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Internet-Based Learning Management Model to Improve the Student's Mathematic Problem Solving Ability

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Abstract: This paper is published from results of a study that aims to develop a model of mathematic learning that can improve the ability to solve Students mathematic problems. It's a learning management based on internet model. This model can be used outside the school through homework that can be controlled by the teachers by using interned media with Google Class application. Furthermore this paper provides information about the development of learning management based internet model abbreviated to "Lemansisnet" which is the development of the model and its learning tools refers to Plomp. The design of model components refers to Joice, Weil & Shower. To measure the validity, effectiveness, and practicality refers to the criteria Nieveen. Further, problem solving ability targeted to be improved refers to problem solving phases by Polya's. Validation process of the model and learning tools is done by six validation teams. Further, the valid model were tested at junior High School 2 Parepare. Based on the development process obtained model that are valid, effective, and practical. This model consists of 6 phases; 1) Problem orientation (on line) 2) Exploration; 3) Guided Training 4) Presenting results; 5) Reflection; 6) Self-Training (on-line).

1. Introduction

There are many models that have been created to solve the mathematic problem such as G.Polya (1945)[4], Scohenfeld (1985), Wilson et al (1993) and Mason et al (1982) which quoted by Benjamin Rott [5]. Polya Model is model that is widely cited up to now, and is widely used in solving mathematic problem at school in Indonesia. However, various research results; TIMSS [6], PISA [7], Marwati [8], Masud [9] students' problem solving skill in Indonesia in general and in the city of Parepare in particular is still low. Among other things because of; 1) the limited time at school for children to practice their ability to solve mathematic problem, 2) lack of problem solving exercises according to the Polya steps, 3) less active students in constructing understanding of mathematical concepts in such a way that ability to think and reasoning is also low, 4) teachers are not creative in choosing the learning model according to the characteristics of the mathematic material taught to the students [8]. The low PISA 2012 results can indicate that our students are not accustomed to solve non routine problems, our students are only commonly faced with problems that have been dicussed in the classroom, they are difficult if faced with new problems (Pranoto)[10]. The main problem in Indonesia

related to learning is the low mastery of teachers in mathematic skill that can improve students' mathematic problem solving skill, so that learning is too focused on the transfer of knowledge alone rather than buuilding deductive thinking skill (Pranoto) [11]. Whereas learning should be directed to the formation of a meaningful experience of grace, but no merely the delivery of nirmakna facts that should not support the growth of reasoning. As result; 1) Students are weak in modeling real situation into mathematic problem and interpreting mathematical solutions to real situation. Even though the mathematical skill demanded by the world is fully mathematic skill: from modeling, finding mathematical solution, interprets to the th eoriginal problem. Students are generally accustomed to solve mathematical problem only without interpreting them to real world problem. This means that students focus on the world of mathematic only, but not fully complete with the experience of interacting between the real world and the world of mathematic. 2) Stage of reasoning summarizes (*comprehension*) and analyze very less. This means that the sophistication of reasoning demanded by the world is higher than which runs in Indonesian Mathematic learning practice. Otherwise, demands of the world on the skill of completing the difficult calculation have been reduced.

On the other hand, the number of internet users in Indonesia continue to increase, the results of the 2016 survey about 132.7 million or approximately 51.8% are internet users from Indonesia's current population is 256,2 million (APJII) [12]. If reviewed by age, approximately 75,5% are ages 10-24 years old, and if viewed in terms of employment about 69.8% are students. While if viewed in terms of internet user content about 93,8% is education. While users of email adress used the highest is google about 61.7%. Therefore if the internet is used in learning that utilizes quality time outside school hours can use google class application by using gmail. Therefore, the result of research written in this paper is how to develop the learning management based internet model which can improve mathematical problem solving ability in Parepare Citi especially and in Indonesia generally known as "lemansisnet" (learning management based internet). By google class is expected to overcome the lack of time in school for students to explore their knowledge independently. Through class google application is expected to grow the ability in mathematic for students and for teachers and in turn the problem solving skill can be improved as competence demands today.

Shifting the role of teachers as facilitator to students provides opportunities for students to be able to learn independently, actively, and creatively. One of the most strategic student learning resources today is information and communication technology (ICT) in the form of internet, because the internet not only improves the efficiency and effectiveness of the learning process, but also affects the development of the material. Patahuddin & Dole [13] reveals that internet activities such as problem solving, mathematical search can help students achieve three goals: 1) As a great tool to solve everyday problems; 2) Facilitate students in learning; 3) Establish students' confidence to have a good understanding and ability in using ICT. Furthemore it is said that the use of the internet is very interesting to make students discuss more and stay focused. On the other hand, Adnan [14] revelas that the constructive ICT based constructive biology learning model is attractive and effective in improving learning motivation, cognitive and metacognitive ability of learners. While cognitive and metacognitive ability can improve the mathematic problem solving skill of high school students in the city of Parepare (Mas'ud) [9].

The results of Martin & Fernandes [15], Akman & Karaslan [16], Mahnegar [17] and Cavus & Alhih [18] reveal that learning managementt system based website can improve the learning quality, because it can improve communication between teachers and students, and communication among students. Because there is space for them to share results, they can increase motivation, stimulation, attitude, interest, focus on solving problem/task, trust, comfort, perseverance, commitment, responsibility and attitude.

Thus, by Eric Ashby (1972) cited (Rusman) [19] teachers should be able to utilize information and communica tion technology (ICT) in learning activities, because the world of education has now entered the fifth revolution, the revolution in which the use of ICT in learning. On the other hand, Josep (Kusuma) [20] states that the quality of education issue lies in the management. One of thing to note according to Kusuma [20] is learning reformation, from teacher-centered learning to student-

centered learning in order for knowledge to be gained significantly. Because knowledge is now more important than other resources, knowledge is seen as the primary resource used in today's world of work, knowledge can be used to create differential advantage (Marquardt) [21]. Therefore, the learning presented by the teacher should be able to develop the student's thought and ideas.

Learning that can develop student's thought, ideas and reasoning is the learning that gives students the chance to learn meaningfully. Learning is said to be meaningful when children are given the oppotunity and facilities to be able to study independently by serving information through discovery. As revealed by (Pritchard) [22] that knowledge and understanding are gradually built up by students by their own experience in learning.

To realize the quality of quality learning, the role of teachers is very strategic, to be able to take advantage of computer and internet media. Because the teacher as a learning manager, as a facilitator and as a leader of learning. Therefore it is important for teachers to apply the principles of management in learning. Because the application of learning management is seen to correlate significantly with the learning outcomes of students (Saprin[23]. Learning management system based internet can help create problem solving models (Kidney et al), [24]; (Psycharis)[25].

2. Theoritical Review

There are several theories that underlie the development of Lemansisnet model that is; 1) Theory of constructivism. The implementation of this theory in learning more emphasis the process than the outcomes. This means that learning outcomes that are the goal of learning are still considered important, but the other side of the learning process that involves strategies, models, approaches and methods are also considered important. Therefore, learning is an active process of constructing knowledge. The active process is strongly supported by the interaction between students and teachers as well as the interaction of students and other sources. 2) Cognitive theory. One of the most needed cognitive theory in improving problem solving skill is information processing theory. 3) Information processing theory explains the processing, storing, and knowledge recall from the brain (Slavin)[26]. This theory explains how someone obtains some informations and can be memorized for a long time. Therefore, it is necessary to apply a spesific learning strategy that can facilitate all information processed in the brain through multiple senses. Information processing states that students processing the information, monitoring it, and planning the strategy related to the information. The point of this theory is memory processing and thinking (Santrock) [27]. Students gradually develop the capacity to developing, processing information, and gradually they can also acquire complex knowledge and skill.

To achieve the objectives of effective mathematic learning, the learning must be designed carefully based on appropriate learning theory, so the students can learn according their readiness, and in according to their thinking stucture. So that, it should be used the right model, approach and method. In order for students to reach the high level thinking stage, students should be trained to study independently, have a meaningful learning and can manage to processing the high quality information, so that they can adapt and generalize their knowledge for the purpose of learning. Therefore, teachers as the learning leader do two main efforts: 1) Strengthen the motivation of students, and 2) Choose the appropriate learning model.

Some researchers have disovered various ways to bring students to the mathematical learning to build their mathematical problem solving skill. (Preety) [28], (Weber)[29] and (Wetley)[30] revealed that teachers play a role in developing students' reasoning, guiding students to develop good criteria in making an argument, encouraging reflection of students. Therefore, teachers should first have a strong understanding of the valid argument in communicating and reasoning.

3. Methods

The type of research used is Research and Development. To measure the quality of the model developed learning device and research instrument. Because quality is measured by its validity, effectivity and practicality. So that, the design of the development of model and learning device, is used developmental plan by (Plomp) [1] they are:

Initial Assessment phase. Based on the analysis of environmental demand, the problem studied is to develop a learning model that aims to improve the problem solving skill of students. In learning process, students need to be actively involved in collaboration and interaction among students with students and teachers. Therefore, in this phase, we did the study of (1) Problem approaches, (2) Learning theories (3) theory about learning model. Besides, at this phase also conducted initial assessment through preliminary research for the purpose of identification of (1) condition of students include learning outcomes, mathematical problem solving skill, as well as daily issues on the environment that use of mathematical communication, (2) analysis of the material are identifying, detailing, and coceptualizing systematically for organizing the learning material. Analysis of the students' tasks, (3) identification of the condition of the mathematic teacher and their teaching-learning process in the school. Based on these results, finally designed a model of learning that is named Lemansisnet, the learning management based internet model.

Design phase. In this phase, a learning model is developed that can improve the problem solving skill of students, by following the development model of (Bruce Joice)[2]. Activities undertaken at this phase design components which include: (1) learning syntax that refers to the learning management of planning, organizing (management and implementation of learning), Controling (Representation and evaluation), and follow up with the sequence or phases of learning expected to improve problem solving skill, (2) learning environment or social system, is a situation or an atmosphere and norms applicable in the model, such as the role of teachers and the activities that the students should perform during the learning process, (3) reaction principle, which provides an overview to teachers how to provide intervention to students and how to view and respond to each behaviors demonstrated by students during the larning process, (4) support system, that is condition required for learning model that is being designed can be done, such as class setting, instructional system, learning device, learning facility, and media needed in learning process, (5) impact of learning. The impact here is two kinds of impacts that are instructional and impact accompanist. Instructional impact is impact that is a direct result of learning, while impact accompanist is an indirect result of learning.

Realization phase. in this phase, a learning model is prepared as a continuation of the design phase. All that has been designed in the second phase, at this phase is realized and entered on the internet system by using google class application.

Evaluation and revision phase. This phase is focused on two things, namely: (a) validation and (b) conducting field trial prototype learning model that has been prepared. The activities undertaken at this phase in detail are: (a) Validating models, learning tools and research instruments. Activities undertaken at the time of validation are as follows.

(i) Ask for expert consideration about the feasibility of learning models prototype, learning tools, and learning instruments that have been developed. For this activity required questionnaire/format in the form of validation sheet submitted to the validator. (ii) Analyze the validation result from validators. If the result show: valid without revision, then next activity is a field trial. Valid with revision, a small revision produces two prototypes. After obtained prototype two, field trial is done. If it is invalid, then a major revision is needed so to obtain prototype two. Then return to the activity (a), which is asking for expert consideration. Here there is a chance of a cycle.

5) Implementation (trial)

4. Result and Discussion

By following the development path, first phase of the product is produced: (1) Teaching materials (2) Learning implementation plan, (3) Students activity sheet, all in electronic form, through validation. Furthemore, after revised and entered on the internet network through google class application, conducted a second session of research that is limited testing. To qualify effectivity and practicality. This paper only discusses the result of first stage of research is until learning device and instrument

that is valid and reliable. After validation by 6 validators and revised, the "lemansisnet" model syntax consists of 6 phases:

Phase 1. Planning
Phase 2. Managing
Phase 3. Controlling
Phase 4. Evaluating
Phase 5. Reflection
Phase 6. Feedback

Many teachers have been applied problem solving especially in Junior High School according to Polya steps, but the result is not maximal yet. When viewed from the root of the problem that students need quality time to train themselves in solving problem, so need to be created new model as the development of the application of Polya theory. The author provides an outlet by incorporating the elements of management and students are trained and controlled through learning technology (internet). In the learning management, teachers implement the learning through: 1) Planning, 2) Implementation, 3) evaluation and learning follow up and 4) supervision in order to achieve the learning objectives effectively and efficiently. Therefore in this learning management, teachers act as the manager, who has the responsibility to 1) plan, 2) organize, 3) direct (control), and 4) evaluate the learning.

In the learning management based-internet model (Lemansisnet) which has been developed by the author and applied by using scientific approach. Because the scientific approach can spur the high level thinking of students. The management process on the implementation of learning and its relationship with the scientific and Polya steps as shown in Table 1.

Table 1. Relation Of "Lemansisnet" Model, Scientific Approach, And Polya Steps In Developing Ability Of Mathematic Problem Solving

No.	Lemansisnet Model	Scientific Approach	Polya
1.	Planning	Ask a question	Understanding problem
2.	Managing	Make a hypothesis	Make problem solving model
3.	Controlling	Test the hypothesis with experiment	Solving problem
4.	Evaluating	Analyze the results of experiment	Solving problem
5.	Reflection	Draw a conclusion	Recheck the result
6.	Feedback	Communicate results	Repeating

5. Conclusion

In principle, the problem depends on the problem solver, not depending on the task. Because a difficult problem for a student can be easy problem for other students. To improve student problem solving skill, teachers shoyld focus on the problem solving process, rather than the result of the problem solving itself.

Because the Learning Management Based Internet Model is focused on having an impact on student's habit of working independently to explore their mathematical knowledge. Sharpen the reasoning for student's future.

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