CHAPTER 1

INTRODUCTION

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Education and learning are the most important of all human activities and always have been the principal means of creating productive and sustainable societies. At the beginning of last century, children were taught in a rigidly formal and stereotyped way. The teacher adopted an authoritarian attitude and the students were the passive recipients of teachers’ teaching styles. The teacher had no sensory or other audio-visual materials to supplement or substitute oral teaching. The teacher of today does not consider the child as a vessel waiting to be filled up with facts. The modern teacher feels the need for instructional planning and evaluation of learning. They realise the existence of widely different backgrounds, difference in student abilities and interests. Hence, the teacher of today realises the need for presenting different learning experiences to suit to individual differences among pupils and attempts to use the media and methods generated by educational technology.

Educational systems around the world face formidable challenges that are taxing conventional strategies. Fresh approaches are needed to address persistent problems of the past and provide students with an education appropriate to the needs of a modern, information-based global society. Now, after more than two decades of unfulfilled promises to revolutionize
education, computer and communication technologies are finally able to offer opportunities to significantly improve learning and evaluation.

The teacher, now also realises the constant influence of new technologies. The changing role of teacher in education has been the result of philosophical, psychological, social, technological and educational influences. The emphasis on subject of instruction is shifted to the nature of the learner and that instructions became student centered.

Ashby (1967) has identified four revolutions in education. In the first revolution, educating the young was shifted, in part, from parents to teachers and from home to school. The second was the adoption of the written words as a tool of education. The third revolution came with the invention of printing and the subsequent wide availability of books. The fourth revolution is the developments in electronics, notably those involving the radio, television, and computer.

New claims are now being made that a combination of cheaper and easier-to-use computers, new communications technologies and the Internet, and a better understanding of how to use these technologies for education are finally enabling computers to help improve teaching and learning. At the same time, some see computers as means for developing countries to join the global information economy more quickly. These new promises and the ubiquitous presence of computers in many sectors of society are driving an
increased interest in bringing computers into schools and classrooms. Computer acts like a super teaching machine catering to the needs of a number of students at the same time. The characteristic aspect of computer related learning materials are their capacity to initiate flexible interactions with the students which is not possible even in teaching machines.

No single change or reform can possibly address all educational challenges, but information and communication technology can address a broad range of changes and improvements. Some areas in which the appropriate use of computers in education might make an important difference are given below.

- Learner-centered education: Teachers can take on new roles as facilitators who empower students to question, experiment, collaborate, inquire, and construct knowledge and understanding.

- Enabling reflective learning and creative expression: Educators can create learning environments that enable students to acquire and use information that helps them understand their world and experiences and, eventually, generate new information and knowledge.

- Lifelong learning: Learning has to take place before, during, and after formal education, beyond the classroom, and through a variety of means. This can be addressed by ICT to a certain extent.
Active inquiry, research, and analysis: Students will be able to formulate critical questions, identify, acquire, and organize information from different sources, and analyze and make judgments about collected information.

Collaborative, project-based learning: Students can work cooperatively in groups, on projects that cross disciplines, constructing knowledge using a variety of both electronic and print research and reference materials, just as problems are solved in real-world and work situations.

Educational/real world relevance: Education must provide information, skills, and experiences that are relevant to the world in which students will live and work.

Individualized instruction: Differences in individual knowledge, learning abilities, and styles are not usually accommodated in traditional classrooms. As a result, students often demonstrate lower retention rates, poor performance, dependence on rote learning, and lack of enthusiasm. Current learning models show that individualized, project-based instruction can reverse these negative effects and contribute to greater student and teacher satisfaction.

Over the last three decades, much international donor funding for education focused on the critical issues of strengthening basic education with
an emphasis on increasing educational access and equity. Education in the 21st century must continue to do what it has been doing to educate students and much more. Investments to increase educational opportunities will pay dividends in terms of meaningful development only if students learn useful, real world skills, gain appropriate knowledge, develop higher cognitive abilities, and are able to work collaboratively across cultures and languages. Continued efforts are needed to modernize content, increase school resources, enhance teacher training, and improve access and equity.

Need and Significance of the Study

Along with the new enthusiasm for using computers in education, serious questions remain. Policy makers, donors, educators, and others are wondering about the real impact of computers on education in general and academic performance specifically. In particular, educators and others are concerned about how best to use these technologies in classrooms and schools and what specific strategies that are needed. Answers to these questions are often incomplete and anecdotal. The empirical quantitative and qualitative research that has been done indicates that computer technologies can have a deep and lasting positive impact on a whole spectrum of educational activities.

International development organizations, including UNESCO, already support computers in schools projects or are exploring how best to use
computers to address educational and developmental problems. Use of computers in education is growing as more people realize that students will be ill-equipped to participate in modern economies without solid technical and research skills. More important, however, is the growing understanding that providing quality education for all will not be possible without computer technologies.

In India, organisations like NCERT, MHRD, etc are much conscious to use the computer based technologies in education. The NCERT’s National Curriculum Framework 2005 (NCF 2005) has acknowledged that Educational Technology and ICT are significant tools to achieve constructivist learning in the new generation of Indian classrooms. It admits to a lack of detailed curricular ideas of how technology could or should fit in. “Technology should be used with more conscious educational purpose, as a cognitive tool, and as a means to facilitate more meaningful learning rather than an end in itself” - to support the constructivist teaching practices as described in the NCF, in a manner that is not superficial, but truly beneficial and meaningful to the learning environment, the learning process and the learner.

The report of the steering committee for secondary, higher and technical education for the eleventh five year plan (2007-2012) stressed the importance of ICT in education. The committee suggested a Government of India sponsored scheme for ICT. The main objective of the scheme is to
establish an enabling environment to promote the usage of ICT, especially, in secondary and higher secondary education in government and government-aided schools in the rural areas. The scheme has essentially four components. The first one is the partnership with the state governments and union territories for providing computer education and computer-aided education. The second is the establishment of SMART classrooms, which shall be the technology demonstrators. Universalisation of computer literacy through the networking of Kendriya Vidyalayas and Navodya Vidyalayas with neighboring schools is the third component. The fourth component relate to the activities of State Institutes of Educational Training (SIETs) which are mandated to produce educational content in the form of films, videos, audios, etc. The scheme is likely to be merged with the new scheme viz. Universal Access and Quality at Secondary Education (known as SUCCESS) during 11th Five Year Plan Period.

Based on the suggestions in NCF 2005, in Kerala, a state level curriculum framework was developed by SCERT ('Kerala Curriculum Framework 2007 (KCF 2007)'). The framework states “The present status of IT education in high schools in Kerala helps only to develop certain fundamental IT skills. The learning process of different subjects can make use of IT to make learning effective and meaningful. This deepens the range and
scope of knowledge that each learner gathers. IT can also help in teacher empowerment”.

The framework also states “First of all, we must realize that computers are essential in our present age in almost all fields. With the help of computers, it is possible to solve almost all the problems associated with the learning process. It can provide assistance to both the teachers and the students. The most important element in such a learning process is that computers have a wide range of interactivity that most other audio-visual aids lack. Therefore, it is the most effective learning aid. It is advisable to identify the areas in each subject, where computers could be used to carry out the learning process”.

In Kerala, the implementation of ICT enables learning and infrastructural facility development by deploying ICT material to school is carried out by IT@School. IT@School is a project of Department of General Education, Government of Kerala, to foster the IT education in schools and which on a longer term would facilitate ICT enabled education in the state. It is the nodal agency for implementing EDUSAT network and runs an exclusive channel for education called Virtual Classroom Technology on Edusat for Rural Schools (ViCTERS).

The curriculum also revised simultaneously by adopting the importance of new technologies and methods in learning and evaluation. The
new curriculum put forward a learning practice that is activity-based and process-oriented. Like infrastructural facilities and learning environments, the evaluation procedure is also changed. According to KCF, “Evaluation is an inevitable part of the process of education. This helps the teacher to identify the areas of excellence in the learner. It can also suggest a proper direction to the process. Evaluation process can direct the course of studies and provide a proper direction for studies. It is not desirable to limit evaluation as a means for remedial teaching or as the basis of classification of learners.”

The present school curriculum is process-oriented. Skills like observation and experimentation could be evaluated only by continuous evaluation process. KCF suggests “Teachers learned how to evaluate students according to classroom activities. This has led to the planning of teachers to become more effective and meaningful. Specific areas for continuous evaluation were fixed. The introduction of indicators for each area made evaluation easier. In the upper primary and high schools, each indicator was given a score which in turn led to a grade. The same system was implemented at the higher secondary level with slight changes.”

The Twelfth Five Year Plan (2012-2017) states “ICT can potentially make significant difference in improving quality. The National Policy of ICT in School Education envisions and provides for the development of a holistic framework of ICT support in the school system. Mission Mode Project
(MMP) on School Education is now under the National e-Governance Plan (NeGP). This would enable comprehensive technology enablement of the school education sector.” It also suggested for creating provisions for ICT in classrooms or portable facilities like a netbook/laptop/iPad and a projector with rechargeable battery, and implement ICT-integrated education.

Based on these recommendations schools were changed a lot. The ICT related infrastructures of the schools were increased. The planning of lessons also was changed by adding ICT slots in it. Many ICT oriented project proposals were submitted to government for implementation. The project proposal to give tablet computer for all secondary school students initiated by Kerala government is one among them.

In this context, the development of Moodle based Learning Management System (M-LMS) is relevant. The computer which is installed M-LMS can act as a server computer. Other computers, tablets and smartphone can connect to the M-LMS installed computer and can use the software environment with the use of a browser.

The developed software environment is web based and interactive. It has the capacity to add the available readymade software in to it. It also provides individual as well as collaborative learning environments to the user.
It helps the facilitators to grade the students with maximum accountability and helps the pupils to assess their performance.

More over, as an experienced person in the field of Computers, especially in Computer Programming, the investigator felt that the M-LMS is the need of the hour. His experience in the ICT enabled activities through his role as a Master Trainer at IT@School project also inspired the investigator for the same.

Hence, the investigator developed the Moodle based Learning Management System (M-LMS).

Statement of the Problem

The fact that computer-based instruction has a lasting impact in the learner, over the traditional method of instruction, is agreed by all in every culture, across the globe. What is required is a will and attitudinal change in the implementation of Information and Communication Technology (ICT) as an integral part of the instructional programme. The investigator’s experience at IT@School Project energized this concept and which propelled him to think of an instructional pattern by applying Moodle, a learning management system, in the teaching of Physics at secondary level.
The investigator being a specialist in the field of ICT thought of applying this learning management system and hence the problem for the present study is worded as “DEVELOPMENT AND VALIDATION OF MOODLE BASED LEARNING MANAGEMENT SYSTEM IN PHYSICS FOR SECONDARY SCHOOL STUDENTS OF KERALA.”

**Definition of key Terms**

Some of the key terms that required clarification are given below, either in verbatim or in operationally.

**Development**

In the present study, ‘development’ means the customisation of the Learning Management System - MOODLE (Modular Object Oriented Dynamic Learning Environment) by adding new modules and alteration of database used in MOODLE according to new additions.

**Modular object oriented dynamic learning environment**

Modular Object Oriented Dynamic Learning Environment (MOODLE) is a web based learning management system widely used with free and open source license.
Learning Management System (LMS)

In the present study the term learning management system means a web based computer software system dedicated for having learning, evaluation and management activities related to educational process. It is a software application for the administration, documentation, tracking, reporting and delivery of electronic educational technology training programmes.

Objectives of the Study

The following are the objectives of the study

• To develop and validate a Moodle based Learning Management System in Physics for secondary school students of Kerala.

• To tryout the developed Moodle based Learning Management System on Secondary School students of Kerala for the whole sample and the relevant subsamples.

• To compare the effectiveness of the developed Moodle based Learning Management System in achievement in Physics for the whole sample and relevant sub samples of Secondary School students of Kerala.

• To compare the achievement in Physics of students taught through Moodle based Learning Management System with that of the students who were taught through the existing method of teaching with respect
to the whole sample and the relevant subsamples of secondary school students of Kerala.

**Hypotheses of the Study**

The following hypotheses were set for the study.

- There exists significant difference in achievement in Physics of students taught through Moodle based Learning Management System and that of the students taught through the existing method of teaching.

- The Moodle based Learning Management System is effective in the teaching of Physics as evidenced by gain score analysis of Secondary School Students.

- The mean post-test scores in Physics achievement of experimental and control groups will differ significantly, with advantage to the experimental group, when the effect of pre-test score is controlled.

- The Moodle based Learning Management System is effective in teaching of Physics for Secondary School Students as evidenced by trend analysis.

**Methodology**

The methodology used for the development of the learning management system and its validation process are given below.
Procedure in Brief

The below given steps were followed for the development of Moodle based Learning Management System and its validation.

- Requirement Analysis.
- Software design for M-LMS.
- Software selection for M-LMS.
- Development of M-LMS.
- Selection and arrangement of a topic for validation.
- Validation of the developed software.

Design of the study

Experimental method and trend analysis were used to complete the study.

The design selected for the experiment is the pretest-posttest non-equivalent group design. Four experimental groups and one control group were utilized in the experiment.

For trend analysis, three different achievement tests were conducted on each of the four groups. The first test was conducted before the implementation of M-LMS based learning and the second and third tests were conducted after the implementation of M-LMS based learning.
Variables in the study

The experimental design consists of manipulating levels or amount of selected independent variables to examine their influence on dependent variables. The independent, dependent and control variables have been explained below.

**Independent variable**

The independent variables selected for the study are two Learning methods using M-LMS and the existing Method of teaching.

**Dependent variable**

Dependent variable selected for the study is achievement in Physics.

**Control variable**

The variable controlled by the study is the initial status of the students in terms of achievement in Physics as measured by pretest.

**Sampling**

The effectiveness of the material in classroom was tested by selecting samples from secondary school pupils of Kerala. In the present study, five independent groups were selected from 9th standard students of Kerala. Four groups were taught using M-LMS and the fifth group with the existing method of instruction.
Tools employed

The M-LMS developed by the investigator was the main tool used for the study. Achievement tests developed by the investigator with the help of his supervising teacher (3 numbers) were the other tools.

Data collection procedure

The data collection procedure used in experimental design and Trend analysis are given below:

Before starting the experiment, pre-test in Physics achievement was conducted on all of the four experimental groups and control group to measure the initial status of the subjects. After the administration of the pre-test, the experimental groups were treated with M-LMS and control group was treated with conventional method of teaching. After the completion of the treatment, a post test in Physics achievement was administered to measure the post experimental status of all the four experimental groups and the control group. The obtained pre-test and post-test scores were used for final analysis.

In the trend analysis part, four groups were participated. Three different achievement tests were conducted on each of the four groups. First test was conducted before the implementation of M-LMS based learning and the second and third tests were conducted after the implementation of M-LMS
based learning. The scores obtained from the three achievement tests were used for final analysis.

**Statistical techniques**

The statistical techniques used for the study are described below:

- Test of significance of difference between means.
- Analysis of Variance (ANOVA)
- Analysis of Covariance (ANCOVA)

**Scope and Limitations of the Study**

The objective behind M-LMS is acquiring new knowledge through individualized learning with the help of web based, collaborative and interactive environment. This environment evaluates the subjects systematically and gives immediate and richer feedback.

Individual as well as group activities are arranged in the developed MOODLE based Learning Environment. The investigator expects that these activities will help the pupils in the following ways:

- learn to explore and represent information dynamically and in different forms;
- become more socially aware and confident;
- able to communicate effectively about complex processes;
• use computers routinely and appropriately;
• become self-motivated and independent learners;
• master content quickly and share their understanding spontaneously;
• gain the ability to work collaboratively; and
• develop a positive orientation toward the future.

The M-LMS is developed in a scientific manner, by utilizing the principles of Self-Learning, Programmed Learning and Computer Assisted Instructions. This will help the learner to achieve the knowledge in his own pace. Suitable feedback procedures verify the progress of the learner continuously and motivate the learner. M-LMS can promote intrinsic motivation to the pupil, which is more effective in learning process.

The importance of using computers in a science education class is not limited to computer-assisted instruction (CAI). Computers can also be used as an educational strategy to improve overall learning in students. Research has shown an improvement in academic achievement in students using computers, as well as an increase in scientific reasoning skills and scientific knowledge.

M-LMS allows the student to work on his own pace. The speed of his responses could be used as additional information in assessing proficiency. Pupils are challenged by test items at an appropriate level; they are not
discouraged or annoyed by items and are provided with instantaneous feedback.

The M-LMS has provisions for group activities as well as individual activities with the full support and information technology. Instead of isolating students, access to technology actually encourages them to collaborate more than in traditional classrooms. Also, instead of becoming monotonous with use, students may find technology use even more interesting as time progresses on.

The present study faces some limitations also. The infrastructural facilities in schools for ICT enabled teaching and learning process is not sufficient at present. But the investigator feels that this will improve in the coming years as more and more smart classrooms are being set up in schools of Kerala.

The duration of the experiment was another shortcoming. For the sake of convenience the investigator was able to focus six weeks continuous application of the Moodle based Learning Management System in all the four schools. Had more schools with increased spell in experimentation would yield better results for application and for generalisation.
In the present study, the arrangement of MLMS is based on a content selected from Secondary School syllabi of Kerala State. It is also applicable in Higher Secondary Level, Open Schools and Higher Education.

More over, the M-LMS is limited to ninth standard Physics only, because of the nature of the current research. But once this software is developed, more topics and subjects can be added to it.

**Organization of the Report**

The report of the study is organized in five chapters. The first chapter includes an introduction, need and significance of the study, statement of the problem, definition of key terms, objectives of the study, hypotheses of the study, methodology, scope and limitations of the study and organization of the report.

The second chapter consists of three parts. Theoretical overview, software review and review of related studies. The first part consists of the theoretical overview of different learning management systems and the present learning environments. In software review part, the relevant softwares needed for the development of a new learning management system are reviewed. Review of related studies are written under two heads. Studies on the use of computer in education and studies on interactive and online learning environments.
The third chapter describes the methodology in detail. The methodology for the development of learning management system and the methodology for testing the effectiveness of the learning management system are included in it.

Fourth chapter deals with the detailed analysis of the study. Comparison of achievement scores of experimental group and control group, test of effectiveness of Moodle based Learning Management System and Comparison of achievement scores through trend analysis are included in analysis chapter in detail.

The fifth chapter deals with the study in retrospect, major findings, conclusions, tenability of hypotheses, educational implications and suggestions for further research. This is followed by references and appendices.