The Effect of Model Learning By Using Media And Mathematical Ability With The Learning Outcome of Students In Material Solubility And Solubility Product

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ABSTRACT: This research was summarizes by results of the study, which aimed to determine the effect of PBL learning model by using media actually virtual media and real media, students classified in high and low mathematical ability and their interactions in the material solubility and solubility product. This research used the experiment classes, by using 2x2 factorial, the population was held at 2 classes which one class given by model PBL combined with virtual media and the second classes was give by model PBL combined with real media in material solubility and solubility product. The hypothesis determined by significant level $\alpha = 0.05$, achieved that Fhitung (A) and (B) of 38.092 according Ftabel (0.05) (1.64) = 3.99, its mean Fhitung < F table, there was interaction between the learning model by using media and mathematical ability with the learning outcome of students. This research shows that students taught with the model PBL combined with virtual media on capable mathematical give highest average result (78.214 ± 7.495), when the students taught by the model PBL combined with real media at low mathematical ability students was held (62.5 ± 7.071). In effect of the simple test, students who have the mathematical ability of high and low do not shows different of significant result by the learning outcome of students in taught of using model and media, 2) There is an effect model of learning by using media for learning outcomes chemistry students on the material solubility and solubility product, 3) There is an effect on learning outcomes mathematical ability of students on the material chemical solubility and solubility product. The results of the study suggest that using PBL models with virtual media at high mathematical ability of students, and the use of PBL models with real media for improving student learning outcomes in mathematics capable students who are low on the solubility product material.

KEYWORDS: Problem based learning, Virtual Media, Real Media, Interaction, Learning Outcomes

1. INTRODUCTION

The main problem in learning in formal education (school) today is still low absorptive capacity of learners. This achievement is certainly a result of the learning conditions are still conventional and do not touch the realm of dimensions learners themselves, namely how to learn. In the sense of something more substantial, that the process of learning to this day still gives dominance teachers and do not provide access for students to develop independently through his discovery in his thinking process. On learning atmosphere tends to teacher-centered classroom so that students become passive (Trianto, 2011). In class the children are directed to the child's ability to memorize information, the brain is forced to recall and hoard information without being required to understand the information he remembered it (Sanjaya, 2006). The success of a lesson can be seen from the ability of learners to learn independently, so that essential knowledge is the result of learning by himself. Therefore, the approach used in the learning process should create and foster a sense of not knowing to want to know, so that Curriculum 2013 using a scientific approach to be used in the learning process (Magdalena, et al, 2014).

Curriculum 2013 using a scientific approach or scientific approach, consisting of observing, ask, gather information, associates, and communicates with the view Kemendikbud that knowledge can not be moved away from the teacher to the learner. Learners are subjects that have the ability to actively search for, cultivate, construct, and use knowledge. Therefore in active learning is determined by the learning component that forms a learning system. In this case the teacher has the task to select appropriate learning models and in accordance with the material that will be presented to obtain a better learning outcomes again.

Curriculum implementation in 2013 there were problems in the learning process which has resulted in maximum learning process chemistry so that the impact on the low student learning outcomes. The problem is the lack of attention of students during the learning process takes place because of the steps of the learning model is oriented mainly to teachers, resulting in students tend not interested in learning. This resulted in many of the students who have not reached the maximum value completeness criteria (KKM) on the subjects of chemistry. has not reached the KKM. This is because the learning process is oriented mainly to the teacher so the impact on the low student learning outcomes.

To overcome the low learning outcomes for students in the learning process teachers must implement innovative learning model. One of the innovative learning model that can be used in the process of learning is problem-based learning model or Problem Base Learning (PBL). This learning model is the model that was recommended in 2013. Curriculum Model PBL applied in teaching chemistry in Curriculum 2013. This model can direct the activities of learners by involving their own sense and motivation to be able to explore curiosity in self-learners. Özdemir (2015) states that the purpose of problem-based learning gives students to get creative learning experience. With this approach the students are busy with their own learning experience so that the information obtained is more meaningful. According Tiantog (2013) in the PBL students work in teams to set goals, obtain information, and make decisions, they apply the knowledge they gained through their research not only to solve problems but also to communicate their findings.

2. DISCUSSION

Chemistry is one of the subjects at the level of high school (SMA). If examined from the nature of science, chemistry is an experimental science in the study of chemical means is not enough just to hear and read, but do activities such as learning lab that will help build students' knowledge of the material being studied. In general, students tend to learn by rote chemistry, chemical material that is either a mathematical or non-mathematical (Addiin, 2014). Chemical materials namely solubility and solubility product is a material listed in the syllabus subjects of chemistry curriculum material 2013. solubility and solubility product predict discuss the formation of deposits, the effect of adding ion namesake. In this material also contained concepts and abstract issues that are considered difficult by students that result students can not build a full understanding of learning materials that lead to the result that less than the maximum learning in students. So the use of PBL learning model can overcome the problems that arise when the learning process is ongoing.

To maximize the learning process chemistry in material solubility and solubility product PBL models applied using instructional media. Septi Aprilia (2011), wrote the utilization of instructional media in teaching and learning can generate new passions and interests, raise motivation and stimulation of learning activities, and even bring psychological influences on students. One medium that can be used to deliver learning chemistry is a real media (real) such as lab activities in laboratories. Through practical activities in the laboratory students will get a concept is learned through direct experience, observe, interpret, predict and ask questions during the activities take place in the laboratory (Hadi, 2009). Laboratory is one effective learning media and a positive impact on student achievement, attitudes and values of students (Kusnadi, 2012). The laboratory also is a source of learning chemistry is indispensable to provide a real experience to the learners, as one of the supporting factors of learning (Darsana, 2014). However, the utilization of laboratory for lab work less effectively done because of lack of time to carry out the laboratory experiments, the time is used to solve the material and because of limited laboratory facilities such as tools and materials lab therefore need to design instructional media chemistry-based laboratory such as virtual media by using laboratory in virtual form (virtual). Laboratory lab activities not only be done in the real laboratory, administration practicum through a virtual laboratory (lab cleaning) can replace real laboratory (Wati, 2014). Application complementary to the chemical laboratory and the laboratory is a major part of the chemistry lesson. Laboratory is essential for making chemical concepts and makes the student will be easier to understand (Altun, 2009). Learning in a virtual laboratory is learning through indirect observation. According Parno and Dwitya in (Nurrokhmah, 2013) Virtual lab is a virtual laboratory that shows animations resemble practicum in laboratory practicum.

Success in chemistry learning, in addition affected learning methods and media, can also be influenced by internal factors that have an influence in the learning process. Internal factors include the students' creativity, mathematical ability, scientific attitudes, learning styles, motivation to learn, and others (Aprilia, 2011). In this case the researchers tried to see from the mathematical ability of students, because of mathematical ability is indispensable in the study of chemistry, especially on the material solubility and solubility product the largely count. Kusumaningrum (2012) write, mathematical ability can be trained how to think and reason in drawing conclusions, for example, through investigation, exploration, experimentation, showing similarities, differences, consistent and inconsistencies.

Math skills tend to be individualized, meaning that each individual has a different mathematical ability. Mathematical thinking skills into one benchmark high-level thinking skills (high ordert hinking skills). The student's ability in solving mathematical problems directly proportional to the ability of students' mathematical thinking. Students with high mathematical thinking skills will be able to find a high problem solving. The ability to think mathematically unique student in solving mathematical problems also related to students' reasoning ability (Supryanto, 2014). Based on the description above, the problem in this study were (1) whether there is an interaction between the learning model by using the media and mathematical ability of the results of studying chemistry student at the material solubility and solubility product (2) whether there was an effect model of learning by using media for learning outcomes chemistry student at the material solubility and solubility product and (3) whether there was an effect on learning outcomes mathematical ability of students on the material chemical solubility and solubility product.

Studies conducted in SMA N 1 Stabat used by purely experimental method. The experimental group I was taught by PBL models with real media and experimental group II taught by PBL models with virtual media. The research design

uses 2 x 2 factorial design independent variables include models with virtual media PBL and PBL models with the real media, the dependent variable is the result of studying chemistry and moderator variable is a mathematical ability. The data collection is done by using tests to measure student learning outcomes chemistry and mathematical ability of students. Mathematical ability test data obtained prior to treatment while studying chemistry student outcome data was obtained after the sample being treated. The statistical test performed at a significance level of 5%. Before the test performed statistical analysis prerequisite test, namely the test of normality and homogeneity of data obtained. The data were then analyzed by descriptive.

The results of the research data showed mathematical ability of students using PBL models with real media (experiment 1) and PBL learning model with virtual media (experiment 2) described in Table 1 as follows:

Table 1. Data Distribution Capabilities Math High and Low

Kemampuan Matematik	Jumlah	Kelas Eksperimen 1	Kelas Eksperimen 2
		Frekuensi	
Tinggi	32	18	14
Rendah	36	16	20
Jumlah	68	34	34

Table 1 shows that the distribution of low mathematical ability is more dominant than the high mathematical ability

Table 2. The mean Learning Outcomes Based Learning Model Using Media

Kemampuan Matematik (B)	**Model Pembelajaran Dengan Menggunakan Media (A)**	
	Model PBL Menggunakan Media Riil (A_1)	Model PBL Menggunakan Media Virtual (A_2)
Tinggi (B_1)	(75 ± 5,940)	(78,214 ± 7,495)
Rendah (B_2)	(62,5 ± 7,071)	(61,25 ± 7,232)

Table 2 in above shows that the average value of student learning outcomes with PBL learning model using virtual media at high mathematical ability of students giving the highest average than using PBL learning model with the real media.

The research data were analyzed using a statistical test Analysis of Variance (ANOVA) at $\alpha = 0.05$ if the criteria of F <F table then Ho is rejected.

The result of the first hypothesis test, the results of testing decision then Ho is rejected is F count 38.092 and F table 3.99 Fhitung < Ftabel. This means it can be concluded their interactions / relationships of interdependence between the ability to mathematically model of learning by using media for learning outcomes chemistry students then conducted further tests (LSD) to the effects simple of each factor in the type of learning model using the media and factor mathematical ability. And we concluded that the learning outcomes of students with PBL learning model using real media with low mathematical abilities, were not significantly different (higher) than the learning outcomes of students who were taught by PBL learning model using virtual media with low mathematical ability. The results of this study also showed that the learning outcomes of students with PBL learning model using real media with high mathematical abilities, were not significantly different (lower) than the learning outcomes of students who were taught by PBL learning model using virtual media with high mathematical ability .. Research Aprilia (2011), which in terms of the ability of math shows students who have a mathematical ability higher if given treatment using virtual media will get results better learning when compared with students who have a mathematical ability high by using media real, while students who have the mathematical ability low education outcomes are still low when given treatment with real or virtual media, because the material characteristics solubility and solubility product is a count, so a mathematical ability is very supportive in resolving the problems faced during the learning process. In this study, students who have a lower mathematical ability with real media have flats of higher learning outcomes than students with low math ability with virtual media. Students with low math ability may make observations directly with the real media while the virtual media students perform indirect observation. Students who have a lower mathematical ability during the learning process requires more real experience to be able to think logically, decisive action and draw conclusions in the learning process. This is in line with research Kusnadi (2012) which states that students with low math ability with real laboratory media have higher learning achievement than students with low math ability with virtual laboratory media.

The second hypothesis test results of students' learning outcome data concluded that the learning model using the media has an influence on the learning outcomes of students in materials chemistry solubility and solubility product

Learning with PBL models make students try to find their own concept or intent of the material being taught, because the teacher learning does not deliver the material directly. Enterprises students in finding their own understanding of these materials make learning more meaningful and material can be stored longer. The greater the involvement and ideas of the students (group of students) used in the study, the greater the sense of having them on the model used. Model PBL teaches students to think more creatively and independently assisted by the use of effective media that virtual media. Learning by using virtual media using the media-shaped lab simulations and animations that run solely by students will be more active in solving problems. Additionally virtual media can be performed repeatedly without spending the time to prepare repetition so students can repeat practicum until they understand.

PBL learning model helped by using different learning real media with virtual media where the real media not all students are active for attention in the process of experimentation because they do not do so directly, but teachers who staged a demonstration in front so there are still students who toyed so that no part certain stages are missed and they do not understand the subject matter being studied. This is in line with research Rokhimulloh (2010) concluded that there is the influence of the use of virtual labs and real laboratory of learning achievement in the material reaction rate, the use of virtual labs with an average value of 61.24 and a real laboratory with an average value of 53.52.

The result of the third hypothesis of the data of student learning outcomes concluded that the mathematical ability of students had an influence on learning outcomes chemistry student at the material solubility and solubility product was concluded that students who have a mathematical ability height gives the average results of studying chemistry higher compared with students who have the ability low mathematics.

Material solubility and solubility product is a material that is a matter. At the time of the learning process, students have the mathematical ability of high perform mathematical calculations more quickly and accurately, because the mathematical ability that can assist students in solving the count in the material solubility and solubility product, so that students get the achievement cognitive well when compared with the achievements of students who have a lower mathematical ability. As well as students with high mathematical ability to be pleased when the study material solubility and solubility product that is the count because they felt they had had enough basic ability is the skill in operating figures, so it will be easier to shape the understanding. Meanwhile in students with low math ability is happening is a strong will to learn to pursue their limitations in terms of mastery of the material solubility and solubility product. It is also in line with research conducted by Aprilia (2012) which states that there are significant high mathematical ability and mathematical ability lower on student achievement.

The study concluded that (1) There is an interaction between the learning model by using the media and mathematical ability of the results of studying chemistry student at the material solubility and solubility product, (2) there was an effect model of learning by using media for learning outcomes chemistry student at the material solubility and solubility product. The PPA learning model application with virtual media on a high mathematical ability students studying chemistry results higher. Instead, the application of PBL learning model with real media at low mathematical ability of students learning outcomes higher chemistry, (3) there was an effect on learning outcomes mathematical ability of students on the material chemical solubility and solubility product. Application of PBL learning model with virtual media and PBL learning model with real media at high mathematical ability of students studying chemistry results were higher than the low mathematical ability of students.

From the conclusion it is suggested that the teacher can apply PBL learning model by using virtual media at high mathematical ability of students, and apply learning with PBL models with real media for improving student learning outcomes in mathematical ability of students is low.

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