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Reconstruction Model Education of Laboratory Research Course Context Chemical Clay, Decision Making Problem Solving (PSDM) Based, to Improve Research Thinking Skills From ChemistryTeacherCandidates

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Abstract: ***This research purpose to reconstruct the lectures of laboratory research clay context-based problem solving decision making (LRPSDM) in one LPTK of Jayapura Papua. The research method was mixed methods research-embedded. At this stage of the reconstruction of the intervention used didactic models (MER-LRPSDM) lay context. Reconstrution model based of problems finding unscientific research laboratory. MER stages starting from the analysis of the literature, discourse analysis to produce teaching materials classes used as infrastructure implementation MER-LRPSDM. Students participants (30 people) were divided into 2 groups (control and experimental). The control group using conventional methods, and the experimental group using the lecture method LRPSDM. The results showed N-average gain posttest: understanding the clay concept of control group was 0.73(high category), the ability to laboratory research design the control group was 0.43 (medium category), understanding the clay concept of experimental class was 0.77 (high category), ability to laboratory research design experimental class was 0.71 (high category), ability PSDM thinking based the classroom experiments, 0.71 (high category). There is a growing understanding of the concept, research skills, and thinking research on experimental class students. Based on the data normality test, there is data that is not normal so that the statistics used were statistically non-parametric indevendent 2 samples, Mann Whitney test,and using SPSS version 22. (Mann Whitney test, sig. <α); Ho: there was no difference in average significantly. In understanding the concept is sig. (0.354)> α (0.05), meaning that there is no significant difference between the understanding of clay concepts between the control and experimental classes, the ability to design laboratory research is sig. (0.001) <α (0.05) means that there are differences in average very significant between the control and experimental class. Obtaining the average value of understanding the clay concept of the control class is 80.7, and 84.1 being the experimental class. The average value of the control class research capacity (58.8), and the experimental class (80.7). So that the reconstrution model of laboratory research studies clay context PSDM based, very excellent to used improve student research thinking, so students can to carry out scientific research, independent, and free from plagiarism.***

Keywords: Education Model Reconstruction, Research Laboratory, problem solving decision making

1. Introduction

Laboratory Research (LR) one of the subjects in group work skills in the department of chemistry education in Papua LPTK one. RL required for all student teachers of chemistry, with the purpose of the mission lectures and student passing standard course of study. In science students are able to manage natural resources in Papua both natural material resources and mineral resources. Therefore, student teachers of chemistry to professionals in the field teaching, and are also professional in the field laboratory research .

In order to achieve the goal of the course, students need to be equipped understanding of the concept of the LR was significantly supported by research planning strategy through the context studied. Directs the pattern of thinking in planning research studies such as the selection of topics related to Papua's natural resources, identify problems, look for relevant supporting theory, identifying the research design, methods, and data analysis approaches. Thus lectures laboratory research context of natural resources are effective.

According Skoumios & Passalis (2010), many studies found not reflect actual research, but tend to be the implementation of tasks that must be met in completing the final task, so are more likely to study the apparent plagiarism. The emergence of the problems frequently encountered by students due to the concept of thinking research was never equipped to students. In addition, the pattern of lectures that do not integrate the context of the lecture as a potential source of LR. Hence the importance of directing students to study in order to research ways of thinking can be accomplished in accordance with the real purpose.

Students important to understand that the research activities of the laboratory is not just a theoretical substantiation complement lectures alone, but also part of the concept of learning to acquire, process and scientific attitude. As with any chemical science is knowledge that can not be separated from the laboratory as a means of proving the theory and it will be followed up or investigated. In general, laboratory research activities purpose to validate the concept of scientifically based problem and provide the skills that need students in preparation for becoming a thinker.

In chemistry lecture material should awaken a planning laboratory research activity which is the application of concepts of proof in the real world. A comprehensive

research can put goals in a space problem. In the space of all the problems of scientific thinking skills can be trained simultaneously as analyzing the problem, gather information, formulate hypotheses, work plan, carry out the work (retrieve data), evaluate, conduct discussions, draw conclusions, and reporting (Utomo & Ruitjer, 1994).

Additionally Harwood in Blonder (2008) proposed a more effective model for learning science-related research in the laboratory. There are several important things prepared as follows: the element of observation, identify problems, define problems, articulate expectations, establish scientific thinking, and asking questions that are central to the students in conducting research.

According Hofstein, *et al*. (1982, 2004), research and laboratory experiments in chemistry plays an important role. The most important benefit when educators provide an overview of information that can be learned by the students about things they do and follow up. According to Hodson (1993, 1996), improper delivery of information to make students do not have a clear objective for not thinking clearly supported.

In understanding the concept of research, some things to think about in order to follow-up study, directed thinking in planning research based on the indicators define problems, taste problems, see the gap problem, decide a potential problem, showing alternative solutions, choosing a solution, solution evaluation, decide the most appropriate solution based on scientific information, the ability of self, the input of experts, developing issues, new knowledge, methods of knowledge, circumstances, implement solutions and focus on implementation, have a good framework, monitoring the implementation, and evaluation of all stages (Ross & Morrison, 2003; Drucker, 2002).

According Stiggins (2010), reasoning or thinking in solving the problem is very important in the lives of learners. Therefore, education practitioners should always position themselves to help learners better to be a thinker (thinker) and fixers (problem solvers) are more effective, so hopefully they are able to solve the problems faced in everyday life and can help himself or others. To achieve these objectives, should have to: 1) rediscover a better vision of the kinds of thinking, 2) knowing how to apply the vision of a quality assessment.

According to Haines (2006), with the thinking of research students are expected to develop plans, strategies, and actions in seeing things that need to be discussed from theoretical lectures to achieve the desired results. It is therefore important to direct the points question on the research plan, define the problem of the various problems in the pan, take decisions in the selection of each action, preparing for the implementation of research, making data analysis strategies, reporting, and planning the implementation of the results. Brainstorming is a very important thing used to collect and develop ideas minds of students, then the student's ability to make decisions on any range brainstorming.

Based on the various opinions and research can be concluded that when educators have been able todirect the thinking skills of students in the lecture material, it is expected that students will be able to design research in the laboratory through the various problems that exist around him.Somethings that are often found in the lecture that constrainthe implementation oflaboratoryresearchare: Paradigm lecture was patterned traditional laboratory studies in which the lecture material does not describe a construction/planning chemistry laboratory research. Material presented does not establish a paradigm that directs the mindset of students on a study by the selected courses. Lecturers have difficulty developing courses that can improve thinking abilityof students studychemistry teacher candidates.

The above problems are also found in the course of chemical education courses one LPTK in Papua province. Laboratory studies one of the compulsory subjects are provided to accommodate the natural resources of Papua synergized with some elective courses that are prospective subjects in laboratory research. In fact, the implementation of lectures and research laboratories do not have contributed to the natural resources of Papua, originally a lecture purpose or mission. Therefore, this subject is less effective and often an obstacle to the completion of final project. This is due to the students do not get the mindset that can steer the topic of laboratory research plan.

In this study, researchers conducted a renewal program to reconstruct the course of lectures program based problem solving decision making. Reconstruction lectures associated with the design of the course teaching materials that suit the needs of students that context chemical material which is a natural clay mineral resources are abundant in Papua. Program tuition is determined by the level of difficulty and depth of the material, typical of lecture material, the complexity of the selection strategy of lectures, student character, lecture facilities and infrastructure conditions are available in accordance with the conditions, needs, potential and characteristics education unit and learners that can be used as a reference, guides, guidelines.

To reconstruct thePL lecture program, the researchers adopted a construction system did a ctic teaching model whichcomes from Germany, known as the Model of Educational Reconstruction (MER). MER introduced by Duit, *et al*(1997, 2004). Based onthe abovestudies, designed a course of lecturesin line with the problems found. Classthe PLcontext of potential prospects Plclay is directed at research student teachers think chemistry throughproblem solving approach-decision making). The title ofthe studyis"Reconstruction Model Education of Laboratory Research Course Context Chemical Clay,Decision Making Problem Solving (PSDM) Based, To Improve Research Thinking Skills From Chemistry Teacher Candidates".

2. Research Methods

Research design is using mixed methods research model of embedded (Creswell, 2009). Lecture programs laboratory research clay context of problem solving decision making (PSDM) based, which consists of three stages: pre-

intervention, intervention, and analysis. Before the stage MER-PLPSDM implemented, has done preliminary studies to observe the state of lectures LR and the background research. The phase before the intervension needs analysis chemistry student teachers. Intervention phase is the implementation phase of the reconstruction model of didactic (MER) clay context PSDM clay, and the data analysis phase is the processing and analysis of the results of the data during the research process. Samples are 30 students 7th semester chemistry education, were divided into two groups of samples (control class and experimental class). Normality test data showed one abnormality data, so as to know the difference in average scores acquisition and capability of understanding the concept of the LR between the control group between the experimental groups, the data is processed using non-parametric statistical Mann Whitney test with SPSS version 22. Test N-gain normalized to know the performance improvement of understanding concepts and research skills in the control class and experimental class.

3. Results and Discussion

The data obtained and analyzed in this study is a preliminary study in the form of search titles LR showed 80% the title and same theme, it can be concluded the inability of students to manage a scientific study. Teaching material products that have been validated expert teams (validation expert judgment), with a score of expert judgment reached 94.7% with a revised 5.3%, with a conclusion worthy of teaching materials to be used. Data normality test experimental and control groups at the level of 95%, the Shapiro-Wilk test (N <40) by using SPSS Statistics 22. According to the criteria of normality: If $L_{maks}<L_{table}$, then the data is normally distributed, If $L_{maks}>L_{table}$, then the data not normally distributed. Aspects of understanding the concept of L_{maks} (0,959)>L_{table} (0.881), the data were not normally distributed (TN), while for aspects of laboratory research capabilities L_{maks} (0.937) <L_{table} (0.881) normally distributed data (N). Data normality test experimental group showed for understanding aspects of the concept L_{maks} (0.937)>L_{table} (0.881), the data are not normally distributed, and for aspects of OT abilities L_{maks} (0.436) <L_{table} (0.881), normal data. Data Normality Test are shown in Table 1 and Table 2.

Table 1: The Normality Test of Control Group (α = 0,05)

Aspect	Kolmogorov-Smirnov[a]			Shapiro-Wilk			Category
	Statistic	Df	Sig.	Statistic	df	Sig.	
Concept understanding	,182	15	,195	,959	15	,673	TN
LR ability	,216	15	,058	,937	15	,346	N

Table 2: The Normality Test of Experiment Group(α= 0,05)

Aspect	Kolmogorov-Smirnov[a] (Lilliofors Significance Correction)			Shapiro-Wilk			Criteria
	Statistic	Df	Sig.	Statistic	df	Sig.	
Concept Understanding	,216	15	,058	,937	15	,346	TN
LR Ability	,498	15	,000	,436	15	,0001	N

The presence of any of the datathatis not normal, so in this study used non-parametric statistical test of two independent samples (Mann Whitney test) with SPSS version 22 statistical, to examine differences in the average of the two sampel (controland experimental groups).

Ho: There is an increasein the understanding of the concept of learning achievement significant between the control class students and classroom experiments.

Ha: There is adifference in learning achievement improvement in understanding the concept of significant between-class students of the control and experimental class.

Criteria: If the value of the significant(sig.)>α, then Ho is accepted, or rejected Ha. The result of the average difference in understanding the concept of the control group and the experimental group are shown in Table3.

Table 3: The Average Difference test results of understanding clay concept of control and experimental classes

			Achievement	
Mann-Whitney U			90,500	
Wilcoxon W			210,500	
Z			-,926	
Asymp. Sig. (2-tailed)			,354	
Exact Sig. [2*(1-tailed Sig.)]			,367[b]	
	Group	N	Mean Rank	Sum of Ranks
Achievement	1,00	15	14,03	210,50
	2,00	15	16,97	254,50
	Total	30		

In the statistical analysis showed that the significant value of 0.354, so that sig. (0.354)>α(0.05), meaning that Ho is accepted. So it can be concluded that there was no significant difference to the achievementof understanding the concept of the control group and experimental group. Statistical test resultdifferences in average ability of researching are shown in Table4.

Table 4: The Average Difference Test Results Researching Capability LR Grade Control and Experimental

	Group	N	Mean Rank	Sum of Ranks
The Ability	1,00	15	8,20	123,00
	2,00	15	22,80	342,00
	Total	30		
			The Ability	
Mann-Whitney U			3,000	
Wilcoxon W			123,000	
Z			-4,549	
Asymp. Sig. (2-tailed)			,0001	
Exact Sig. [2*(1-tailed Sig.)]			,000[b]	

Instatistical tests showed Asymp. Sig. (2-tailed) means that significant value thus obtained 0,001sig. (0.001) <<α(0.05), meaning that Ha is accepted. So it canbe concluded that there are differences inthe increase in research capability (the PL) are very significant between students of the experimental group and control group students. When viewed from the value of the acquisition of understanding of the concept of clay, andthe abilityto design the Plat pretest and posttest control and experimental classes can be seen from the graph1, and2.

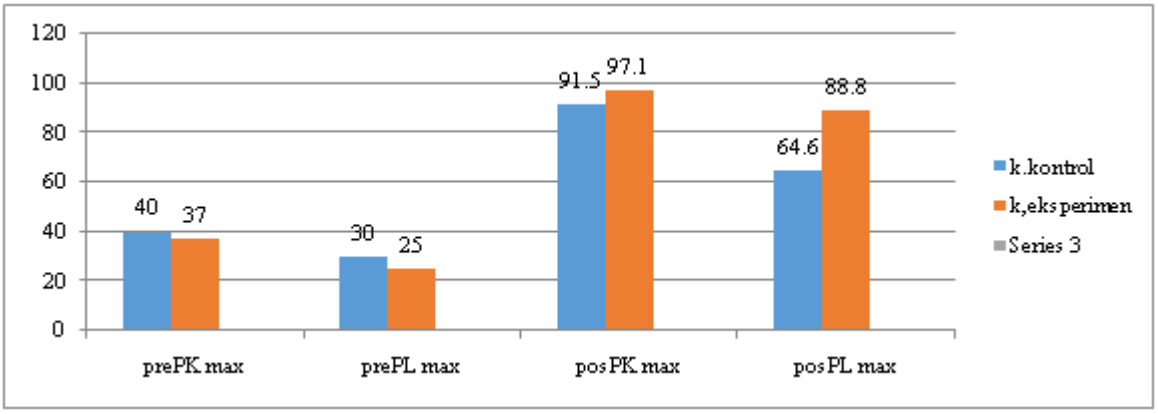

Figure 1: Thegraphgainthe highest scorepretest and posttestunderstanding ofconceptsandresearch skills/PL

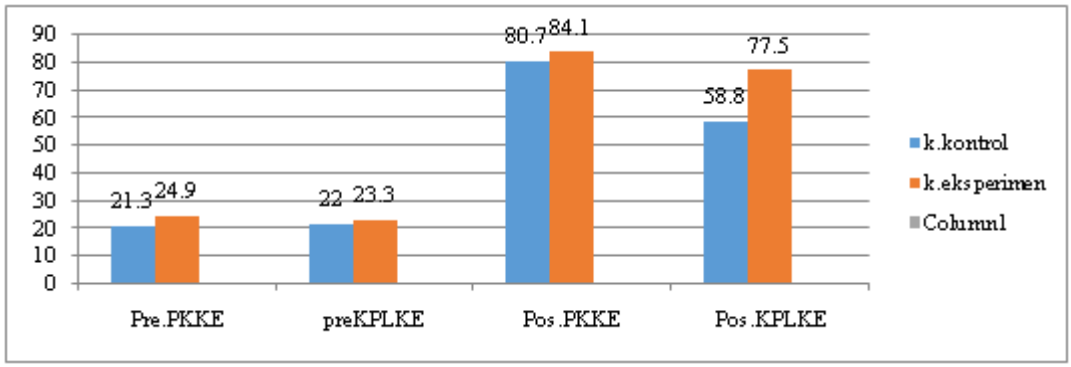

Figure 2: Thegraphacquisitionmean valueandcapabilityof understandingthe concept ofthe PL

Figure charts 1 and 2 show the pretest value acquisition capability concepts and research skills between the controlclass (pre.PKKE and pre.KPLKE) have almost not ticeable difference. Similarly,the acquisition value of the mean post test understanding of the concept(pos.PKKE) alsodid notdiffersignificantlytoo. However,the acquisition value of research skills (the PL), showsthe yield of the experimental classis significantly higher. This is show significant increase inthe ability ofthe experimental class after treatment PLPSDM.

Score understanding of the concept of control and experimental classes is shown through the acquisition of N-gain, forthe control class(0.73) higher category, class experiment (0.77) higher category. Obtainin score of N-gain research skills class controls(0.43) the medium category, the experimental class(0,71) higher category. Obtaining N-gain experimental class(0,71) higher category. Based on theacquisition ofN-gain can be concluded that there is a significant increase in the ability of concepts betwee the control and experimental classes. However, the ability of researching, researching upgrades difference between the control and experimental classgrade, grade control demonstrated ability is still being researched and have not beenable to go beyond the standard limitvaluethe PL, butthe experimental class research capacity increased significantly. In thinking skills class PLPSDM controlstudy, also increased significantly.

4. Conclusion

The conclusion of the analysis and discussion of research is the study proves that the model reconstruction of didactic (MER) program of lectures and research laboratories in the context of the clay-based problem solving decision making (PSDM), managed to improve the ability to think research experiment class students, this is evidenced by the acquisition of an increase in balanced ability and capability of understanding the concept of the PL at the high category. The average difference significantly occurs in the acquisition of PL scores between class and class control experimentation. Value success PL ability experimental class is higher than the control class, this is due to the ability to think PLPSDM who has owned the experimental class students that have the ability to aspects of the problem of sensitivity, choice of solution, for accurate decision making, solution implementation, and evaluation. In addition, teaching materials reconstructed also be an asset for students, in the context of managing a research through the material being studied.

5. Suggestion

Based on theresearch conducted, the suggestions can be put forwardis thatthis studyhas shownthat theapplication ofthe lecture program MER research chemical context-based clay minerals HRD, has been able toimprovestudent research thought experiment class, then the model MER-PLPSDM can be an alternative model of lectures on lecture materials as potential sources of research.

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