CHAPTER I

INTRODUCTION

A. Background

Natural Sciences (IPA) is related to how to find out about natural phenomenon systematically, so that science is not just mastery knowledge in the form of a collection of facts, concepts, or principles but also a process of discovery (Depdiknas, 2006). Physics as a part of natural science should also teach students how to form their knowledge with their own effort by discovery. This indicates teacher should provide active learning process that allows students to dig physics concept by themselves.

Similarly, physics education has similar aims. The most important one is to find ways to help students learn physics more effectively and efficiently, to understand concepts more deeply (Meltzer, 2003). This may be done with a proper curriculum. There should be connections in the curriculum to everyday life so that the students are trained in the art of finding a physical explanation for what they experience. There should be opportunities to experience the scientific method so that the students can apply it when making critical investigations. The physics education should make a contribution to the development of the student's view of the world, develop scientific literacy, experimental skills, and communication skills and train the student in problem solving with mathematical methods (Olme, 2000).

In addition, Science education should teach students to critically evaluate new information. In digital and information age, the access of information is easier than before. People can use internet to search any information they want to find. They can publish their work on science field on world wide web. The amount of sciencific information increses double every year. We need to prepare students to assess new things effectively (Nachmias, & Linn, 1987).

To see the relationship between one physical quantity to another, we can express it in verbal form or it usually be expressed by mathematical equation or graphical form. One of the first topics taught in a traditional high-school physics course is motion.It includes the concepts of position, velocity and acceleration. Graph of objects in motion are frequently used since they offer a valuable and alternative to verbal and algebraic descriptions of motion by offering students another way of manipulating the developing concepts (Arons, 1990). Graphs are the best summary of functional relationship. Many teachers consider the use of graphs in a laboratory setting to be critical importance for reinforcing graphing skills and developing an understanding of many topics in physics, especially in motion (Svec, 1999).If graphs are to be valuable tool for students then we must know the students level of graphing ability. Studies have identified difficulties with such graphic abilities. Students have difficulties making connections among graphs of different variables, physical concepts, and the real world, and they often perceive graphs as just a picture (Linn, Layman & Nachmias, 1987).

According to Sadiman (Pipin, 2011: 1) advantages of graph are: (1) very useful for studying and considering the quantitative data and their relations, (2)

allows to quickly analyse and interpret comparisons between the data presented, both in terms of size, number, growth and direction. Furthermore Dickinson & Hook (Roslina, 1997:17), cited four usefulness of such graphs, namely: (1) chart can arouse the reader's interest to the materials presented, (2) graphs can classify, simplify a lot more information than the material presented; (3) charts can help the things referred to in the text book or presentation, (4) the graph is also a statistical section to the other users.

Though Brassel and Rowe (1993: 65) based on research findings that students who are lack in knowledge about the use of graphs, are predicted to affect the success of their learning in college. The reason is based on the use of graphs that are widely used in college, so students need to know how to read data from the charts and doing the right interpretation.

Along with the presentation of information in the form of graphs, tables and verbal forms, Danapelita (1996: 65) revealed that students often have difficulties when completing the questions of physics are presented in graphical form compared to physics problems presented in tabular or verbal. From problem-solving steps that they do, they more often have difficulties in retrieving information (recall phase according to Polya) are presented in graphical form, henceforth associated with related concepts, either in the form of mathematical equations or other draft form.

The result of practical exam of one school in Bandung shows that even all the students past the standard mark, only 48,5% of the students are adequate to statecorrect conclusion about Newton Laws of Motion based on experiment and

34,3% of students are adequate to statecorrect conclusion about Simple Harmonic Motion based on experiment. Almost half of students are hard to make a conclusion, not only in Newton Laws of Motion experiment, but also in Simple Harmonic Motion experiment. This happened because of some reason. Although the procedure standard and tools were well provided for the practical examination, the data which were analysed weren't approaching the ideal data. In Newton Laws of Motion experiment, the failure might come from some incorrect procedure by students. While in Simple Harmonic Motion experiment the procedure was easy to follow, so the failure might come from the timing of getting the data. Because of that, the data obtained were not good enough. Students'observation during data collection process was not accurate. This inaccuracy was due to the limitations of human sense, the eyes. The human eyes are not so sensitive to the change of fast moving object according information from http://www.colorbasics.com/Retina/, it only can capture a picture in 0,2 second, or the eyes see only five pictures each second.

The bad data that being drawn into graphical form can cause the students get wrong conclusion. while actually with this graph, students learn to read the data presented. but, the graph shows pattern with inaccurate information or presents a scrambled pattern that hard to be analysed. VBL can be used to get accurate data. This data is easily to be drawn into graphical form. Its pattern is tidy and showing the right information to students about concept being learned. This can provide the right conclusion on experiment and the misconception can be avoided.

Various issues related to the acquisition of bad data can be addressed by improving the quality and specifications of practical tools that exist and the use of experiment method more effective and accurate. Students are expected to understand the concepts or laws of physics properly. So that the quality of learning can be improved, ultimately the quality of education in schools can be improved too.

The efforts to improve the quality of education have been done, either through the development of teachers' quality, education providers, as well as the construction of various facilities support the educational process. These efforts were not producing change significantly (Liliasari: 1997). Therefore, it is still necessary to develop the efforts in various aspects of the learning process. One of developments in progress is video-based learning process that can help the student to improve their learning achievement and graph interpretation skills.

Video Based Laboratory is a set of learning activities using video experiments as a source of primary data. And then the video is processed by computer software that can produce data that more accurately and with high precision. We need a video analysis because there are several reasons. The basic reason is that most of the human eye has limited ability to observe an event that is very fast. Some practical activities that cannot be done with traditional lab instruments can be done using video analysis.

Romadhon (2009, 359-369) express that using video analysis showing in learning process makes students easily understand about the motion phenomenon, and accurately collect the data. The using of video analysis also reduces of using

many laboratory tools in the class. The whole learning process using video analysis is able to train the student to observe, to collect data, to hypothesize, to predict, and to conclude the experiment results.

Beichner (1999: 101), based on his research suggested that VBL is a powerful tool to enhance students' understanding of one of the most difficult topics in physics that is important and graphs, but it may help to clarify and help students overcome difficulties understanding the graphs and grasp an understanding of the concept.

Previous studies highlight differences in score patterns on advanced placement program (AP) tests by gender (National Summary Report, 2007). The College Board is awareof the differences in male and female score patterns and has conducted at least one analysis of thequestion content in an attempt to identify any bias in the content or format of the biology test (Buck, Kostin,& Morgan, 2002). Analysts identified twelve categories as likely to show gender-based performancedifferences. Of these, males scored better on average on eleven of them. Of the eleven, eight accountedfor 65% of the variance in the standardized difference. Females did better in categories related to people,such as human physiology, genetics, and inheritance, as well as cell division, and males did better inatmospheric science and experimental apparatus. When the question called for an open-ended writtenresponse, females did better (Buck, Kostin, & Morgan, 2002). In fact, the research has shown only two gender differences in specific sub-areas of spatial and verbal abilities, three-dimensional mental rotation (favouring men), and speech production (favouring women).

Male students tended to take the science tests in larger percentages than female students and toscore higher (National Summary Report, 2007). The exception would be in biology and environmental science where rates arecomparable.Males also scored higher on the subject tests than females, with the exception of psychology.A higher percentage of males also received a score of 5 than females in 2007 on science AP tests,with the exception of psychology.

Based on the above, related to the need for understanding of concepts and understanding graphs, push the author to do research about comparing learning achievement and graph interpretation skills of male and female students on kinematics of linear motion with video-based laboratory on 5E Learning Cycle model.

B. The Main Problem

Based on the background above, the problem in this study is formulated as follows: "Is the use of Video-Based Laboratory (VBL) on 5E learning cycle (LC)model moreeffective in increasing the learning achievement and graph interpretation skills of male students than female students?"

To facilitate the study, then the formulation of above is described into the research questions as follows:

1. How is the difference of learning achievement scoreimprovement of male and female students after the implementationof Video-Based Laboratory (VBL) on 5E Learning Cycle Model on Kinematics of Linear Motion?

2. How is the difference of graph interpretation skills score improvement of male and female students after the implementation of Video-Based Laboratory (VBL) on 5E Learning CycleModel on Kinematics of Linear Motion?

C. Research Objectives

Referring to the problems described, the general purpose of this study is to get an idea of learning achievement and graph interpretation skills of male compared to female students on kinematics of linear motionwith Video-Based Laboratory (VBL) on5ELearning CycleModel. While the purposes of this study in particular, are to:

1. Get an overview about the difference of learning achievement score improvement of male and female students after the implementation of Video-Based Laboratory (VBL) on5E Learning Cycle Model on Kinematics of Linear Motion.
2. Get an overview about difference of graph interpretation skills score improvement of male and female students after the implementation of Video-Based Laboratory (VBL) on 5E Learning Cycle Model on Kinematics of Linear Motion.

D. Problem Delimitations

To be more focused, and then the problems in this study are limited to the following aspects:

1. The effectiveness of Video Based Laboratory on 5E Learning Cycle Model determined by normalized gain score, Richard R. Hake category, achieved by male group and female group in Learning Achievement and Graph Interpretation Skills scores. Video Based Laboratory on 5ELearning cycle Model to be said improving Learning Achievement and Graph Interpretation Skills of male class higher than female class, if the N-gain of male class is higher than N-gain of the female class.
2. Learning Achievement is defined as learning outcomes of the students after he received a learning experience (Nana Sudjana, 2006). Learning achievement measured by multiple-choice test that was developed based on The Bloom's Taxonomy. The test is limited to the cognitive domains of C1 (recalling), C2 (understanding), C3 (application) and C4 (analysis). The effectiveness of student learning achievement is viewed by the N-Gain of both classes.

E. Definition of Important Terms

In the present study, it is provided an overview of the term of limits so that the reader has the same understanding with the intention of the researcher. The term limits are:

1. Video Based Laboratory(VBL)

   There is a session to introduce a concept using the demonstration tool to show a concrete physical phenomena, and then continued with the depiction of the relationship between physical quantities, aided by a Video-Based Laboratory, the computer program that analyses of natural phenomena using a motion tracker, which is then presented in accordance with the phenomenon actually to help deepen understanding of concepts and understanding graph on the topic Kinematics of Linear Motion. Media Video-Based Laboratory (VBL) used was taken from teacher demonstrations, and presented the results of analysis in accordance with the procedures recommended by Beichner and Abbott (1999: 2) which is provided online at several sites. The accomplishment use of Video-Based Laboratory on Learning Cycle 5E was measured using the activities observation sheet of teachers and students.

2. Graph Interpretation Skills is defined as the ability of students to translate and interpret concept of Kinematics of Linear Motion which are visualized through graphs. In other words, the ability of students to read between the lines in the graph and analyse it, then make a conclusion. In this study, graph is referred to a line in the Kinematics of LinearMotion graph, as a tool used in the analysis of the relationship between these variables and show changes in motion at a specific time period. To determine the ability of students in the understanding of kinematics graphs, it was useda standardized tests TUGK (Test of Understanding Graphs Kinematics) developed by Robert J. Beichner (1996). The test is a multiple choice test consisting of five answer choices.

Coverage of Test of Understanding Graphs Kinematics are: (a) determine the speed from the s = f (t)graph (referred to as the understanding of graphs 1 or abbreviated G1), (b) determine the acceleration from the v = f (t) graph (G2), (c) determine the change in the position of the v = f (t) graph (G3), (d) determine a change in velocity from the a = f (t) graph (G4), (e) selecting another graph related to a given kinematics graph (G5), (f) selecting an appropriate explanation based on kinematics graph (G6) and (g) selecting the graph associated with a given condition (G7).

F. Benefits of Research

This research is expected to be useful for the development of Video-Based Physics learning for teachers and is expected to be helpful resources to the further research for researchers who want to develop Video-Based Physics Learning.

G. Assumptions and Hypotheses

1. Assumptions

In observance of the advantages of Video-Based Laboratory, researcher makesthe following assumptions:

a. The use of VBL on Learning Cycle 5E Model, facilitating the improvement in learning achievement.

b. The use of VBL on Learning Cycle 5E, facilitating students to gather and obtain accurate data, reports, and represent it in a table or graph, which shows relationship between two physical quantities. These activities have an

impact on ability to understand graphs. Related research shows that male students have more potential in spatial (visualisation) sub-areas, while female students have more potential in verbal (speech production) sub-areas (Halpern, 2000).

2. Hypothesis

With a basis on the assumptions as above, researcher proposed the following hypotheses:

a. H_1: The use of Video-Based Laboratory (VBL) on Learning Cycle 5E Model, can significantly improve the Learning Achievement of male students compared to female students. ($\mu_{M1} > \mu_{F1}$).

b. H_1: The use of Video-Based Laboratory on Learning Cycle 5E Model, can significantly improve the Graph Interpretation Skills of male students compared to female students.($\mu_{M2} > \mu_{F2}$)

H. Research Variables

In this study there are one variable that will be examined its effect on two dependent variables, namely:

1. The participants' gender.

Dependent variables are:

1. The improvement ofstudents'LearningAchievement.
2. The improvement of students' Graph Interpretation Skills.