CHAPTER I

INTRODUCTION

1.1 Background

> *Christian schooling intends that students become committed to Christ and to a Christian way of life, willing to serve God and their neighbors. There are at least three parts to this general aim. First, Students learn to unfold the basis, framework, and implication of a Christian vision of life. Second, they learn about God's world and how humans have responded to God's mandate to take care of the earth. Third, they develop and responsibility apply the concepts, abilities, value, and creativity gifts that enable them to contribute positively to God's kingdom and to society."* (Van Brummelen, 2009, p.14)

The quotation above points out that the aims of Christian education are (a) Helping students to serve God and their neighbors by the used of knowledge (Matthew 22:37-40). (b) To enable students to contribute positively in daily life as a respons to God's mandate to take care of the earth. The bible makes it clear that humans have a religious heart as a core in our dimension of life; including moral, economic, social, lingual, rational, aesthetic, physical, emotional, mathematical, and scientific parts (Van Brummelen, 2009, p. 101). A religious heart has an active role in life, including how students respond to God's mandate. Therefore education should lead students to have a good concept for each dimension of life. Preparing knowledge in science also refers to preparing the knowledge of Chemistry.

The reason to learn Chemistry is to prepare students with good knowledge which then enables them to appreciate the impact on society and understand nature. In chemistry, students learn about matter and the changes matter undergoes, including chemical reaction. On the practical level, students are able to apply knowledge of *reaction rates* in energy and environment reaction, in population control, in the food industry and agricultural processes, in materials

and technology, in health and medicine - chemists in pharmaceutical industry are researching potent drug design to treat cancer, AIDS, and many other diseases (Chang, 2002, p.510).

Because this knowledge is also important to understand God's mandate and discover God's laws, Christian education should provided a learning process to improve student's knowledge ("knowledge-that" including concept and cognitive concept, "knowledge-how" including abilities and skills, "knowledge-why" and "knowledge-with" including outcomes) (Van Brummelen, 2009, p.18).

Ideally, to achieve the objective of Christian education, teaching and learning in a classroom should be a meaningful process. Planning should refer to a student's needs and development level. Meaningful learning should be based on four phases of learning; preparing, presenting, practicing, and purposeful responding (Van Bummelen, 2009, pp.114-119). Further, he explains (2009, p. 121):

> As a teacher you deliberately plan learning to include all four phases of learning in your units. Provide an adequate, experience based setting. Accompany disclosure with variety of reformulation activities that help students assimilate and reinforce new concept. Give opportunities to transcend the precision learning by applying their learning to new situation and responding in their own distinctive ways.

The above quotation explains about meaningful learning. Meaningful learning obtained by observing, thinking, and analyzing information, concluding, and solving the problems of the phenomena around their lives.

Based on pre observation on the researcher practicum time at Makasar, there were some problems that occurred for grade XI students in learning chemistry. The learning was identified as not meaningful; the lessons were not related to student's daily experience. It was not related to the real world.

Therefore, Chemistry was a difficult subject and not interesting for students. That's why students were underachieving as shown by the following score, there were only 5 students from 22 students who had score above 60 point (Chemistry standard score). Students also had difficulties in grasping the concepts of Chemistry, due to the method of the teachers' presentation which made it difficult for students to understand abstract concepts, whereas they should have reached that level according to Paiget's idea (as cited in Papalia, Olds, and Feldman, 2007, p. 416).

The second difficulty is that students could not grasp the three-D (3D) concept of the molecules. Many students found it difficult to imagine the process of chemical reaction. Thirdly, students could not understand the benefit of learning Chemistry. Fourthly, students had little experience in connecting Chemistry concepts with the phenomena of life (see appendix C-1; Journal Reflection October 1 & October 13, 2009). As discussed by Herrington (2008) the *National Sciences Education Standards* (NSES) also found the same common problems in Chemistry class that many students associate molecules with physical science and fail to understand that all living system are composed of molecules.

Based on the above problems this research intends to study the use of laboratory experiment in learning Chemistry to achieve grade XI learning outcomes.

1.2 Statement of Problems

1) Can the use of laboratory-experiments in learning Chemistry be successful in achieving grade XI learning outcomes?

2) How can laboratory-experiments in learning Chemistry be used to achieve grade XI learning outcomes?
3) What are the constraints in using laboratory-experiment in learning Chemistry to increase grade XI learning outcomes?

1.3 Purpose of the Study

1) The purpose of the study is to determine the use of laboratory-experiments in learning Chemistry to achieve grade XI learning outcomes.
2) The purpose of the study is to determine the way of using Laboratory-experiments in learning Chemistry to achieve grade XI outcomes.
3) The purpose of the study is to determine the constraints of using laboratory-experiments in learning Chemistry to achieve grade XI learning outcomes.

1.4 Benefits of the Study

The use of lab experiment can help teachers in the way of presentation lesson. The lessons become more interesting and make it clearer, and easier for students to grasp Chemistry concepts. Students become more enthusiastic in a learning process and this could achieve learning outcomes

1.5 Definition of Term

1.5.1 Laboratory-experiment

Experiment is the way to find out what factors affect a particular natural phenomenon, by conducting an experiment, we can discover the information we are seeking and use the information to suit our own purpose (Bentley, 2000, pp.155-156)

Laboratory-work or laboratory-experiment is a type of science instruction. This strategy involves *firsthand experiences,* permitting students to participate in science as a way of thinking and investigating. This instructional strategy provide concrete, authentic experience that aids students in comprehending phenomena that are necessarily discussed in the classroom (Chiappetta and Koballa, 2006, p. 201).

1.5.2 Chemistry

Chemistry is the study of matter and the changes matter undergoes. Matter is defined as anything that has mass and occupies space (Chang, 2007, p.1).

1.5.3 *Rate of Reaction*

Rate of reaction is the change of amount of substance of a reactant or a product with time (Δn /Δ s) (Chang, 2002, p. 510). These concepts discussed in this topic are molarities, *rate of reaction* law, factors that influence on *rate of reaction* including chemical reaction, and equation of *rate of reaction* (ibid.)

1.5.4 Learning outcomes

Learning objective describs what we expect students to learn and what they can demonstrate they have learned (Van Brummelen, 2009, p.14). Leaning objective focuses on some learning points; some focus on *learning-that* (cognitive knowledge), some on *learning-how* (intellectual, aesthetic, and physical abilities), some on *learning-why* (values and commitments), some on *learning-with (relating positively to others)*. However, in this case the researcher places more emphasis on the learning objective which is focused on *learning-that,* which talks about cognitive and understanding area.