CHAPTER II

LITERATURE REVIEW

2.1 Research & Development Method

Research and Development (R & D) is a strategy or research method that is powerful enough to improve the practice. Research and development is also a process or steps to develop a new product or refine an existing product, which can be accounted for (Sukmadinata, 2009).

Sugiyono (2009) in Haryati (2012) argues that, research and development methods are research methods used to produce a particular product, and test the effectiveness of the product. In order to produce a specific product used research that needs analysis (used survey or qualitative method) and to test the effectiveness of the product in order to function in wide society, hence required research to test the effectiveness of the product (used experiment method).

2.1. 1 The Objective of Research and Development Methods

According to Akker (2006) the aims of development research are differentiated based on the development of curriculum, technology and media, lesson and instruction, and didactic teacher education. Here's an explanation:

1. In the curriculum section

   The aim is to inform the decision-making process throughout the development of a product / program to improve a program / product becomes more advanced and the ability of developers to create a variety of things of this kind on the situation in the future.

2. In the technology and media

   The aim is to improve the instructional design, development and evaluation process based on other specific problem-solving situations or generalized inspection procedures.

3. In the lesson and instruction section

   The objectives are for development in the design of the learning environment, the formulation of the curriculum, and the assessment of the success of observation and learning, and simultaneously working to play a role in understanding fundamental scientific.

4. In the teacher's education section

   The aim is to contribute professional teachers' learning and refine changes in a specific educational setting.

2.1. 2 Research and Development Stages

Borg & Gall (1983) in Haryati (2012) developed 10 stages in developing the model, namely:

1. Research and information collecting, included in this step include literature studies related to the issues studied, needs measurement, small-scale research, and preparation to formulate research frameworks;
2. Planning, including in this step to prepare a research plan that includes formulating skills and expertise related to the problem, determining the objectives to be achieved at each stage, design or research steps and if possible / necessary to conduct a feasibility study on a limited basis;
3. Develop preliminary form of product, is to develop the initial form of the product to be produced. Included in this step is the preparation of supporting components, preparing guidelines and manuals, and evaluating the feasibility of supporting tools. Examples of development of learning materials, learning process and evaluation instruments;
4. Preliminary field testing, is to conduct initial field trials on a limited scale, involving 1 to 3 schools, with 6-12 subjects. In this step, data collection and analysis can be done by interview, observation or questionnaire;
5. Main product revision, is to make improvements to the initial product produced based on initial test results. This improvement is more likely to be done more than once, in accordance with the results shown in the

limited trial, so that the main draft product (model) ready to be tested more widely.

6. Main field testing, usually called the main trial involving a wider audience 5 to 15 schools, with the number of subjects 30 to 100 people. Data collection is done quantitatively, especially done to the performance before and after the implementation of the test. The results obtained from this trial are in the form of evaluation of the achievement of the test results (model design) compared to the control group. Thus in general this step uses experimental research design;
7. Operational product revision, is to make improvements / improvements to the results of a wider trial, so that the product developed is an operational model design that is ready to be validated;
8. Operational field testing, is a validation test of the operational model that has been produced. Implemented in 10 to 30 schools involving 40 untill with 200 subjects. Testing is done through questionnaires, interviews, and observation and analysis of the results. The purpose of this step is to determine whether a developed model is really ready for use in school without having to be directed or assisted by the researcher / developer of the model;
9. Final product revision, is to make final improvements to the model developed to produce the final product;
10. Dissemination and implementation, is a move to disseminate products / models developed to audiences / society at large, especially in the arena of education. The key steps in this phase are to communicate and disseminate the findings / models, either in the form of research seminars, journal publications, or exposure to stoke holders related to the research findings.

2.2 Teaching Material

According to Sadjati in Prastowo (2014), Teaching Materials is a set of materials that are arranged systematically, whether written or not, so as to create

an environment or atmosphere that allows learners to learn. There is also the opinion that the teaching materials are information, tools, and text that teachers or instructors need for planning and reviewing the implementation of learning. This view is also complemented by Pannen that teaching materials are materials or learning materials compiled in the learning process. With teaching materials allows students to learn a competence in a coherent and systematic so that the accumulative able to master all the competencies as a whole and integrated.

From the above explanation can be concluded that the teaching materials in general are basically all the materials (be it information, tools, and text) are arranged in a systematic manner that displays the whole figure of competence that will be controlled learners and used in the learning process with the aim for planning and review of the implementation of learning (Prastowo, 2012).

2.2.1 The Purpose of Teaching Material

According to the Development Team and Management Directorate of Basic Education High School in Prastowo (2014), as for the purpose of making teaching material itself, at least three kinds, namely:

1. Provide teaching materials in accordance with the demands of the curriculum by considering the needs of students that is teaching materials in accordance with the characteristics and settings or social environment of students.
2. Assist students in obtaining alternative teaching materials in addition to text books that are sometimes difficult to obtain.
3. Facilitate teachers in implementation of learning activity.

2.2.2 The Function of Teaching Material

The types of teaching materials functions can be divided into two kinds, namely functions for educators and functions for learners.

1. Function of teaching materials for educators:
   a. Saves the teaching time in teaching.
   b. Change the role of educator from a teacher to a facilitator

c. Improving the learning process becomes more effective and interactive.
d. Guidelines for educators who will direct all the activities that should be taught learners.
e. Evaluation tool achievement or mastery of learning outcomes.

2. Function of teaching materials for learners:
   a. Learners can learn without having any educators or other students.
   b. Learners can learn whenever and wherever they want
   c. Learners can learn according to their speed.
   d. Learners can learn in the order of their own choosing.
   e. Helps potential learners to become independent learners.
   f. Guidelines for learners who will direct all their activities in the learning process and are the substance of competence that should be studied or mastered (Prastowo, 2014).

2.2.3 Types of Teaching Material

The types of materials according to Tocharman in training coaching high school by the Education Ministry, among others:

1. Visual teaching materials consist of printed materials such as handout, books, modules, student worksheets, brochures, leaflets, wallchart, photos / drawings and non printed prints, such as models / mockups.
2. Teaching materials by listening (audio) such as cassettes, radio, LPs, and audio compact discs.
3. Teaching materials with viewing and listening (audio visual) such as video compact disk, film.
4. Interactive multimedia teaching materials such as CAI (Computer Assisted Instruction), interactive multimedia compact disc (CD), and web-based learning materials (Nugraha, 2013).

2.2.4 Making Teaching Material

Basically teaching materials is a means of learning that contains the material and ways of learning. So in the preparation must follow the ways of preparation of learning tools in general. Before preparing teaching materials, teachers should be the identification of indicators of achievement of competencies contained in the syllabus has been prepared. The preparation of an instructional teaching materials are the order of the following activities:

1. Setting the title of teaching material to be compiled.
2. Prepare reference books and other resource books.
3. Identify basic competencies, review the learning materials, and design appropriate learning activities.
4. Identify indicators of achievement and design the form and type of assessment to be presented.
5. Designing the format of writing teaching materials.
6. Preparation of draft teaching learning materials.

2.2.5 The Benefit of Making Teaching Material

The benefits of making teaching materials can be divided into two kinds, namely the usefulness for teachers and students. For teachers, the use of the preparation of teaching materials at least there are eight kinds, namely:

1. Obtained instructional materials appropriate to the curriculum demands and according to the needs of students.
2. No longer dependent on textbooks that are sometimes difficult to obtain.
3. Teaching materials become richer, because they are developed using various references.
4. Increase the teacher's knowledge and experience in writing teaching materials.
5. Teaching materials will be able to build effective learning communication between teachers and students because students will feel more confident to the teacher.

6. Obtained teaching materials that can assist in the implementation of learning activities.
7. Can be submitted as a work that is assessed to increase the credit score for promotional purposes.
8. Increase teacher's earnings if the product is published.

For students, if the teaching materials that are made are varied, innovative and interesting, then there are at least three uses of teaching materials for learners, namely:

1. Learning activities become more interesting.
2. Will get more opportunities to study independently with the guidance of educators.
3. It will be easy to learn every competence that must be mastered (Prastowo, 2014).

2.3 Learning Using Teaching Materials

According to Nasution (2003), learning with teaching materials is a learning that should or entirely use teaching materials. The purpose of learning teaching materials is to open opportunities for students to learn according to the ability and the way each. In other meanings that learning instructional materials is the application of learning methods based on individual learning style principles which among others have the characteristics as proposed Nasution (2003), as follows:

1. Provide an opportunity for students to learn according to their own speed.
2. Opens the possibility for students to achieve full mastery of the material being studied.
3. Encourage students to run problem solving methods.
4. Develop an attitude of initiative and self-organizing in learning.
5. Establish habits to self-assess and heighten motivation to learn.
6. Determine the level of knowledge students have not done learning activities.

7. Provide frequent evaluations individually to determine the learning outcomes achieved.

Learning using teaching materials is one of the principles of applying individual learning. With the teaching materials students are free to implement learning in accordance with the speed and opportunity of each. More importantly, students are no longer passively listening to a lecture from the teacher, but the students are expected to actively respond to the learning process by listening, reading, evaluating, watching demonstrations, and interact with fellow students and teachers.

2.4 Development of Teaching Materials

2.4.1 Development Stages of Teaching Materials

According to Teaching Material Development Guide that published by Depdiknas, there are three basic stages that need to be passed to develop teaching materials, namely: analysis of teaching materials needs, selecting learning resources, and compile a map of teaching materials based on the structure of each teaching materials.

1. Analysis of Teaching Material Needs

Is the initial process that must be taken in preparing the teaching materials. This analysis aims to make the teaching materials that are made in accordance with the demands of competence that must be mastered by the students. The analysis of teaching material needs include three stages, namely: analysis of curriculum, learning resources, and determining the type and title of teaching materials.

2. Selecting Learning Resources

As has been mentioned earlier that considering the source of learning is very diverse. Each also has advantages and disadvantages. For that required screening or screening. This selection is based on consideration of conformity with predetermined learning objectives. To simplify the selection process of the learning resources, the following Sudjana and Rivai show two criteria that can be

used in the selection of learning resources, namely general criteria and specific criteria.

a. General Criteria

In general, when choosing a learning resource we should consider the following four criteria:

1. In terms of economic

   Learning resources should be cheap or inexpensive. With affordable prices, then all the layers of society will be able to hold it.

2. In practical terms and simple

   Learning resources used should not require service or procurement difficult and rare.

3. In terms of easily obtaining

   Learning resources should be selected close and easy to find.

4. Flexible

   Learning resources can be utilized for various learning purposes.

b. Specific Criteria

There are a number of specific criteria for selection of learning resources. Specific criteria include:

1. Learning resources can motivate learners in learning.
2. Learning resources for teaching purposes.
3. Learning resources for research.
4. Learning resources to solve problems.
5. Learning resources can be for presentation.

3. Prepare the Map of Teaching Materials Based on the Structure of Each Teaching Material

   After the process of anal the needs of teaching materials, then we will find out how much teaching materials that even though applied in a certain period of learning, both of type and quantity. The next step is to compile a map of the need for teaching materials. The map of teaching materials needs has many uses, including:

   a. To know the amount of teaching materials that must be written.

b. To know the sequence or sequence of teaching materials such as what (this sequence of instructional materials is needed in determining the priority of writing).
c. To determine the nature of teaching materials.

2.5 Problem Based Learning Model

According to Sanjaya in Nuryanto (2015), the learning model of problem-based learning is a series of learning activities that emphasize the process of solving problems faced scientifically. Problem-based learning does not expect students to simply listen, record, and then memorize the material, but through problem-based learning students actively think or interpret problems, search and process data, present solutions and eventually conclude.

PBL is a student-centered instructional strategy in which students learn through facilitated problem solving. In PBL, student learning center on a complex real world problem that doesn't have a single correct answer. Students work in small to medium groups to pinpoint what they need to learn in order to solve a problem. They engage in self-directed learning and then apply their new knowledge to the problem and reflect on what they learned and the effectiveness of the strategies employed (Mustafa, 2016).

According to Hamdani (2011) in Khotim (2015), PBL emphasizes the problems of daily life that are meaningful to the students and the teacher's role in presenting the issues, ask questions, facilitating the investigation and debriefing. Model PBL is an approach to student-centered teaching and empowering students to do research, integrating theory and practice, and apply the knowledge and skills to develop viable solutions to define existing problems.

According to Hmelo (1996) dalam Hmelo-Silver (2006), In PBL, students have the opportunity to develop skills in reasoning and self-directed learning. The PBL method requires students to become responsible for their own learning. Empirical studies of PBL have demonstrated that students who have learned from PBL curricula are better able to apply their knowledge to novel problems as well

as utilize more effective self-directed learning strategies than students who have learned from traditional curricula.

2.5.1 Principles and Characteristics of Problem Based Learning

According to Hamdani (2011) in Khotim (2015), the principle of problem-based learning is:

1. Using real problems as materials to develop knowledge of critical thinking skills and problem solving.
2. Open-ended problem.
3. Student centered.
4. Interaction between students.

The characteristics of problem-based learning are:

1. That is a learning activity not just expect students to listen, record, then memorize learning materials, but must be active thinking, communicating, searching and processing data, and finally concluded.
2. Learning activities should be directed to solve the problem. PBLs placed the problem as the focus of learning, without the problem of impossible learning process.
3. Problem solving is done using a scientific thinking approach (deductive-inductive, systematic-empirical).

2.5.2 The stages of Problem Based Learning

Many experts explain the application of problem-based learning strategies. Jhon Dewey an American educational expert explains there are six stages of Problem-Based Learning Strategy which later became known as problem solving:

1. Problem Orientation, explain learning objective and motivate student to be actively involved in problem solving.
2. Organizing Student, Helping student to define and orginize learning task related to the problem.

3. Guiding the investigation of individual and group, encourage student to collect appropriate information and doing experiment to get an explanation and problem solving.
4. Develop and present the work result, help student in make a plan and prepare the appropriate work such as report and share task with your friend.
5. Analysis and evaluate the problem solving process , evaluate learning outcomes about the material that has been studied or ask group to presentation the work result.

2.5.3 Advantages of Problem Based Learning

Problem-based learning has advantages including:

1. Problem solving is a technique that is good enough to understand the content of the lessons.
2. Problem solving can challenge students' abilities and provide satisfaction to determine new knowledge for students.
3. Problem solving can improve student learning activities.
4. Problem solving can help students how to transfer their knowledge to understand real-life problems.
5. Problem solving can help students develop new knowledge and be responsible for their learning. In addition, the problem solving can also encourage self-evaluation of the results and the learning process.
6. Through the problem solving can show to students that every subject is essentially a way of thinking, and something that must be understood by students, not just learning from teachers or from books only.
7. Problem solving is considered more fun and liked by students.
8. Problem solving can develop students' ability to think critically and complete their ability to resolve with new knowledge.
9. Problem solving can give students the opportunity to apply the knowledge they have in the real world.

10. Problem solving can develop students' interest to continually learn even though learning on formal education is over.

2.5.4 Disadvantages of Problem Based Learning

Besides the advantages, problem-based learning also has disadvantages, that are:

1. when students are not interested or do not have the belief that the problem learned is difficult to solve, then they will feel reluctant to try.
2. The success of learning strategies through problem solving takes a long time to preparation.
3. Without understanding why they are trying to solve the problem being studied, then they will not learn what they want to learn (Suyanti, 2010).

2.6 The Standard of Teaching Material Based on BSNP

The National Education Standards Agency (BSNP) is an independent institution with the authority to determine the eligibility of textbooks for use in schools. BSNP was established based on Government Regulation No.19 of 2005 with the task of:

1. Develop national education standards.
2. Holding a national exam.
3. Provide recommendations to the government and local governments in guaranteeing and controlling the quality of education.
4. Formulate criteria for graduation from the educational unit on elementary and secondary education, and,
5. Assess the appropriateness of content, advisability of presentation, language advisability, and advisability of textbook (Mardapi, 2007).

2.6.1 The Feasibility Components of Textbook Content

The eligibility components of this content are outlined in the following subcomponents or indicators: a) Alignment with SK and KD subjects, child development, community needs; b) Substance of science and life skills; c) Insights to move forward and develop; d) The diversity of social values (Mardapi, 2007).

2.6.2 The Feasibility Component of The Textbook Languages

These linguistic components are elaborated into the following subcomponents or indicators: a) Readability; b) Conformity with good and proper Indonesian language rules; c) Language logic (Mardapi, 2007).

2.6.3 The Feasibility Component of Text Book Presentation

This presentation component is elaborated into the following subcomponents or indicators: a) Techniques; b) Material; c) Learning (Mardapi, 2007).

2.6.4 The Feasibility Components of Textbook Book Graphic

These components of graffiti are broken down into the following subcomponents or indicators: a) Book size / format; b) Design of leather parts; c) Design of contents; d) Quality of paper; e) Quality of prints; f) Quality of binding (Mardapi, 2007).

2.7 Conceptual Framework

Chemistry is a compulsory lesson for senior high school students. But the learning outcomes of learners on chemistry lessons are still low. One of the reasons is lack of teachers' ability to select and apply teaching materials that refer to learning models that are compatible with the nature of chemistry. Currently, integrated teaching materials with learning models are still very rarely used in schools. So it 's necessary to develop teaching materials.

In its development, the teaching materials are integrated learning model that adjusted with learning needs. One of them is problem based learning which is a learning model characterized by real problems as context to learners critical

thinking and problem-solving skills and also gain knowledge. By integrating problem-based learning models on teaching materials, learners can improve conceptual understanding and develop critical thinking skills.