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The Development Of "Advance Os" Teaching Model On Mathematics For Primary School Students

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Abstract: The aim of this development research study is for making a prototype of Advance OS teaching model on Maths for primary school students. It is based on Gall, Gall, & Borg Research and Development method which is developed from Dick & Carey's theory. The steps are now simplified into 3 steps: previous study, model development, and model measurement. On the first step--previous study--, the reseachers applied descriptive-qualitative approarch by doing library reasearch, field research of the product, and getting the preliminary research finding. On the second step--model development--, teaching model was developed by appliying Dick & Carey's model. This step was a compiling step of planning, developing draft of product, preliminary test, first revision, and widely test of product. The last step--model measurement--is the step for measuring the effect of the product. It was done by conducting "true experimental design" using "posttest–only control design". The research finding of this study is *Advance OS* teaching model on mathematics for primary school students. It has four big steps on appliying the model: presenting advance organizer, eksploring scientific approach, presenting organizer, and open-ended step including empowering cognitive structure by giving open-ended questions to the students.

Keywords: advance OS, research and development, primary school

1 INTRODUCTION

Education is a planned-well process to make comfort zone for the students, so that they can build their own talents, have high spiritual paradigm, self-control, brilliant ideas, possitive character, and some more skills which hopefully can be useful for themselves, their people, and their homeland. In a line with education, the teaching process of education is an interaction between students, teachers, and teaching sources around them. The process of education must be built in comfortable, fun, challenging, inspiring zone or place, and also motivating the students to take a part in the long process of education, including giving the students chance to compete themselves, and building their ability and spirit physically and spiritually. (Kemendikbud, 2014., 2016).

Based on Kemendikbud (2016), here are the principal concept on applying Curriculum-2013: (1) from students who-get-to-know into students who-look-for-to-know; (2) from the teacher-centre-learning into various-centre-learning; (3) from textual approach into scientific approach; (4) from content-based learning into competence-based learning; (5) from partial learning into integrated learning; (6) from single-answer learning into multi-dimension-answer learning; (7) from verbalism learning into applied-skill learning; (8) balancing and increasing process between hard skills and soft skills; (9) learning process which focus on the students as long-life learners; (10) teaching

process which focus on teachers as a real positive example (*ing ngarso sung tulodo*), building self initiate from students (*ing madyo mangun karso*), and building students' creativity during learning process (*tut wuri handayani*); (11) learning process at home, school, and around the world; (12) learning process which principally everyone is a teacher, everyone is students, and everywhere is "classroom"; (13) using IT to support effectiveness and efficience of learning process; and (14) every single student is unique.

Mathematics as a communication tool must support students to know, to explain, to give reason, to chat, and to read Maths as a part of teaching and learning process. Learning process will be meaningful when students can associate new paradigm into their own understanding. It gives impact into changing or modifying process of one's *subsumer*. Based on Ausubel's point of view, meaningful learning process is a process of entailing new information on relevant concepts of one's cognitive structure.

By entailing the relevant concepts so can make cognitive structured named *subsumer*, then here comes a question:" from where it is?" Building concept is basic process of to get the concept itself. It comes from a process of finding hypothesis, testing hypothesis, toward specific principal of teaching. A student usually has his own basic concept to build meaningful learning process.

On Ausubel's learning theory, meaningful learning process can be done through advance organizer model of learning. It supports students' concept of learning directly. It is designed to support students' cognitive structure, students' understanding of one thing, and how to maintaine, explain, and organize it well.

Principally, advance organizer model has three steps of activity: presenting advance organizer, presenting assignments, and empowering cognitive filed. Due to presenting on a presentation session, here are disadvantages and obstacles of the model. That is why we need to develop Advance OS teaching model. It is developed from the basic of Advance organizer model by combining it with open-ended and scientific approaches. On open-ended approach, the students get open problem to solve. Students must solve the problem by giving some more options and giving more correct answers of questions, so they can get new experiences in finding new thing. On maths learning process, the students get understanding, skill, concept, principal, or rule step by step. (Shimada, 1997: 56).

Open-ended learning process based on (Tim MKPBM, 2001: 114) is developed to build creativity and mathematics concept through a problem solving simulation. It gives students chance to investigate some strategies and ways to elaborate problems. Scientific approach itself is an approach applied on Curriculum 2013 in Indonesia. It discusses about observing, questioning, associating, experimenting, and networking. Teaching process on Curriculum 2013 is done by applying scientific approach itself. It is focused on modern pedagogical dimension during the teaching process. By developing Advance OS teaching model, hopefully it can increase primary school students' understanding on Mathematics.

1.1 Meaningful Learning by David Ausubel

Based on Ausubel (on Dahar, 2011: 68), teaching process can be classified into three dimensions. They are: first, information or teaching material(s); second, the way of student to entailed the information to the cognitive structure of student, including fact, concept, and general material which have been learned and remained by them. On the first level dimension, the students can get information from accepting learning that presenting information itself or in a final

design.on the second level, students must apply the information on the first level into their own understanding so that there will be a meaningful learning. Students can also remember the new information with no need to entail their previous understanding with this.

1.2 Ausubel's Theory in Teaching and Learning Process

In applying Ausubel's teaching theory to make it meaningful learning, a new concept or information must entail with students's structures of cognitive. Here are concept in meaningful learning as the following:

a. Preliminary rule
   It guides students to the material that will be learned today and helps them to remain the material or related information to use in remaining new information.
b. Progresive Differenciate
   It a process to arrange concept by teaching inclusive concept, less inclusive concept, and spesific general concept.
c. Superordinate Learning
   It is the next level of progresive differenciate learning process.
d. Integrative Tolerance
   To get intergrative tolerance, teaching material should be arrange as well as possible to move conceptual hierarcy up and down aesily during the information or material is given.

1.3 Constructivism Teaching Theory

On constructivism theory of study, knowledge cannot be moved automatically from teacher's mine into the student's. It means that students must be active in building their understanding based on their own cognitive mature. Students are not empty botles which are freely refilled by their teacher.

Cobb (2001: 6) states 3 statements in constructivism teaching theory as the following: first, students' participation in constructing knowledge meaningfully; second, entailing ideas in constructing concept meaningfully; and third, entailing ideas and new information they got.

Constructivism is about putting students active participation in entailing ideas and knowledge in their world. Specifically, Hudoyo (1990: 4) states that one can be easier in learning something if there is understand well by others.

1.4 Building Knowledge in Constructivism Teaching Theory

Building knowledge in constructivism teaching theory puts the subject (student) in active possition to create his cognitive structure in his interaction with his surrounding. By this way, student can rearrange his own reality. Cognitive interaction could be happened if student can create his own understanding. The structure has to adapt following the changing happened. This unstopable adaptation is done by student's own experience and understanding. (Piaget, 1997: 60). The most important focus in constructivism teaching theory is the students become the center of teaching process. They have to develop their knowledge, nor teacher or others. They have to take responsible on their study result. Students creativity and activity will help them to be independence in their life (Hamzah, 2001: 10).

Learning process must focuss too on experiential learning. It is an adaptation from real life experience, discussion with friends, and then develop into new idea and concept. That is why the princip in teaching and learning process is not focus on the teacher but students. By this way, the learning outcomes can be reported by seeing the process of teaching activity itself. The spreading knowledge is transformed in "created and recreated" way in together, could be obhective or subjective, and oriented on human's convergen and divergen part of brain (Semiawan in Hamzah, 2001: 6).

Hopefully students can analyze something by thinking not immitating. Man is building his own concept about real thing by himself. In teaching and learning process, an understanding cannot be moved automatically from teacher's mind into his students'. Students must be active in building their understanding mentally in building their understanding. (Hamzah, 2001: 21-22).

The knowledge in constructivism field is not only about logical and high understanding but also about building finding ideas, point of view(s), or something else. Experience is not always about physical experience like touching, seeing, smelling, or else but it could be mentally experience like thinking of an object or something already get (Hamzah, 2001: 80).

As has been mentioned above that in constructivism teaching theory, the students must be active in developing their knowledge. It can be done by answering questions, digging and measuring our own understanding. (Anonymous, 2002: 1).

Teaching process in constructivism theory pushes students interaction in interpreting and building their knowledge. Everyone arranges his experience by creating mentally structure and applying in learning process. A man interacts with others in their surrounding and then transformed it into his mind. By doing this, he has build his own new understanding from previus understanding he has. (Cobb, 2000: 15).

In building concept of constructivism, here are some points need to know: (1) real and contextual teaching process in relevan field, (2) focus on process of teaching, (3) applying social experience of teaching, and (4) teaching process must be done in order to construct students' experience. (Cobb, 2000: 5).

1.5 Relevan Previous Study

Here are some relevan theories as teh following:

(1)Joseph D. Novak. 2002. *Meaningful Learning: The Essential Factor for Conceptual Change in Limited or Inappropriate Propositional Hierarchies Leading do Empowerment of Learners. Journal Learning.*
In this study, he states that building and reconstructing meaning by students must be done actively to integrate previous understanding and new concept that they already got. Ausubel's assimilation theory of cognitive teaching theory has been proved effectively in guiding research or study and instructional design on fascilitating meaningful learning.

(2)Sri Rahayu, Antonius Tri Widodo, and Supartono. 2010. *Pengembangan Model Pembelajaran* Advance Organizer *untuk Meningkatkan Aktivitas dan Hasil Belajar Siswa. Jurnal Inovasi Pendidikan Kimia*, vol 4, no. 1, 497-505.
The research study showed that developing learning process in reaserch can be apply in research activity to increase students' study activity and result of study. It can be shown that study activity in experimental class was higher score than the one in control class.

(3)Nuri Shabania, Yuke Mardiati, and Ahmad Sofyan. 2015. *Pengaruh Pembelajaran Model* Advance Organizer *terhadap Hasil Belajar Biologi Siswa pada Konsep Protista. Jurnal Edusains*. Vol. 7, no. 1, 70-76.
They state that the objectives of the study is to know the effect of Advance Organizer model toward the study result of Biology on concept of Protista. The post-test score for both groups were 3,087, in t-table with 5% significance level, and (df) = 78 was 1,67, so it can be concluded that t-measure > t-table. It means that alternative hypothesis (Ha) was accepted and Nul Hypothesis was rejected. It is shown that there was significant different on applying

advance organizer model toward the students who study biology.

2 RESEARCH METHOD

This study was conducted using Reasearch and Development (R&D) approach of theory. It is a process of developing a new product, modifiying, or perfecting previous product or concept (Sukmadinata, 2012: 164).
Gall, Gall & Borg, (2007: 589) explains that R&D comes from industrial field to design and develop a high quality product. The product can be hardware (like teaching tools, handbook, module, modul) and software (like teaching programs, curriculum, teaching model, teaching evaluation, measurement isntruments, etc) (Sukmadinata, 2012: 171).

In conducting R&D, Sukmadinata (2012: 167) states that the researcher(s) should use descriptive, evaluative, and experimental methods of study. The descriptive method is used to collect data about the real condition in research field. Those are: (1) real condition of the product to compare or to develop based on the ready-use prototype, (2) condition of school, teacher, headmaster, and students, (3) condition of supporting factors and the obstacles of developing and using the product that will be developed.

Evaluative method is used to evaluate the trial-and-error session in developing a product. It is developed through several tests. At the end of the test, there must be evaluating session. The last method--experimental method--is used to measure the developed product.

2.1 Reasearch Procedure

The procedures of this research are included 3 (three) steps: (1) previous study: it was done by applying descriptive-qualitative approach. Qualitative approach began with library research, and then followed by field research about the product would be developed, previous study, and stopped with giving description and finding analysis; (2) developing session: it was conducted to develop model, evaluation, and revision based on the finding on trial-and-error step; (3) testing: it was conducted to test or measure the developing product (Suwandi, 2016: 39).

3. RESEARCH FINDINGS AND DISCUSSIONS

In this part of developing the product refers to the model designed by Dick & Carey (2009), the developing model was compiling of planning and developing draft of product. Planning level is compiling level of arranging the research method, mentioing purposes of the study, designing the process of study, testing in narrow field. The developing preliminary form of product level is included developing teaching tools, teaching process, and arranging evaluation instruments.

On the preliminary field testing, the tests was done in 1 to 3 different schools by taking 6 to 12 different subjects of study, they are teachers. During the test, the researchers was also observing, interviewing, and spreading questionnaire. Revising the result of study in main product revision session was the next activity done by the researcher. Main field testing was the next activity by testing 5 to 15 different schools and participating 30 to 100 teachers. The quantitative data of teachers appearance before and after using the measuring model were submitted. The result was evaluated well by the researcher. The result then revised in operational product revision level. The next activity was operasional field testing. It was done to 10 to 30 different school and participating 40 to 200 subjetc of research. The measuring process was conducted by spreading questionnaire, interviewing the subjetcs, observing, and analysing the result. The finding on filed

were being the basic data to do final product revision. This revision was based on the field research result.

3.1 Advance OS Teaching Model

Advance OS teaching model in this study is a developing model of advance organizer model by open-ended and scientific approaches. Advance OS teaching process is included first step on presenting advance organizer which are included clarifiying purpose(s) of teaching, teaching process, presenting organizer, identifying conclusive, giving samples or illustrations; the second step of scientific exploration was included observing, questioning, associating, experimenting, and networking ; The third level was presenting organizer, included presenting assignments, measuring, processing, and conclusing; The last level is Open-ended level, it was included empowering cognitive structure by giving open-ended questions.

3.2 The Purposes and Assumptions

Collecting information is the one of learning purpose which is related to some relevant theories that can support and guide the teachers in doing their duty in sharing knowledge to the students. In this Advance OS Model, teachers are being the organizers of teaching materials and presenting information by giving assignments to the students that finaly need to be presented in front of classroom. Advance OS model spreading concepts and to the students imidiately. In this model, the students are the knowledge constructors. Advance OS Model is designed to empower students cognitive structure, specific knowledge of several materials, and how they can run, clear, and arrange the knowledge well. Advance OS model presents introductional material shown first on learning process, and finally get closer to scientific approach by observing, questioning, associating, experimenting, and networking. Students get their chance to share their idesaon their presentation, and the last step is evaluation step by getting open-ended questions to measure students ability.

3.2.1 Presenting Advance Organizer

The first step is presenting the purposes of study, presenting introductional materials, and entailing them with some relevant knowledge. Clarifying the teaching purposes is a way to get students' attention and guide them to the purposes of teaching process to get meaningful learning. Presenting introductioanl material is an activity to review materials which has been teaching several times ago. Guiding students to entail the previous material with the new material they are going to get.

3.2.2 Scientific Exploration

In this level, the students are asked to do observing, questioning, associating, experimenting, and networking. On observing session, the students are asked to read, listen, and see (with or without any tools). Questioning session is done by giving questions about unclear information. In associating session, the students are asked to collect information by doing expreriments, reading some different source of teaching, observing something, interviewing speakers. In associating session, the students are associate collected information.

3.2.3 Presenting Organizer

It is about the whole presentation of students on each teaching material by presenting in front of class, answering questions, insisting opinion wisely, communicating with team, and making conclusion.

3.2.4 Open-ended Session

Open-ended session is included empowering cognitif structure by presenting open problem. Teaching process using open problem to the students

dan increase students' ability in answering questions inseveral ways, and giving chance to get some more correct answers so that make them finding intelectual and potential experiences.

4 CONCLUSIONS

Teaching mathematics using Advance OS model is including three steps:

1. Presenting advance organizer. It is about clarifying the objectives of the study, presenting organizer, identifying conclusion, and giving appropriate sample.
2. Exploring scientific approach, including: observing, questioning, associating, experimenting, and networking.
3. Presenting organizer, including: presenting the assignment, trial and error, and making conclusion about students' structure cognitive by giving open-ended questions.

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