamatan penemuan konsep berupa data kuantitatif diperoleh melalui lembar tes kognitif terdiri atas 25 soal dan di uji dengan menggunakan uji t dengan taraf nyata* $\alpha = 0,05$*. Berdasarkan hasil analisis data menunjukan bahwa ada pengaruh model pembelajaran inkuiri berbasis laboratorium pada materi keanekaragaman hewan vertebrata.*

Kata kunci: *pembelajaran laboratorium, hasil belajar mahasiswa, inkuiri.*

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▪ INTRODUCTION

The development of various learning methods and models is still in the spotlight to achieve learning quality. The low quality of education was more due to the ineffectiveness of the learning process in the classroom (Hamre et al., 2013). This indicates that a revolution in learning is needed. According to Hosnan (2014) that the achievement of learning quality one of them uses the principle of providing a diverse learning experience through the application of various strategies and methods of learning that are fun, contextual, effective, efficient and meaningful. Achievement of learning objectives, until now the truth is still sought regarding the models and methods of learning that are appropriate in teaching students (Maulina, 2015; Shephard, 2008).

Teacher creativity is needed in carrying out the learning process for an achievement of good student learning outcomes (Hosnan, 2014; Korthagen, 2013; Núñez Pardo & Téllez Téllez, 2009; Lee & Erdogan, 2007). Learning model as one of the principles of achieving quality learning is needed in order to improve the quality of learning. Model is a systematic procedure of learning patterns to achieve learning goals and as guidance for instructors in planning and implementing learning activities (Hosnan, 2014). Thus model-based learning for an instructor becomes an important part, referring to the failure to achieve learning goals.

Biology Learning is a science learning that requires students to be able to develop ideas or creativity towards an object of view (Maulina, 2015). Therefore in its implementation, a model is needed which can reflect the characteristics of science learning. Inquiry is one of the learning models that encourages students to build a conceptual understanding. Inquiry learning emphasizes student activity to the maximum to find and find out (Banchi & Bell, 2008; Bell, Urhahne, Schanze, & Ploetzner, 2010; Hosnan, 2014; Shih, Chuang & Hwang). Inkuri learning activities also support the creation of increased activities, especially in honing student soft skills. The discussion method will build an informative cooperative relationship within group members (Maulina, 2015). The inquiry learning model is a series of learning activities that emphasize the process of thinking critically and analytically to find and find answers to a question in question (Sanjaya, 2006).

The implementation of learning by applying a self-evident model to construct concepts (constructing) knowledge is clearly in accordance with the experience data obtained during the learning process. Therefore, learning activities in vertebrate zoology courses are presented using wet preparation animals. Students will construct the characteristics and characteristics of animals belonging to the vertebrate sub-phylum and classification of animals into each class from the preparation of wet specimens through observation. Inquiry laboratory is applied to see the successful conceptual understanding of students in vertebrate zoological subjects. Thus the expectation of the implementation of inquiry-based learning is to find out the improvement in the quality and quality of student learning as measured by understanding concepts and can be used as a development of knowledge about learning for the team of lecturers involved in these learning activities. This study aims to determine the effect of learning incuri on improving student learning outcomes.

▪ METHOD

This study is a quasi-experimental study with the population in this study were undergraduate students of Department Biology Education, University of Lampung at 2012/2013 academic year. The sample used in this study was taken using a cluster

random sampling technique of 2 classes with 30 classes each. Observation data of concept discovery in the form of quantitative data obtained through cognitive test sheets consisting of 25 questions. All instrument of this research was validated by expert in biology content and education.

This research was applied to vertebrate zoology subjects with the main material of the characteristics and characteristics of vertebrate animals, the diversity of vertebrate animals, pisces, reptiles, amphibians, aves, and mammals. The research design used in this study was the pretest posttest control group. Analysis of the data test was carried out using the t test with a real level $\alpha = 0.05$ which was processed using the SPSS 17.00 calculation program. The acquisition of statistical data is then interpreted descriptively.

▪ RESULT AND DISCUSSION

Data obtained from calculations using the SPSS 17.00 program are presented in Figure 1 below. Figure 1 shows a comparison of the results of understanding concepts from the experimental class (group 1) and the control class (group 2). The experimental group (M = 38.9333) had a higher change compared to the control group (M = 6,700). The results of the analysis show that the data is homogeneous (F = 0.150; where p> 0.05). This shows that there is no variance between the experimental and control groups. In other words the data variation in the two treatment groups was the same.

Group Statistics

	kelompok	N	Mean	Std. Deviation	Std. Error Mean
gain	1,00	30	38,9333	15,59163	2,84663
	2,00	30	6,7000	16,02186	2,92518

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
gain	Equal variances assumed	,150	,700	7,897	58	,000	32,23333	4,08166	24,06300	40,40367
	Equal variances not assumed			7,897	57,957	,000	32,23333	4,08166	24,06287	40,40380

Figure 1. The result of t-test

Figure 1 shows that there is a difference at the level of 5 percent ($\alpha = 0.05$) where the results of the calculation of t count = 7.897 greater than 0.05. The results of this calculation means that the experimental class (group 1) has a significant change compared to the control class (group 2).

Vertebrate zoology is a compulsory subject which in its learning activities contains practical activities. Vertebrate zoology studies the diversity of vertebrate animals that includes five classes in the order of kingdom animalia. Vertebrate zoology in learning is a very complex subject which includes a classification system with special characterization at each grade level. The problem that arises is the wide diversity of vertebrate animals how students can easily master the concept of classification material to its taxonomic order.

The results of understanding the concept of students in vertebrate courses are presented in the display of data Figure 1. The results show that there is an effect of the implementation of inquiry learning on students' conceptual understanding of vertebrate zoology courses. Amin (2010) states that the implementation of science learning can use the now popular learning methodology namely constructivist and contextual learning. Inquiry as part of learning that adheres to constructivism can be a solution in science learning. In this contextual study as mentioned it was obtained through direct observation of the object of study with the acquisition of data as a basis for drawing conclusions. Shields (2006) states that inquiry learning begins with a question. The implementation of laboratory-based inquiry is carried out starting from a question about the subject matter that will be discussed at each meeting which then continues on a basic hypothesis that will be revealed. Through observation of the object studied, the hypothesis can be searched for truth. Data and facts become references in formulating concepts.

Mastery of concepts can be obtained from observations of observations of animal preparations. Students learn to understand the real characteristics seen from each observation, the differences and similarities of several animals so that students learn to group several animals at the same class level. The results of the observations during conducting research showed that students felt interested and enthusiastic about attending the lectures of Vertebrate Zoology. The learning process is fun and students are taught to have other abilities besides constructing an understanding of how to classify vertebrate animals based on traits that appear to be accompanied by factual data contained in the body of each vertebrate animal that is the object of observation.

The results of the study showed that there was influence on the application of the inquiry learning model compared to the control class. As stated by Maulina (2015) that through lesson study activities inquiry learning models can improve understanding of learning concepts and enhance student learning activities. Inquiry as a model teaches students to be careful and careful in making observations, so that appropriate conclusions can be obtained. Maulina (2016) states that students find it difficult to understand the material in cell biology lectures that have an impact on low learning outcomes, addressing this requires a solution in learning to present contextual lecture material that contains contemporary material related to real life. Being involved in learning to train students to contextually learn from observing objects directly. Thus, inquiry in biology learning as part of science is very relevant to be used in learning in which integrated processes, attitudes and scientific products (Minner, Levy, & Century, 2010).

The form of the concept understanding test provided is a cognitive test which shows that students in the experimental class have a higher understanding of the concept than the controls ($p > 0.05$). Doing learning in a combination in the laboratory makes students able to deduce data to build conclusions that are a general understanding of the concept. Studies in the laboratory generally emphasize an inductive approach to learning concepts (Abraham, 2011; Nivalainen, Asikainen, & Hirvonen, 2013). Explained that concept formation is an inductive process. Through learning experience gained during the learning process understanding of concepts is obtained.

▪ CONCLUSION

The results of this study can be concluded that to improve the understanding of the concept of learning, inquiry is one of the offers that can be applied in learning

science, especially biology learning. In science learning that requires a contextualization process, so that direct observations in the laboratory are suitable for use in vertebrate zoology lectures. Further research is needed to find out how much knowledge and understanding of concepts obtained by students and need to be reviewed the improvement of student activities which accompanies an increase in understanding of concepts with the implementation of inquiry in learning.

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Implementation of Discovery Learning Based Worksheet To Improve Students' Concept Mastery of Science

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Abstract: This study aims to determine the application of student worksheets based discovery learning to increase concept mastery student in the experimental class 1 and class 2 experiments. The method used is pre experimental design with one group pretest-posttest design to look at the increase in the value pretest and posttest in each class experiment. The results showed that through learning using student worksheets based discovery learning can improve students mastery of concepts with high category in the experimental class 1 and class 2 experiments with each N-gain of 0.72 and 0.71.

Keywords: discovery learning, worksheet, concept mastery.

Abstrak: *Penelitian ini bertujuan untuk mengetahui penerapan students' worksheet berbasis discovery learning terhadap peningkatan penguasaan konsep siswa pada kelas eksperimen 1 dan kelas eksperimen 2. Metode penelitian yang digunakan adalah pre-eksperimental dengan desain one group pretest-posttest design yaitu dengan melihat peningkatan nilai pretest dan postest pada setiap kelas eksperimen. Hasil penelitian menunjukkan bahwa melalui pembelajaran menggunakan students' worksheet berbasis discovery learning dapat meningkatkan penguasaan konsep siswa dengan kategori tinggi pada kelas eksperimen 1 dan kelas eksperimen 2 dengan masing-masing N-gain sebesar 0,72 dan 0,71.*

Kata kunci: *pembelajaran penemuan, lembar kerja siswa, penguasaan konsep.*

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▪ INTRODUCTION

Education is the main means of a nation that determines the quality of society in adjusting to the rapid changes and advances in science and technology, so that education continues to develop in an effort to improve the quality of education. One of the methods taken is through science learning. Natural Science (IPA) is a study of natural phenomena in the form of facts, concepts, principles through a process of discovery that is a series of activities in the scientific method. IPA products are obtained through a process of thinking and acting in dealing with or responding to problems that exist in the environment, so that through science learning can help students to actively act physically or hands-on and actively think minds-on in finding information related to these matters. things learned (Zubaidah et al., 2014).

Activities in science learning require learning media to help students in the discovery process. Learning media used can influence the effectiveness of learning. According Schmidt (2012), media is a communication tool that can streamline the teaching and learning process, so that learning media is a supporting tool for implementing learning. The media serves to facilitate the teacher in delivering the subject matter to be more interesting and not monotonous. Student Worksheets (students' worksheet) is one of the learning media that can help students add information about concepts learned through systematic learning activities, and can help teachers direct students to discover concepts through their activities.

Students' worksheet contains a set of fundamental activities that must be carried out by students to maximize understanding in an effort to form basic abilities according to indicators of achievement (Choo, Rotgans, Yew, & Schmidt, 2011; Karsli & Şahin, 2009; Utami, 2016). Students' worksheet includes print media as a result of the development of print technology in the form of books and contains Visual material. The worksheet can help students in the learning process become better and more meaningful. Moreover, worksheets can improve the science learning outcomes of high school students (Özmen, DemİrcİoĞlu, & Coll, 2009; Taşlidere, 2013). students' worksheet preparation must fulfill certain conditions in order to become good quality worksheets. Good worksheet must fulfill didactic, construction, and technical requirements, namely: (1) Didactic conditions governing the use of universal worksheets can be used well for students who are slow or smart. students' worksheet places more emphasis on the process of finding concepts, and most importantly in students' worksheet there are variations in stimulus through various media and student activities. students' worksheet is expected to prioritize development social, emotional, moral and aesthetic communication skills. Student learning experience is determined by students' personal development goals; (2) Construction requirements related to language usage, sentence structure, vocabulary, level of difficulty, and clarity in students' worksheet; and (3) Technical requirements emphasize writing, drawing, appearance in students' worksheet. students' worksheet is declared of quality if it meets three criteria, namely validity, practicality, and effectiveness (Nieveen, 2007).

In fact, currently the existing students' worksheet does not meet the requirements of quality students' worksheet. This is in accordance with the results of a preliminary observation of several junior high school teachers in Lampung Province who were randomly selected, namely SMP N 1 Natar, South Lampung District, SMP N 22 Bandar Lampung and SMP N 15 Pesawaran, stating that the three schools used students' worksheet originating from publishers . The students' worksheet from the issuer after being analyzed has many weaknesses. These weaknesses include: the contents of the

students' worksheet only focus on the cognitive. The material description on the students' worksheet does not represent indicators in the syllabus, making it difficult for students to carry out the exploration and introduction to concepts. The application of student concepts emphasizes the completion of quantitative questions.

Unfortunately, worksheet that had been used in schools was conventional students' worksheet purchased from book agents who had not used a particular learning model (Sintia, 2015). Conventional students' worksheet does not make students find structured directions to understand the material provided so that students tend to be passive, not active in the learning process so that it is not in accordance with the nature of science learning which emphasizes providing direct learning experiences in finding concepts. As a result, most students score below the average of more than 50%. The low achievement of Indonesian students' learning can also be seen from several international research results, namely the results of the Trends in International Mathematics and Science Studies (TIMSS) 2015 said that Indonesia's science results ranked 44th out of 47 countries with an average value of 397 higher than the average value of Saudi Arabia, Marocco and Kuwait countries, namely 390, 352, and 337. The results of the 2015 Program for International Student Assessment (PISA) research also found that the ability of Indonesian students in mathematics, science, and reading was still low, namely Indonesia ranked 62nd out of 70 countries (OECD, 2015).

Various efforts can be made to improve student learning outcomes, one of which is the learning process using discovery learning models. Based on the results of previous studies: (1) Cohen (2008) states that learning using the discovery learning model influences the understanding of science concepts and scientific attitudes of students, namely there are differences in the average value of understanding concepts and scientific attitudes of students that are significant between groups of students learning with discovery models learning with groups of students who study with the direct teaching model. (2) Sintia (2015) also states that the development of students' worksheet based on discovery learning through a scientific approach to temperature and heat material was declared effective with the percentage of 79.41% of students completing KKM. On this basis, this research has developed students' worksheet based on discovery learning. Discovery learning is a learning model that emphasizes active students in finding their own concepts. According to Joolingen (1999), discovery learning is learning where students build their own knowledge by experimenting, and draw conclusions from rules / concepts from the experimental results. Based on the above background, it shows that students' worksheet is needed which can improve the mastery of students 'concepts, so research on the development of student worksheets based on discovery learning is done to improve the mastery of students' concepts.

▪ METHOD

The research method used was pre-experimental with the design of one group pretest-posttest design. The research was conducted in SMPN 15 Pesawaran Lampung in two classes, namely class VII-D as experimental class 1 and class VII-A as experimental class 2. Both classes used students' worksheet products based on discovery learning. The data obtained from the mastery of students' concepts in learning using students' worksheet based on discovery learning is done by using tests so that the results of the mastery of the science concept can be seen from the pretest and posttest scores. From the results of the preetest and posttest, the N-gain is calculated to determine the extent of the mastery of the science concept.

▪ RESULT AND DISCUSSION

Increasing students 'mastery of concepts is an increase in mastery of students' concepts through the implementation of science learning using students' worksheet based on discovery learning as a result of development. The increase in mastery of student concepts is shown by the scores obtained by students in the concept mastery test (preetest and posttest), indicated by the N-gain score, ie the difference between the preetest and posttest scores is calculated based on the Hake equation. The mean results of mastery of student concepts are listed in table 1.

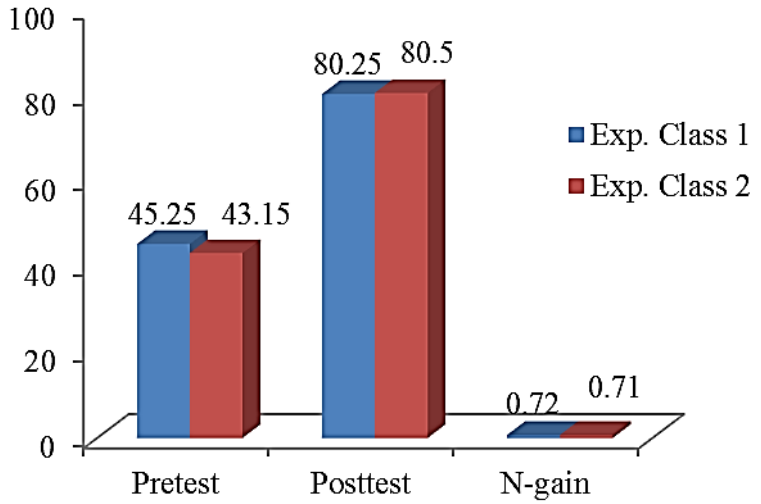

Figure 1. Students' concept mastery data

It can be seen that N-gain experimental class 1 has an average of 0.72 classified as high criteria so that it can be said that the experimental class 1 has a high increase in mastery of concepts. Experiment class 2 has an average N-gain of 0.71 with high criteria, it can be said that the experimental class 2 has a high increase in mastery of concepts. Based on the results of the study at the beginning of the learning obtained the value of mastery of students' concepts in the material changes in the objects around us on average is less satisfactory seen from the results of the preetest of the concept mastery. After using students' worksheet based on discovery learning there is an increase, this is based on the results of the posttest about the concept mastery. The results showed an increase in N-gain scores, this shows that science learning using students' worksheet based on discovery learning is able to improve mastery of students' science concepts. This is in line with the results of Kurnianto's research, et al (2015) that discovery learning learning models accompanied by students' worksheet can improve student learning achievement on aspects of knowledge and skills. Likewise with the opinion of Balim (2009) which states that learning through inquiry will be able to improve academic achievement, learning retention, and inquiry learning skills, both in the cognitive and affective domains of students. This is reinforced by Syafi'i, et al (2014) that Question based discovery learning that is used in learning by performing discovery learning stages can improve student learning outcomes. Thus, the results of the development of students' worksheet in this study can be used as an alternative in

helping teachers to improve the mastery of the concept of class VII SMP students on the material changes in the objects around us.

▪ CONCLUSION

The implementation of learning with students' worksheet is based on discovery learning in science learning to improve students' mastery of concepts very high. The increase in mastery of the science concept is shown through the N-gain score, which is the difference between the preetest and posttest scores. Based on the results of the research and discussion it can be concluded that the use of students' worksheet based on discovery learning has succeeded in increasing the mastery of concepts of students with high categories.

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Improving Students' Literation Through The Implementation of Mind Mapping-Based Discovery Learning Model

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Abstract: This study aims to apply the discovery learning model based on concept maps to improve student literacy. As many as 25 students of class VIIIF SMPN 16, were chosen as the research sample. Literacy ability is measured by observation using an observation sheet with regard to student attitudes when discovery through reading activities. Students' responses to learning are also measured through focus group interview (FGI). The results showed that the application of this model could improve the literacy culture of students with a score of 74.67 and the average student learning outcomes obtained a score of 81.53 which included good categories.

Keywords: discovery learning, mind mapping, literacy.

Abstrak: *Penelitian ini bertujuan untuk menerapkan model pembelajaran penemuan berbasis peta konsep dalam meningkatkan literasi siswa. Sebanyak 25 orang siswa kelas VIIIF, SMPN 16 dipilih sebagai sampel penelitian. Kemampuan literasi diukur dengan pengamatan menggunakan lembar observasi berkenaan dengan sikap siswa ketika penemuan melalui aktivitas membaca. Respon siswa dalam pembelajaran juga diukur melalui focus group interview (FGI). Hasil penelitian menunjukkan bahwa penerapan model ini dapat meningkatkan budaya literasi siswa dengan skor 74,67 dan rata-rata hasil belajar siswa diperoleh skor 81,53 yang termasuk kategori baik.*

Kata kunci: *pembelajaran penemuan, peta konsep, literasi.*

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▪ INTRODUCTION

The survey results of UNESCO's world organizations (United Nations Educational, Scientific and Cultural Organization) released from 61 countries surveyed showing interest in reading Indonesian society at number 59 with a result of 0.001% meaning that from 1000 Indonesians there was only 1 categorized as diligent reading (Tekno, 2016). Given the low literacy culture of reading in the community, the Indonesian Government since July 2015 through the Ministry of Education and Culture has launched an agenda for the school literacy movement (GLS).

Literacy is often interpreted as literacy ability which includes the routine of reading and writing. Furthermore according to NIFL (National Institute for Literacy) that literacy includes a person's ability to read, write, speak, calculate and solve problems at a certain level of expertise that is beneficial to work, family and society (Keefe & Copeland, 2011; Perry, 2012; Shanahan, & Shanahan, 2012). Illiteracy is one of the major obstacles to the development of a person's quality of life towards a better direction. Therefore literacy culture is not a trivial thing, but it has a multiple effect. In this case it means that literacy can have a very broad influence on the lives of individuals, communities and nations. Through literacy capabilities can help eradicate poverty and ensure the implementation of sustainable development even to the realization of world peace.

At present the term literacy has been widely used in a broader sense such as information literacy, computer literacy and scientific literacy. Science literacy in students needs to be improved, because it can have an impact on the breadth of mastery of science and skills. Science literacy according to the international study of PISA (Program for International Students Assessment) is the ability to use scientific knowledge, identify problems and draw conclusions based on evidence, in order to understand and make decisions about nature and changes that occur in nature as a result of human activities (Bybee, McCrae, & Laurie, 2009). Based on the results of the PISA international study data analysis that in the 2015 mapping, there were still 49 of the 72 participating countries that had the ability to achieve scientific literacy below the international average score, which was below the score of 501. Furthermore the results of the PISA analysis also showed that the ability Science literacy of students in Indonesia is ranked 64th out of 72 countries (OECD, 2016). These data reveal that the scientific literacy achievements of Indonesian students are still relatively low.

Achievement of science literacy in Indonesian students is relatively low because most students do not have a literacy culture that includes reading and writing habits so that it is implicated in the low mastery of science knowledge. To support scientific literacy, a learning stimulus is needed that is able to encourage students to want to do reading and writing activities. One effort that can be done by teachers in the classroom is to apply discovery-based learning models that are combined with the project of making mind mapping. The discovery learning model invites students to find various sources of learning information and find understanding independently through reading activities. While mind mapping learning brings students to re-express ideas as a result of reading activities as a whole picture of a whole scientific concept. Through the implementation of discovery learning models combined with mind mapping making projects, it is hoped that it can be a solution in fostering a culture of literacy so that it affects the mastery of students' scientific knowledge.

▪ METHOD

The discovery learning model combines mind mapping to improve the student literacy culture applied to science subjects of plant motion material. This research was conducted at SMP Negeri 16 Bandar Lampung with research subjects of class VIII F in the academic year 2017/2018. Literacy culture is measured by making observations using a Likert scale observation questionnaire instrument related to student attitudes when discovery through reading activities. In addition, this study also measures student learning outcomes after the learning process is carried out. While the response of students in learning is done through focus group interview (FGI) activities. The overall data of the research results are converted into five criteria of literacy. The application of discovery learning models combined with mind mapping in learning is done in 3 cycles, with the allocation of time for each cycle is 2 x 40 minutes. Related to the learning model used in teaching and learning activities so that the implementation of learning in the classroom is also equipped with discovery learning based materials as well, related to this is the application of student worksheets (students' worksheet) based on discovery learning in learning.

▪ RESULT AND DISCUSSION

After the learning process is carried out applying the discovery learning model using students' worksheet based on discovery learning and combined with making mind mapping then data is obtained as shown in Table 1. Some mind mapping students' work is presented in Figure 1.

Table 1. The average culture of student literacy through the application of a combined discovery learning model to the making of mind mapping

No	Literacy aspects	Group of students					Average	Criteria
		I	II	III	IV	V		
1	Affective (reading activity)	76.67	72.22	78.89	71.11	74.44	74.67	Good
2	Cognitive (learning outcomes)	82.17	80.50	8300	80.33	81.67	81.53	Excellence

Based on Table 2, it can be seen that student literacy culture, especially in the aspect of reading activities, includes criteria "good" while the student learning outcomes are categorized as "very good". The factors predicted to influence the literacy culture of students in this study are the fact that learning when the teacher facilitates the use of students' worksheet based on discovery learning models in the learning process, has actually provided a conducive learning environment for students. Teachers in the discovery learning model act more as facilitators, in the sense that they are able to provide facilities in the learning process and assist students in learning so that a sense of comfort can be created that can bring students the courage to optimally express or discuss subject matter (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011).

The learning process by using students' worksheet focuses more on student learning in groups so that it can create an atmosphere of learning that discuss and collaborate with each other. As according to Choo, Rotgans, Yew, & Schmidt (2011), students' worksheet can be used by teachers to activate students in learning activities, help students in finding and developing mind concepts and as an alternative way of presenting subject matter. Another factor that is thought to influence the culture of literacy is that the discovery learning model is revealed to be able to involve students in the process of finding and investigating themselves from various sources of information, so students feel more challenged to develop understanding of knowledge. This learning climate stimulates students to continue reading. What's more, after reading activities students are led to explore the concept of mind that has been stored in memory into the form of mind mapping. This fact of learning increasingly fosters students' interest in reading activities so that literacy culture can continue to be improved.

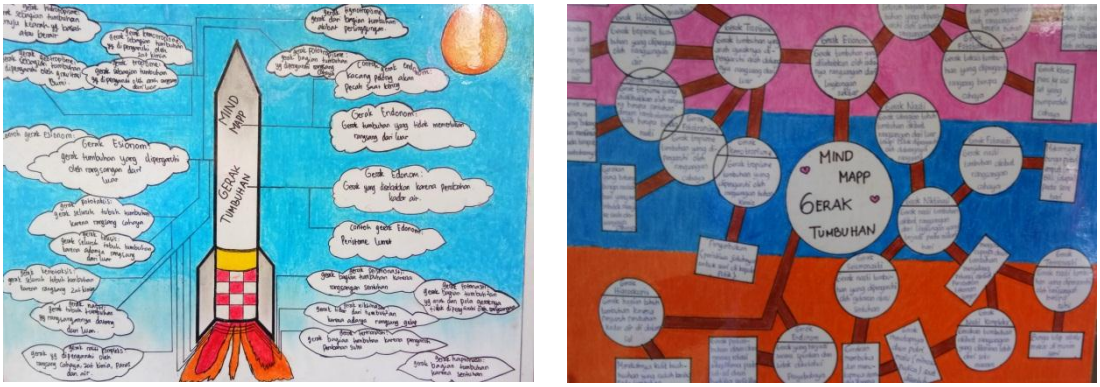

Figure 1. Students' generated-mind mapping

Teaching and learning activities with discovery learning models combined with making mind mapping ensure the involvement of students actively in developing knowledge independently and give birth to good learning attitudes, so that the impact on the level of understanding of students is increasingly deep as a result the quality of the process and student learning outcomes are more maximal. The habit of finding independent learning resources in discovery learning models and creating mind concepts in the form of mind mapping turns out to be able to increase self-confidence (self confidence) and increase self-confidence (self efficacy) so that it increases self motivation for students to do activities read. Basically in this study there is a linear relationship between the application of the discovery learning model combined with mind mapping with the student literacy culture.

▪ CONCLUSION

Based on the exposure to the data from the research and discussion that have been stated above, it can be concluded that the application of discovery learning models combined with mind mapping can be said to improve the literacy culture of junior high school students based on the results of a descriptive analysis of student attitudes when reading activities that show a number of 74.67 with the criteria of "good" and the

average student learning outcomes obtained a figure of 81.53 including the category of "very good". The application of discovery learning models combined with mind mapping is also stated to be proven to improve the literacy culture of junior high school students. This can be seen based on students' qualitative responses to the learning process.

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Habits of Mind and Concept Mastery of Cell in Multimedia Virtual Class Environment: A Case of Biology Students in Lampung University

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Abstract: The ability of students to use Information and Communication Technology (ICT) is still not optimally integrated with learning. Even though most students already have gadgets, internet connections are available via campus hotspots. Based on this, learning in higher education cannot be separated from the use of computerized and online-based technology. The integration of ICT into vclass-based multimedia learning is a potential thing to develop. This vclass-based multimedia application is expected to improve habits of mind and conceptual understanding of biology cell of students. Improved learning outcomes can be demonstrated through conceptual understanding which are the ability to understand the concepts that exist in the learning material after the learning process takes place.

Keywords: habits of mind, mastery of concepts, cells, virtual class.

Abstrak: *Kemampuan mahasiswa dalam menggunakan Teknologi Informasi dan Komunikasi (TIK) masih belum optimal diintegrasikan dengan pembelajaran. Padahal sebagian besar mahasiswa sudah memiliki gadget, tersedia koneksi internet melalui hotspot kampus. Berdasarkan hal tersebut, pembelajaran di perguruan tinggi tidak bisa terlepas dari pemanfaatan teknologi yang terkomputerisasi dan berbasis online. Integrasi TIK ke dalam pembelajaran melalui multimedia berbasis vclass merupakan hal yang potensial untuk dikembangkan. Penerapan multimedia berbasis vclass ini dapat meningkatkan habits of mind dan penguasaan konsep sel mahasiswa pendidikan biologi. Peningkatan hasil belajar dapat ditunjukkan melalui penguasaan konsep yang merupakan kemampuan memahami konsep-konsep yang ada dalam materi pembelajaran setelah proses pembelajaran berlangsung.*

Kata kunci: *habits of mind, penguasaan konsep, sel, kelas virtual.*

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▪ INTRODUCTION

Information and Communication Technology (ICT) based learning is still not optimal and the database of lecture material and student assignments is still stored in the conventional way. Even though most students already have computers / laptops / gadgets, lecture rooms are also equipped with one LCD unit, internet connection is available through campus hotspots. Based on this, learning in higher education cannot be separated from the use of computerized and online-based technology. Many universities have extensive access to abundant Information and Communication Technology (ICT) -based teaching and learning resources but these resources have not yet manifested their great potential for education (Dikti, 2010).

Miarso (2009) argues that the development of information and communication technology (ICT) has provided various possibilities for improving the quality of education, namely among others to: (1) increase access to obtain information from anywhere, anyone, anytime and anything, (2) increasing the effectiveness of communication with various forms of sensory stimulation, (3) increasing relevance to more and more diverse needs, (4) adjusting to changing environmental conditions, and (5) increasing efficiency by saving time, effort and costs. The use of ICT by students must still be under the guidance of lecturers because according to Rustaman (2011), the use of information technology in addition to providing a number of facilities and alternative solutions in learning, tends to also have an impact on cultural shifts.

For this reason, the integration of ICT into learning through multimedia based on vclass is a potential thing to be developed because basically the teaching and learning process is a reciprocal interaction and communication activity between educators and students that takes place in educational situations to achieve learning goals (Rustaman, 2003) The interaction is not just a communication relationship between the teacher and students but also educational interactions that reflect attitudes, values, and habits of mind in students.

Some researchers (Ennis, 1987; Paul, 1990; Costa, 1991; Perkins, 1984; Flavell, 1976; Zimmerman, 1990; Amabile, 1983 in Marzano et al., 1993) put habitual thinking into three categories namely self regulation, critical thinking and creative thinking. The observations show that students' thinking habits are still low and need to be improved. Some of the results of these studies indicate that habits of mind can be explored, trained, developed and shaped for the better. Costa & Kallick (2000) and Campbell (2006) claim habits of mind as characteristics of intelligent thinking behavior that are highest in solving problems and are indicators of success in academics, work and social relations. According to Sriyati (2011), a number of researchers claim that habits of mind can help students to conduct self regulation in their learning and find solutions in their social relationships and workplaces. Risnanosanti's research (2011) shows that learning with habits of mind strategies can improve higher-order thinking skills and better learning outcomes for students. Improved learning outcomes can be demonstrated through mastery of concepts which are the ability to understand the concepts that exist in the learning material after the learning process takes place.

The use of multimedia can be combined with Virtual Class (Vclass) based on Learning Management System (LMS). Vclass is an online class that provides facilities for participants to communicate with each other, view presentations or videos, interact between participants, and share information resources within groups (Ferriman, 2013). Virtual classroom systems can be accessed anytime and anywhere for 24 hours every day so that students have more learning experience (Kumar and Shasi, 2013). LMS is an

application that automates and virtualizes the teaching and learning process electronically (Wahono, 2008). LMS that can be used effectively and efficiently, namely Edmodo, Schoology, and Moodle. Edmodo and Schoology applications implement more on social media while the moodle application has more features that support learning.

▪ METHOD

The method used in this study is the weak experiment. Vclass-based interactive multimedia applications are applied to one experimental class. Measurement of habits of mind was carried out through questionnaires given at the beginning and end of the implementation of electronic portfolio assessments. The mastery of concept measurement was carried out through pretest and posttest. Therefore, the research design used is The One-Group Pretest-Posttest Design. Data obtained in the form of quantitative data carried out regression tests with the help of SPSS 17 program.

This research consists of stages of research preparation, research and the final stages of research. The virtual class used in this study is vclass.unila.ac.id and whatsapp as a medium to support online discussion. Multimedia in the form of animation of cell biology concepts, images, and videos published to students through vclass. Online discussions are held regularly once a week to deepen the material given in class during lectures. The data obtained based on the research are field notes during the lecture process, the mahsaiswa response questionnaire which was discussed descriptively, the results of student mastery concept tests, and habits of mind questionnaires. Quantitative data analysis was assisted using Statistical Package For Social Sciences (SPSS) 17 for windows software. Questionnaire data habits of mind (Marzano, 1993) uses the highest four and lowest one. Processing and analysis of habits of mind data is done through the initial and final HoM average test to determine the increase in habits of mind. This test uses the formula N-Gain (Meltzer, 2002) and normalized gain criteria according to Meltzer (2002).

Before the average difference test is carried out, the statistical prerequisite test is done first through the normality test using the Kolmogorov-Smirnov test. In addition to the average difference test, to determine the effect of vclass-based multimedia on students 'habits of mind, Paired-sample T Test was conducted with the help of SPSS 17. The measurement was done by comparing students' habits of mind scores between before and after the electronic portfolio assessment. Acceptance or rejection of a hypothesis based on the value of t or its significance value.

▪ RESULT AND DISCUSSION

Vclass-based multimedia to improve habits of mind and mastery of concepts was made in vclass.unila as shown in Figure 1. The habits of mind data were obtained from questionnaires with scores from a scale of 1 to 4 adapted from the habits of mind questionnaire Sriyati (2011) developed by Marzano et al (1993). This questionnaire is given before the application of multimedia based on vclass and after the lecture ends which can be accessed online. The results of this questionnaire can describe the binding of habits of mind of students from the three categories, namely self regulation, critical thinking, and creative thinking. The different test results of the average habits of mind at the pretest and posttest prove that multimedia based on vclass can increase the habits of mind of students with the average N-Gain which is included in the medium category, namely 0.50 (Table 1).

Table 1. Questionnaire score for habits of mind

No	Factor	Average Initial Score	Average Final Score	Average N-gain
1	Self regulation	45.54	73.51	0.51
2	Critical thinking	50.68	76.08	0.51
3	Creative thinking	48.48	71.62	0.45
Habits of mind		48.23	73.74	0.50

Increased students' habits of mind because of multimedia contributions based on vclass which have components in the form of online discussions, self assessment, and assignments. Increased habits of mind occurred in each category, namely self regulation at 0.51 (medium category), critical thinking at 0.51 (medium category) and creative thinking 0.45 (medium category). This shows that multimedia based vclass is more able to train self regulation and critical thinking of students compared to creative thinking. The equation is because online assignments and discussions provide opportunities for students to realize their thoughts, make effective plans and are sensitive to feedback and sources of information. This is in accordance with the results of the student response recapitulation which states that 73% of students are increasingly diligent in searching for learning resources through the internet and books, 60% of students make assignments, and 65% are aware of their own thoughts through online discussions and assignments. However, students experienced problems in accessing habits of mind questionnaires through vclass (85%) so that filling out questionnaires was given an alternative through googleform.

Increased students' habits of mind were also analyzed through student N-gain grouping (Table 2). The number of students who have a low category is 15.6%, the medium category is 65.6%, and the high category is 18.8%. Besides the N-gain HoM data of students, the Paired-Sample T test was also conducted to determine the significance level. The initial and final habits of mind scores are used in this test and produce t count = -17.251 (½α = 0.025). This tcount value proves that there are significant differences in habits of mind between before and after the application of multimedia based on vclass. Increased habits of mind of students can also be from the progress of the learning process of students from the tasks given during learning. Habits of mind in question are one's productive thinking habits when responding to answers to questions or problems whose answers are not immediately known (Costa and Kallick, 2000).

Table 2. Category for N-gain habits of mind.

No	Category	Number of students	Percentage
1.	Low	5	15.6 %
2.	Middle	21	65.6 %
3.	High	6	18.8 %

The postest habits of mind results show that 30% -50% of students get a score of 4 for each category, which is aware of their own thoughts, sensitive to feedback, evaluating the effectiveness of actions, looking for accuracy, being open, being able to place themselves when there are guarantees, are sensitive and know the ability of knowledge of friends, can involve themselves in the task even though the answers and

solutions are not immediately apparent, make efforts to maximize abilities and knowledge, create and improve evaluation standards made by themselves, produce new ways to see situations different from the usual way. However, for one category, which is "clear and seeking clarity", that is, students feel that some part of the task being done is confusing so that it influences the overall results. This is in accordance with the learning process where students often ask questions about the assignments given and some students revise their assignments because there are still many mistakes.

Marzano (1993) and Sriyati (2011) state that it is rare for people to use mental habits like this, therefore habits of mind must be applied to students, because students rarely see habits of mind used by people around them. Thus, habits of mind need to be introduced, explored, trained and developed by students which can be done through multimedia based vclass. In this study two concept mastery tests were carried out which were carried out twice the concept mastery test at the beginning and end of the application of vclass-based multimedia. The pretest and postets questions consist of 10 social essays with cognitive levels of C2 (comprehending) to C5 (synthesizing). The pretest and posttest are still carried out offline because the types of essay and student questions are still constrained by poor internet access, then the test results are analyzed and the results of the recapitulation can be seen in Table 3.

Table 3. Result berdasarkan category of N-gain

Category	Number of students	Percentage
Low	1	3.1 %
Middle	20	62.5 %
High	11	34.3 %

Table 3 shows that students experience increased mastery of different concepts ranging from low to high categories. Most students experienced an increase in mastery of concepts in the medium category, namely 62.5% while the high category was 34.3% and the low category was 3.1%. In addition to N-gain data mastery of student concepts, the Paired-Sample T test is also conducted to determine the significance level. The pretest and posttest scores were used in this test and produced t count = -30.179 (½α = 0.025). This tcount value proves that there are significant differences in the mastery of concepts between before and after the application of multimedia based on vclass.

The increase in mastery of concepts in students occurs because multimedia animation, images, and videos about cell biology are very helpful for students in understanding cell concepts, organelles, and the processes that occur in them. In addition, the availability of multimedia online helps students to access learning resources that can be accessed anytime and anywhere. Online discussions also help students who do not understand the concept so they can ask questions in the discussion group, then students who are more understanding can help answer. As McCulloch (2006) argues that efforts to build and reconstruct students' knowledge can be done with continuous feedback, students need scaffolding in achieving Zone of Proximal Development (ZPD), scaffolding can be done by lecturers or peers in various ways including instructions (explaining concepts certain), warnings (provide feedback) or encouragement. Feedback through virtual classes can help students construct critical thinking knowledge in identifying errors, sources of information, and analyzing problems.

▪ CONCLUSION

Based on the research that has been done, it can be concluded in general that learning with multimedia based on vclass can improve habits of mind or student thinking habits which consist of three categories, namely self regulation, critical thinking, and creative thinking. In addition, the application of multimedia based on vcalass also increases the mastery of cell biology concepts because it can help students understand concepts in the cell biology course and facilitate students in obtaining learning resources.

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Development of Performance Assessment Instrument for Electrolyte and Non Electrolyte Solutions

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Abstract: This study was aimed to develop the performance assesment instrument on the practice of electrolyte and non-electrolyte solution, to describe the characteristics in terms of legibility, construction, implementation of product, and to describe the teachers responses on the performance of developed. The design of this research was Research and Development (R&D). The result of expert validation toward assessment instrument showed the level readable realibility, construction, and implementation of the performance assesment instrument equal to 91,11%, 84%, and 100%; respectively. The teachers gave very good responses to the legibility content, construction, and implementation of the performance assesment instrument with percentage were 96,67%, 96%, and 96,67% respectively. The conclusion obtained from this research is the performance of developed were excellent.

Keywords: assessment performance instrument on experiment, electrolyte solution development.

Abstrak: *Penelitian ini bertujuan untuk mengembangkan instrumen asesmen kinerja praktikum larutan elektrolit dan non elektrolit, mendeskripsikan karakteristiknya dari segi keterbacaan, konstruksi dan keterpakaian produk, serta mendeskripsikan tanggapan guru kimia terhadap instrumen yang dikembangkan. Desain penelitian yang digunakan adalah Research and Development (R&D). Hasil validasi ahli terhadap instrumen asesmen kinerja yang dikembangkan menunjukkan aspek keterbacaan 91,11%; aspek konstruksi 84%; dan aspek keterpa¬kaian 100 %; yang termasuk dalam kategori sangat tinggi. Guru juga telah memberikan tanggapan dengan sangat baik terhadap aspek keterbacaan, konstruksi dan keterpakaian produk dengan persentase masing-masing 96,67%, 96%, dan 96,67%. Kesimpulan yang diperoleh pada penelitian ini yaitu instrumen asesmen kinerja praktikum yang dikembang¬kan memiliki kriteria sangat baik.*

Kata kunci: *instrumen asesmen kinerja praktikum, larutan elektrolit, pengembangan.*

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▪ INTRODUCTION

The assessment of learning outcomes by teachers is carried out to monitor the process, progress of learning, and continuous improvement of student learning outcomes. Assessment of learning outcomes by the teacher has a role, among others, namely to help students know the achievements of learning (learning outcomes), as well as teachers and students can obtain information about the weaknesses and strengths of learning and learning (Permendikbud No 104, 2014). Learning is said to be effective, efficient and productive when accompanied by good assessment (Stiggins in Sudrajat, A., Permanasari A., Zainul A., and Buchari, 2011).

Assessment plays a very important role, because the assessment is expected to provide feedback about the material students have learned, the effectiveness of the learning process and student learning outcomes (Kusaeri and Suprananto, 2012). The scope of the assessment includes the attitudes, knowledge and skills competencies carried out in a balanced manner so that it can be used to determine the relative position of each student towards the prescribed standards (Anonim, 2013a). Assessment or assessment is a process of getting information about what students have learned and how successful the students are in learning it (Abidin, 2014).

Assessment carried out on students can be used as evidence that should be considered in the implementation of learning evaluation, because it is not only assessing students, assessment is also used in assessing the teaching system (Hamalik, 2001). Assessment of learning outcomes in practical skills competencies can use performance assessment (Anonim, 2014a). Performance assessment is considered as one form of assessment that sees student competence not only in terms of cognitive, but also viewed from the psychomotor perspective of students (Ardli, I., Abdullah, A.G., Mujdalipah, S., and Ana, 2012). Performance assessment is important, because it can motivate students to demonstrate a process that can be observed directly. Therefore, the performance assessment is very suitable to assess the achievement of competencies that require students to perform certain tasks such as practicum (Wulan, 2013).

In practice, performance assessments are carried out using assessment instruments or performance assessment instruments. An assessment instrument is a tool used to assess students in achieving learning (Anonymous, 2014a). Performance assessment instruments used in measuring students' abilities in an indicator must be equipped with a rubric (Susila, 2012). The rubric serves as the assessment standard for clearly identifying student performance in the form of a score guide for the expected criteria (Wulan, 2013). By referring to this rubric, student performance in practical activities can be assessed by the teacher. One subject that is closely related to practical activities is a chemical subject. Practical activities in chemistry learning are very important (Abrahams I., Reiss, M.J., and Sharpe, R.M., 2013). This is because practicum activities can help students build chemical concepts. Therefore, every learning activity related to practical activities requires a performance assessment to assess this. One example of the basic competency in chemistry learning is Basic Competence (KD) 4.8 designing, doing, and concluding and presenting the results of experiments to determine the nature of electrolyte solutions and non-electrolyte solutions (Anonim, 2014b). To reach the KD, students are trained to design and experiment with electrolyte and non-electrolyte solutions, then an assessment of the student's lab performance is carried out.

The fact is that the use of performance assessments in schools is still very limited (Wulan, 2007). This fact corresponds to the research conducted by Karviyani (2015) on the development of practicum performance assessments on acid-base material, from the

results of the study explained that some teachers do not provide practicum performance assessments and there are some teachers who have done practicum assessments but did not make assessment rubric. The teacher finds it difficult to make a performance assessment instrument along with the rubric and indicators, this is because the teacher does not understand the performance assessment instrument and the teacher never makes a performance assessment instrument (Oktriawan, 2015). In addition, performance assessment procedures offered by assessment experts are too complex, namely the performance components that are overvalued and not appropriate to assess the performance of students in large numbers and scoring guidelines used are unclear, making it difficult to understand and difficult to implement on daily learning activities (Susila, 2012; Wulan, 2008).

▪ METHOD

Research and development of practicum performance assessment instruments on electrolyte and non-electrolyte solution material consisted of several stages according to Borg and Gall in Sukmadinata (2011), but this study was only carried out until the revision phase of the trial results. This is due to limited time and lack of research expertise to carry out the next stage. This stage aims to collect data on existing conditions as a comparison material for developed products. At this stage there are three Public High Schools in Lampung Province and one private high school in Bandar Lampung. Instructional methods are questionnaires. The questionnaire was distributed to 40 class XI students and four chemistry teachers in the four high schools who had obtained electrolyte and non-electrolyte solution material.

The data produced is classified and the percentage of answers is calculated. Calculation of the percentage of income, aims to see the percentage of each answer to the question so that the data obtained can be analyzed. At this stage, the draft product of practicum performance assessment instruments was designed based on the results of library studies and field studies, that most teachers did not understand the practical performance assessment instruments and the complexity of assessment procedures so that they were difficult to apply. teacher. Therefore, design performance assessment equipment that is efficient, practical, and easy to learn so that it is easy to use by the teacher. After the product design is complete, the performance assessment instruments are arranged according to the product design that has been made. The product is ready to be validated by an expert validator, namely a lecturer at the Lam¬pung University Chemistry Management. Verification was made on aspects of product use, construction aspects and reading aspects of performance assessment instruments in electrolyte and non electrolyte solution labs. After the validation is complete, the data from the validation results are recorded and tabulated.

At this stage, the researcher conducted an implementation test for the 2017 Chemical Education students. This stage can be used to determine the suitability of the task with the rubric that has been made. If there is a performance that does not appear, it needs to be changed according to the performance that appears in the implementation test. Next do the trial limit. The purpose of this test is to find out the teacher's response to aspects of reading, construction, and product use of the practicum performance assessment instrument. This limited trial was carried out by showing assessment instruments for the performance of electrolyte and non-electrolyte solution practices and asking two chemistry teachers in class XI in one of the Public High Schools in Bandarlampung to respond to products that had been developed by filling out

questionnaires that had been provided. After that the results of the percentage answer ¬ questionnaire are interpreted based on the interpretation of Arikunto (2008).

▪ RESULT AND DISCUSSION

The results of the curriculum analysis are KI-KD-Indicators. The results of the assessment of assessment literature and research results related to the assessment of practicum performance are ways of preparing assessments and knowing the criteria for good assessment instruments, as well as references in developing laboratory performance assessment instruments. The results of the field study found several facts about teacher responses found in Figure 1. Practical performance assessment used by teachers, 25% of teachers did not always carry out practical activities on chemical learning processes. As many as 50% of the teachers did not conduct electrolyte and non-electrolyte solution practicum activities so that they were replaced with learning media in the form of power points, video de- monstrations and illustrations in the form of books. Furthermore, 50% of teachers assess the ability of student performance in conducting practical activities. As many as 75% of teachers do not understand the performance assessment. Teachers who have never made a performance assessment instrument to measure student performance abilities are as much as 75% and all teachers answer that it is necessary to develop assessment instruments.

The students' responses to the questionnaire are shown in Figure 1. Based on these images, 85% of the students answered that they always practiced the chemistry learning process. As many as 50% of students have practicum guides and 50% of students answer that the teacher explains the practicum procedure and explains how to use the instrument before practicing on electrolyte and non-electrolyte solution material. As many as 90% of students answered it was important to do practical activities on electrolyte and non-electrolyte solution material because it would have good consequences for them, namely to be careful and careful in practicum be careful in using laboratory tools and materials and more enthusiasm in practicum so that the resulting value is maximized. The product planning will be developed, which consists of the initial part (front cover, inner cover, introduction and table of contents), content section (practicum guide, assessment method, task and performance rubric) and the final part (bibliography and back cover) .

In product development there are revised product components, while the front cover display before and after revision is presented in Figure 3. The cover of the title sentence is neatly arranged, the image is replaced because it is unclear and the practicum in the picture is the teacher. In the preface there are deficiencies, namely the use of languages that do not follow the rules of EYD, preface before and after revisions are presented in Figure 4. The next section is revised task and the performance rubric. Performance tasks and rubrics are made of two types, tasks and detailed performance and task rubrics and performance rubrics based on new scenarios. Task and performance rubrics in detail are all skills at the time the lab is observed, this is so that the educator knows all the performance that is assessed according to the stages in the experimental procedure.

If the performance assessment is compiled based on all stages of performance or stages of the experimental work step, then the performance assessment will be very detailed and complex (Wulan, 2008). If these skills are applied to the daily practice, the teacher will be difficult and overwhelmed in assessing students' skills, because it is not in accordance with the large number of students. Therefore the assessment needs to be

revised to be simpler, the performance assessment is simply a performance assessment based on a new assessment scenario (Wulan, 2008). The performance taken is only representative performance from all stages of the skills assessed.

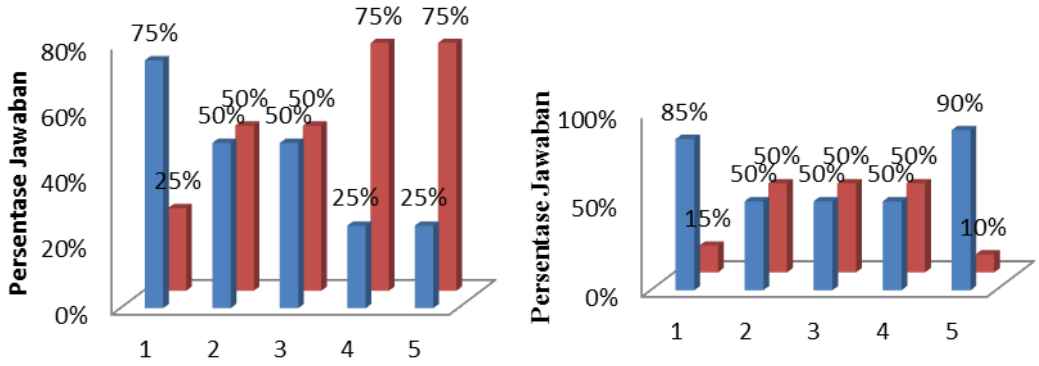

Figure 1. Percentage of answers to questionnaire filling by the teacher (left) and students (right)

In addition to compiling products, research instruments were also prepared to assess the products developed. The assessment instrument consisted of expert validation instruments, teacher response instruments, and the implementation observation sheet of performance assessment. Expert validation instruments and teacher response instruments include aspects of readability, construction and use of products used to assess the product being developed. while the observation sheet is used to test the implementation of the product performance assessment instruments developed

Based on the readability aspect, according to the validator of the performance assessment instrument in general it is in accordance with the rules of EYD writing, but there are still writing sentences that do not follow the rules of EYD. Writing does not use words that can give rise to multiple meanings and the use of language is easy to understand. The results of expert validation showed that the readability aspect obtained a percentage of 91.11%. The results of this percentage indicate that the practicum performance assessment instruments developed are included in very high criteria. In the aspect of construction, the validator stated that the assessment instrument for the performance of electrolyte and non-electrolyte solution practicum developed according to the task with the experimental procedure, the aspect was considered an important aspect in the experiment and was in line with the performance assessment instrument with the task. The results of expert validation for construction aspects yield percentages of 84% which indicates that the development of practicum performance assessment instruments has a very high category.

In the aspect of product use, according to the validator the performance assessment instrument developed has been very simple and easy for the teacher to be able to assess the performance of all students in the same time and the percentage of the validator's assessment is 100%. The percentage of product utilization aspects is 100% with a very high interpretation of scores. The average percentage of the questionnaire aspects of reading, product use, and construction are included in the high category so that assessment instruments for the performance of development outcomes have been compiled and have met these three aspects and can used for initial field trials. After the assessment instrument for the performance of electrolyte and non-electrolyte solutions

developed was completed by the Valiator, the next step was to carry out a feasibility test on the practicum performance assessment instrument on electrolyte and non-electrolyte solution materials. The initial product of the practicum performance assessment instrument before being tested to school, was tested beforehand on the 2017 students of Chemical Education. Experiments were carried out in the chemistry learning laboratory FKIP Unila with 10 students. Based on the results of the trial results, this performance assessment instrument has no revisions.

After being tested on students, implementation tests were conducted on 10 students in one of the Public High Schools in Bandar Lampung. This study uses product validity, namely the use of practical performance assessment instruments for use by teachers in schools. If the developed instruments are easy to use, then the performance assessment instruments are considered valid. Based on the results of the implementation test with students, the performance assessment instrument has no revisions. Furthermore, a limited trial is carried out, aiming to find out the teacher's response to the product that has been developed. The aspects assessed are readability, construction and product wear. The assessment apparatus of the electrolyte and non-electrolyte solutions were tested in SMA 17 Bandar Lampung. The respondents in the trial were two chemistry teachers. Fill in the statement of the results of the validation aspects of readability about the use of language that is in accordance with standard of indonesian language, a language that is easy to understand and does not cause multiple meanings. Based on the assessment of the percentage teacher is 96.67% with a very high category, it can be concluded that the readability aspect of the development of performance assessment instruments is good.

In the aspect of construction, according to the teacher it is appropriate between the task and the experimental procedure, aspects that are considered to be important aspects and rubrics of the performance assessment apparatus are in accordance with the task. The construction aspect of the development of the practical performance assessment instrument has been good so there is no revision. These results are also reinforced by data through a total calculation of 96% so that it falls into the very high category. In the aspect of product use, instruments that have been produced are simple, easy to carry out assessments during practical work and cost-effective. The average percentage of 96.67% indicates that the aspect of the use of the product of the performance assessment instrument is included in the high category. Overall, the results of the assessment on aspects of readability, construction and product use by the teacher indicate that the development of assessment instruments for the performance of electrolyte and non-electrolyte solutions is good so that it can be used as a reference for teachers to carry out practical assessment. Based on the development that has been done, it can be known that the assessment instrument performance of electrolyte and non-electrolyte solution labs has characteristics including being able to be applied in the implementation of school, efficient, and easy to use by the teacher. The supporting factors are cooperation between teachers and students with good researchers. There were no significant obstacles during development.

▪ CONCLUSION

Based on the results of the research and discussion it was concluded that the performance assessment instruments of the development results had characteristics that could be applied in their implementation at school, efficiently, and were easily used by the teacher. The teacher responded very well to the performance assessment instruments

of practicum which were developed with the results of the percentage of readability aspects of 96.67%, construction aspects of 96% and aspects of product use 96.67% in the very high category. Performance assessment instruments on electrolyte and non-electrolyte solution practicum results from development are supported by a simple and practical assessment and task rubric, so that it is easy to use by teachers in evaluating practical performance. There were no significant obstacles during the development of practicum performance assessment instruments on electrolyte and non-electrolyte solution materials.

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