CHAPTER 1
INTRODUCTION

1.0. INTRODUCTION

“Education is a process of learning through a continuous reconstruction of experience.”

- John Dewey

Science has earned an important status by emerging as a powerful force for socioeconomic changes and development of the nations. Science deals with identifying problems, searching explanations and seeking solution for the welfare and advancement of the society. The spirit and values of science have helped mankind to achieve development in various fields. Hence, the youth must be attracted towards science education and courses should be designed in such a way that every pupil should be given an opportunity to appropriate the needs and potentials of an individual as well as of the country.

Future of a Nation greatly depends on the type of education imparted. This does not mean academic education. There is an immediate and urgent need for giving scientific and technical education to our people in order to build up future economic life. Hence, there is the need for a well planned and systematic program of science education. This can be done only by providing physical facilities to the teachers and students. The purpose of science education is to enable individuals to use scientific process skills; in other words, to be able to define the problems around them, to observe, to analyze,
to hypothesize, to experiment, to conclude, to generalize, and to apply the information they have with the necessary skills. Scientific process skills (SPS) include skills that every individual could use in each step of their daily life by being scientifically literate and increasing the quality and standard of life by comprehending the nature of science (Padilla, 1990). Therefore, these skills affect the personal, social, and global lives of individuals. The SPS are a necessary tool to produce and use scientific information, to perform scientific research, and to solve problems. These skills can be gained by students through certain science education activities.

Physics is a subject which gives meaning to nature and natural phenomena. It is essential to teach children in the context of the natural setup to develop their sense of inquiry and find reason for themselves. The traditional method of teaching helps to some extent. But when information available in the internet is introduced to teach concepts, principles, procedures and the like, it motivates the learners towards self achievement and inquiring minds and hence develops scientists out of them.

- A scientist should ask personal questions, observe, read a lot, seek information, and carry out experiment to satisfy his curiosity.
- A scientist must continue to search for answers to explain what was observed to predict possible results.

Examples:
- Galileo’s curiosity about the heavens led him to construct a better telescope.

- Benjamin Franklin was curious about the nature of lightning.

Developing such inquiring minds is indeed essential to mould out effective future citizens and hence develop the nation.

1.1. WEB BASED INSTRUCTION

The WWW, with its increasing capacity for multimedia, multimode communication and information presentation, easy access to an ever-growing body of information and new way of data representation, has provided educators with exciting opportunities to enhance teaching and learning. Its appropriate application supports the dissemination of skills, and knowledge in a holistic approach, not limited to any particular course, technologies, or infrastructures.

Advances in computer and communication technology have opened an unprecedented opportunity for satisfying many educational needs and bringing a wide variety of educational applications closer to a broad base of potential users.

The most important difference that has taken place in the world in the last few years is the rapid development and spreading of information technology in every field namely education, economy, health, agriculture, social life, and entertainment.

Advances in learning environment have provided students with a wide variety of teaching/learning alternatives that have expanded the educational process beyond the traditional classroom. Developments in web based learning have provided students with a
wide variety of teaching/learning alternatives that have expanded the educational process beyond the traditional classroom.

In addition to the face-to-face mode of instruction students now receive instruction through teleconferencing, web-based instruction, e-learning, and other advancements currently taking place with telecommunications technologies.

“Web based learning techniques” refers to the decentralized method by which material is delivered on the Internet. Instead of attending classes in a centralized institution or location, students sit in front of a monitor viewing, listening and interacting with class materials that have been designed for that purpose. Various components are incorporated into the class materials so as to mimic and enhance the real life experience of a classroom.

In a classroom, when a student has a question, he or she raises his or her hand and immediately grabs the professor’s attention. This is the student’s first line of communication. On the web things do not happen like this, but there are several effective ways to communicate with the professor, teaching assistant, and classmates. By means of “asynchronous” communication tools such as email, bulletin boards and chat rooms, or even synchronous videoconferencing, a student can maintain contact with the instructor and fellow classmates.

Hence, Web-based instruction refers to providing a learning environment that is mediated and supported via the Internet/Intranet and connected to a computer with
hyperlinks to resources outside the instructional domain. The instruction is designed so that the computer displays lessons in response to learner/user interactions.

1.2. NEED AND SIGNIFICANCE

Information technology has turned out to be an inevitable part of human existence. Each generation gets acquainted with computers at a lower stage than the previous generation. Be it in the daily life activities, studies, offices, curriculum development, hospitals, communication, aviation technologies or space technologies or even simple modern day activities, the use of computers and technology has become indispensable. Modern schools all over the world are taking an effort towards building an IT generation where, teaching methodologies, curriculum development and evaluation techniques are being computerized. This proves of great value to the development of the society. The use of technology in education has proved to be useful in various cases where the learners prefer to learn at their own pace, delve deeper into the subject, time constraints are limiting the time of class hours, individual attention cannot be given by the teachers, class size is large, where no interpersonal relation can be developed with teachers and such numerous factors.

Various studies were also conducted in the area of Web Based Instruction. The representatives in this field were Wilson\(^{80}\) (2003) and Young\(^{85}\) (2002), Chism\(^{10}\) (2003), Hudson and Walther\(^{38}\) (2002), McDaniel\(^{54}\) (2004). These studies have shown the need for implementation of Web Based Instruction for faculty members and that argued that the greatest impact of Web-based instruction on higher education comes from the World Wide
Web and noted that one important dimension to course quality is the faculty member’s perception of quality.

To compete with the world, even we need to prepare ourselves. The use of online teaching methodologies can have a strong impact on the minds of students all over the world. To develop a skilled nation, we need to develop the scientific skills among students and motivate them towards the use of technology in their studies.

The studies concentrating on developing the various scientific skills were scant. The former being the disinterest of students towards taking up science subjects, the very little interpersonal relationship with teachers and the latter being the need to keep up with the increasing competition in the world, the investigator felt an urgent need to make a contribution from her part towards developing a strategy that could develop scientific skill among students. This is the underlying motivation behind this research study.

1.2. STATEMENT OF THE PROBLEM

The study is intended to check the effectiveness of web based on the scientific skills among higher secondary students and so is entitled

“EFFECTIVENESS OF WEB BASED INSTRUCTION IN LEARNING SCIENTIFIC SKILLS AMONG HIGHER SECONDARY STUDENTS.”
1.4. OPERATIONAL DEFINITION OF IMPORTANT TERMS

**EFFECTIVENESS:** For the present study, effectiveness means a change produced by giving web based instruction.

**WEB BASED INSTRUCTION:** A form of computer-based instruction which uses the World Wide Web as the primary method of delivering information. (Oregon Network for Education\(^6^0\), 2006). For the present study, the package used was a specially designed website incorporating the contents in the syllabus prescribed by the university wherein links were provided for each chapter along with the content for the same, accessible to the concerned group following the syllabus.

**SCIENTIFIC SKILLS:** To expertise in various scientific abilities like Observation Skill, Reasoning Skill, Reporting Skill, Interpretative Skill, Computer Skills and Problem Solving.(Glossary of Education\(^6^7\), [www.education.com](http://www.education.com)). But this study is confined to Reporting, Interpretation, Reasoning and Problem Solving Skills.

**HIGHER SECONDARY:** Education for those who have had secondary education, usually from 15-18 years, for the present study they are termed as the preparatory year students. (Ministry of Higher education, Kingdom of Saudi Arabia).

**STUDENTS:** In the present study, students refer to the sample used, falling under the age group of 16-17 years, enrolled in the university.

1.5. VARIABLES OF THE STUDY

1. Dependant Variables
   a. Reporting Skill
b. Interpretation Skill
c. Interpretative Skill
d. Problem Solving Skill

2. Independent Variable

a. Web Based Instruction Package

1.6. OBJECTIVES

Objectives of the present study are:

1. To evaluate the gain scores of the Reporting and Interpretation Skills among students.

2. To determine the effectiveness of Web Based Instruction package for developing Reporting and Interpretation Skills among students.

3. To examine the gain scores of the Reasoning and Problem Solving Skills among students.

4. To determine the effectiveness of Web Based Instruction for developing Reasoning and Problem Solving Skills among the students.

5. To examine difference in the gain scores of the Scientific Skills among students.

6. To infer whether Web Based Instruction package is effective for developing Scientific Skills among students.
1.7. HYPOTHESES OF THE STUDY

1. There is a significant difference in the pretest mean scores of Reporting and Interpretation Skill among students.

2. There exists a significant difference between the post test mean scores in the Reporting and Interpretation Skill after the implementation of web Based Instructional strategy.

3. There exists a significant difference in the gain scores of the Reporting and Interpretation Skill among students.

4. Web Based Instruction package is effective for developing Reporting and Interpretation Skill among the Higher Secondary Students.

5. There is a significant difference in the pretest mean scores of Reasoning and Problem solving Skill among students.

6. There exists a significant difference between the post test mean scores in the Reasoning and Problem Solving Skill after the implementation of Web Based Instructional Strategy.

7. There exists a significant difference in the gain scores of the Reasoning and Problem solving skill among students.

8. Web Based Instruction package is effective for developing Reasoning and Problem Solving ability among the higher secondary students.
1.8. THE TOOLS USED FOR THE STUDY

Criterion Referenced Test

1.9. MATERIALS DEVELOPED

Web Based Instruction Package

Project work

1.10. METHODOLOGY

Quasi Experimental method was used for the study. To assess the effectiveness of Web Based Instruction on the Scientific Skills of Higher Secondary Students, the students were administered the Web Based Instruction Package. A pre-test post-test two group design was used. The sample for the experimental study comprised of 228 students from Princess Nora University, Riyadh, KSA (Experimental group – 114, Control Group - 114). Samples were selected by the selection criteria of the university whereby, students were distributed in each class depending on their overall grades in previous levels. Students were evenly distributed in each class, with a maximum of 20 in each. The investigator picked 114 each for both control and experimental group by random elimination method. The students were observed for a semester, comprising of 120 days with two hours of class each day, and were graded based on their midterm examination, quizzes conducted in the class, their self study materials (projects) and the practical laboratory works. Examinations were held in accordance with the university norms and were prepared by the investigator with the approval of
experts from the university and the supervising teacher. The achievements of the Experimental and Control Groups were then compared.

1. 10.1. STEPS IN THE PREPARATION OF THE PACKAGE

1. **Question:** Identifying and listing the content – checking availability of domain name, finalizing syllabus for instruction, getting an idea of the instruction material to be prepared.

2. **Plan:** Developing a strategy to find the pertinent information rapidly (like developing hyperlinks in the package), selecting appropriate versions of software to be used and the like.

3. **Gather:** Harvesting information. The content to be delivered was well planned and prepared by the investigator in this stage.

4. **Sort, sift and analyze:** Rearranging the puzzle pieces ie – getting the picture. This includes elimination of the unwanted details.

5. **Synthesize:** Refining the content to the level of students.

6. **Evaluate:** Figuring out what is missing.

7. **Report:** Sharing insights and finalizing the software.

The Web Based Instruction Package prepared by the investigator incorporated the prescribed curriculum for the students under investigation. The content was carefully selected; hyperlinks, reference and supporting websites were chosen appropriately, mode of delivery of instruction using the supporting software were also carefully planned.

Using
these, the students either alone or with the help of their teacher can delve deeper into the subject matter.

1.11. ORGANIZATION OF THE REPORT

The entire report of the work done is classified into six chapters. The First chapter contains the introduction of the work under consideration, the statement of the problem, objectives, hypotheses, operational definitions of the statement of the problem, research methodology and the statistical methods used.

The second chapter deals in detail with the theoretical aspects of web based instruction and scientific skills. The theory of web based instruction, package preparation and the like are discussed in this chapter.

The third chapter deals with the review of related studies. Similar studies conducted earlier are cited and the conclusions derived from those are elaborately discussed here.

The fourth chapter is about the methodology used by the researcher in the study. All the details regarding the study, which includes, the research design, data collection and the like are discussed in this chapter.

The fifth chapter analyses and interprets the study conducted by the researcher. Conclusions are derived from the results in this chapter.

The sixth chapter gives the conclusions and suggestions of the study. This chapter details the result of the study. This chapter also discusses the suggestions for further study and the advantages and disadvantages of web based instruction.