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Introduction

Today every one of us without any objection agrees that, computers and internet are the two devices that have made our life more modernized. Even almost all countries today increasingly recognize educated citizens are critical to their chances for success in the worldwide digital economy. It becomes utmost important for our children who are the would-be citizens of our country to develop the 21st century skills to be best prepared for the opportunity to succeed. The skills are none other than the use of technology, media literacy, effective communication, critical thinking, problem solving and collaboration. In this context, e-learning approach becomes not only handy but also the most appropriate one, in bringing out effective paradigm shift in our society.

E-learning is a combination of learning services and technology to provide high value integrated learning and rendering a concrete experiential learning. This could be at any time, any place. E-learning mode has brought a tremendous improvement in the field of education. It has become a very dynamic phase in digital revolution. By means of e-learning it is possible to store the knowledge/learning experiences digitally. This digital data can be accessed randomly; retrieved fast; manipulated; and above all, the space required for storage is very less. These digital tools can be effectively used to enrich the courseware content with multimedia features, like, audio, video, graphics, 3D-animation etc. This will result in better understanding and hence retention of the subject.

E-learning supplements the conventional delivery of instructions in the class-room. Thus e-learning facilitates the learning and instructional process for both the teachers and students. It is an extended form of classroom teaching in which, learning is facilitated by the application of information technology. It is the process of education using computer, telecommunication, and network and storage capacity.

In the word e-learning "e" refer to electronic where it would incorporate all educational activities carried out online or offline; i.e., synchronously or asynchronously via networked or standalone computers and other electronic devices. It is categorically noticed by its automatic and immediate feedback to the students' learning activities. It may involve the delivery of the content in an internet/extranet, satellite broadcast, interactive television, CD-ROM, DVD, audio and videotape etc. "Advances in technology continue to transform how we live, work, play, and learn. Intel is committed to making education accessible and engaging for all students. Computers on Wheels offers a one-to-one e-learning environment, enabling teachers to impart twenty-first century skills, such as critical thinking, analytical skills, problem solving and communication and collaboration skills, in an engaging manner, motivating students to attend classes and thus improve student retention," said R. Ravichandran, Director-Sales, Intel South Asia". It also emphasized that e-learning should not be just a machine based teaching but will be only effective in engaging all the participants when it has a human touch. In this context learning can be at any level, elementary school, high school, college, corporate and training institutions. E-learning is gaining its popularity because of its obvious advantages.

By going through all the explanations as said above one can conclude by saying that E-learning generally encompasses the electronic media, like, radio, TV and computers. World Wide Web has generated a new horizon in education. To put simply e-learning is referred to as learning supported by resources that are available through a computer (online/offline/telemode). In an e-learning setup learning can occur through interaction; the instructional material can be presented as text, graphics, animated graphics, audio/video or both (multimedia approach).

The present report deals with the details of a UGC sponsored (11th plan) mini research project conducted by the investigator during an academic period 2011 and 2012. The mini research study was conducted with an experimental design. The main purpose of the study was to find the impact of infusion of e-learning approach in the teaching-learning process at secondary school level.

Need and scope of the study:

Educational Technology and computers have taken a noteworthy point in NCF 2005. The draft brings out the role of these two in the following statement " the tremendous effectiveness of the computer and computing technology in shaping modern society has created the need for an educated public that can utilize such technology most effectively for the betterment of society and humankind. There is, therefore, a growing realization of the need to have a place for these domains of knowledge in the school curriculum. A distinction must be made between the Information Technology (IT) curriculum, which involves the use and application of tools of the information and computer age and the Computer Science (CS) curriculum, which is concerned with how these tools are designed and deployed. Both of these have their respective place in school education"-(NCF-2005-3.2.3). Such a felt need has a historical record with National Policy of Education 1986 and its Programme of Action 1992 also with of course a slighter variation in its expression. Further one can really understand the need and importance of the intervention of computers and e-learning approach in the teaching-learning process by looking in to the advantages of this which otherwise would not occur, some of them are presented below:

- It caters to individual difference in an education system. Each child can get a first-hand learning experience through either online or offline mode of e-learning.

- Children are going to be better versed with the lessons taught in the classroom or even learning at home. More and more schools are realizing the importance of e-learning for school kids.

- It brings more effectiveness and eligibility to teaching. It enhances the power of memorization through understanding the learning concepts.

- Teachers' difficulty of meeting individual difference is minimized but at the same time each student can get care and attention by the intervention of computers and mode of e-learning.

- A student getting immediate feedback is the utmost highlighting point in this type of approach in teaching. Here the feedback will act as motivating factor, and the success in the task of learning will keep the student on the track. 'Success' will act as a

- 'Reinforcing' factor and strengthens the learning based.

- E-learning approach in teaching will satisfy several psychological principles and learning theories as well as learning laws.

- A student will feel more free, secured and relaxed by the fear of failure and also feel free from several insulting situations.

- This approach transforms the existing conventional education system into totally a student centered/learner centered system as far as possible to the approximate level.

- Because of all the above points, a student will develop a new confidence and such intervention help in the removal of inferiority complex among students.

- A computer savvy child will not suffer from the burden of heavy school bags!

- The new trend set by such interventions has made it possible that even in the absence of a teacher, learning can take place. An absentee can get through digital storage, the things what all he has missed. It could be, like, computer aided instructions in terms of tutorials, drill works,

interactive CDs, virtual class, virtual lab, virtual experiments etc. All such efforts will make the student is getting a first-hand information.

- The courseware in the form of 3D animations and some simulations will help the student to understand better. And also, the pictorial representation of the subject will enhance the retention power and retrieval capacity among the children.

Apart from all the above said points, one more important aspect is, if anyone keenly observes the annual results of 10th standard in our state, it becomes quite clear that, in the subjects like, Science and Mathematics the cases of failures are more. If the same is observed at rural area, the list is going to be added by one or two more subjects, namely the 2nd language English and Social Studies. Whether it is science or mathematics or social studies, as the abstractness of the subject increases, the level of difficulty also increases and in turn students' learning outcomes are also get declined. It is this point which made the investigator to reflect deeply and prompted to make some initiative movements with sincere and dedicated efforts to solve this problem. With this background the present mini research project was conceived and carried out.

Title of the study:

The study is entitled as **"Intervention of E-learning for the Quality Improvement of Teaching-Learning Process at Secondary School Level".**

Objectives of the study:

The following are the objectives of the study:

- To bring about the quality improvement, efficiency and effectiveness in teaching learning process in the selected subjects, namely, Science and Mathematics at secondary school level by the intervention of computers and software packages in terms of e-learning approach.
- To develop a software package as a teacher support material/self-learning material for the selected subjects, namely, Science and Mathematics at secondary school level through infusion technique that is suitable for English as well as Kannada medium of instruction.

- To validate experimentally the prepared software package in a selected secondary school.

Hypotheses of the study:

The main purpose of the study was to bring a quality improvement in teaching-learning process. Therefore it was designed with a hope for bringing out the above said aim to be reached through e-learning approach. This being an experimental study the role of hypotheses seems to be very significant. Hence the purpose of finding of effectiveness of e-learning approach as well as intervention of computers contributed for the construction of hypotheses i.e., hypotheses related to the effectiveness of the experimental treatment which in turn has resulted in the formation of directional hypotheses. These are as follows:

1. The level of performance in the post achievement test will be higher than the level of performance in the pre achievement test irrespective of the subject, school and gender.

2. The level of performance in the post achievement test in the subject physics in the chosen unit will be higher than the level of performance in the pre achievement test irrespective of the school and gender.

3. The level of performance in the post achievement test in the subject mathematics in the chosen unit will be higher than the level of performance in the pre achievement test irrespective of the school and gender.

4. The level of performance in the post achievement test in the physics in the chosen unit will be higher than the level of performance in the pre achievement test irrespective of the medium of instruction.

5. The level of performance in the post achievement test in the chosen unit in mathematics will be higher than the level of performance in the pre achievement test irrespective of the medium of instruction.

6. The level of performance in the post achievement test in the chosen unit in physics will be higher than the level of performance in the pre achievement test irrespective of gender.

7. The level of performance in the post achievement test in the chosen unit in mathematics will be higher than the level of performance in the pre achievement test irrespective of gender.

Methodology of the study

The study was conducted in two different but successive phases, they are,

Phase I

This involves preparation of software materials as teacher support/self-learning material for the subjects, namely, science and mathematics by the collective effort of resource persons like, subject specialists, software specialists, educationists and experienced teachers. It involves the following steps:

- Prescribing the objectives as general objectives and instructional objectives
- Content fixation based on prescribed curriculum for state schools
- Designing a methodology to facilitate infusion for the material as a support system to teaching-learning situation/self – learning mode.
- Constructing a scheme of evaluation
- The software package preparation for both Kannada as well as English medium of instruction

Phase II

This phase involves the following steps:

- Selection of school and respective teachers and teachers' orientation based on suitable sampling technique.
- The samples will be drawn randomly from the school in Mysore city only.
- Execution of the programme in the selected school
- Experimental validation.

Development of the courseware material (Phase-1):

The chosen topics in both the subjects, namely, Science (Physics) and Mathematics with the respective units were treated for the teaching meant for e-learning mode. For this, a try out was carried out on a chosen topic in Science (physics) and mathematics initially. This was considered as a pilot study. Based on the feedback from this initial try-out the final courseware and other strategies coming under e-learning approach were finalized. A scheme of activities was prepared. This was subjected to expert's opinion and scrutiny. Their suggestions were also incorporated. However it was checked for the simplicity of the language, practicability and user-friendly nature. These instructional materials were strictly in compatibility with the textual information of the subjects, Science (physics) and mathematics.

The final try-out had the techniques, like, use of computers, interactive CDs, power point presentations; you tube clippings that are relevant to the teaching points, use of LCD and smart board, touch screen and on-line as well as off-line interactions etc. The major technique used for the implementation of the so prepared e-learning material or the instructional material was said to be "Infusion Technique". This means e-learning approaches were infused in between the conventional teaching by the regular teachers.

Pilot study

Pilot study gave a strong support for the research work during the first phase. This phase I had an extensive survey of related literature, analysis of the existing curriculum, analysis of the concerned textbooks and also the preparation of the courseware material in terms of e-learning approach. The pilot study constituted the activities like, Conventional teaching by regular teachers; Followed by a pre-test on the selected unit in each subject; Use of projectors, like LCD, and synchronizing with teacher teaching; Use of Smart boards as teacher support; Self-learning mode; Followed by post-test; Data collection and Data analysis; and finally the findings.

Preparation of the courseware (Phase-2)

The final draft was prepared after referring the initial draft to experts. Keeping the observations made during the pilot study the initial draft was modified and the final draft was prepared. Under this final draft the courseware materials on

chapters, namely, Electromagnetic Induction and Universe in the subject Science, Quadratic Equation and Circles in the subject Mathematics were present. Due to paucity of time the final try out had one chapter in each subject. The sample representation of the tried out chapters in each subject is present in the major report, whereas, the full length representation of the same is attached as an appendix to the research report.

The final try-out had the techniques, like, use of computers, interactive CDs, power point presentations; you tube clippings that are relevant to the teaching points, use of LCD and smart board, touch screen and on-line as well as off-line interactions etc. The major technique used for the implementation of the so prepared e-learning material or the instructional material was said to be "Infusion Technique". This means e-learning approaches were infused in between the conventional teaching by the regular teachers. The scheme of activities was designed in the following manner:

- Conventional teaching by regular teachers
- Administration of an achievement test which was considered as pre-test in this project
- Adopting infusion technique for e-learning by means of, projectors, like LCD and synchronizing with teacher teaching
- Use of smart board as teacher support material
- Self-learning mode (Software or course ware packages) for students
- Administration of an achievement test which was considered as post-test in this project
- Data collection and data analysis
- Findings, results and interpretations

Experimental validation of the study

The study was conducted in two different schools following the state syllabus in which the target group constituted the students belonging to 10th standard of both English and Kannada medium of instruction. Due to some practical problems and technical hurdles the research program did not have a parallel group rather all the students in both the schools were subsumed in experimental group only. The school chosen, the size of the sample are given in the table below:

Sample:

Table 5.1 Distribution of the sample for the study

Sl.No.	Name of the School	Boys	Girls	Sample (N)
1	IOE High School	39	15	54
2	VVVS High School	19	12	31

Design of the study:

For this mini research project a pre-test – treatment – post-test, single group design was adopted. The design of the experiment is represented diagrammatically in the figure given below.

Design of the experiment:

Sl.No	Activities	Name of the schools- IOE HS and VVVSHS
1	**Pre treatment**	• Assessment of the level performance in the pre achievement test in the subject Science (Physics) in the chosen unit through an achievement test. • Assessment of the level performance in the pre achievement test in the subject Mathematics in the chosen unit through an achievement test.

2	**Treatment**	- Adopting infusion technique for e-learning by means of, projectors, like LCD and synchronizing with teacher teaching - Use of smart board as teacher support material - Self-learning mode (Software or course ware packages) for students - Making use of interactive CDs that are produced by the software companies in the educational field, like, Edurite, Infobells, Digilearn, Discovery Channel-School meant for grades 3-6 and 6-12, and Jawaharlal Nehru Centre for Higher Science Research with a multimedia approach.
3	**Post treatment**	- Assessment of the level performance in the Post achievement test in the subject Science(Physics) in the chosen unit through an achievement test. - Assessment of the level performance in the Post achievement test in the subject Mathematics in the chosen unit through an achievement test.

Tools:

To measure the independent and dependent variables various tools were used. Fig below gives the details of the tools and the purpose to which they were used.

Tools and their purposes

Name of the Tool	Variable measured
1. Achievement test on the unit Electromagnetic Induction in Science, both in Kannada and English medium of instruction (Paper-Pencil mode).	Pre-levels and post-levels of achievement on the unit Electromagnetic Induction in Science, both in Kannada and English medium of instruction.
2. Achievement test on the unit Quadratic Equation in Mathematics both in Kannada and English medium of instruction (Paper-Pencil mode).	Pre-levels and post-levels of achievement on the unit Quadratic Equation in Mathematics both in Kannada and English medium of instruction.
3. Achievement test on the unit Electromagnetic Induction in Science both in Kannada and English medium of instruction (through interactive CDs).	Post-levels of achievement on the unit Electromagnetic Induction in Science both in Kannada and English medium of instruction.
4. Achievement test on the unit Quadratic Equation in Mathematics both in Kannada and English medium of instruction (through interactive CDs).	Post-levels of achievement on the unit Quadratic Equation in Mathematics both in Kannada and English medium of instruction.

Analysis of the data

Statistical analysis was done at the experimental phase of the study where in the deliberately prepared self-instructional materials in the form of e-learning approach was validated.

While validating the effectiveness of or the impact of intervention of computers in the form of e-learning approach to bring about a quality improvement in the teaching-learning process, three main effects were tested with respect to the three independent variables, namely, the treatment, school and the gender. For this purpose the statistical devices, like, t-test and paired t-test was employed. As regards the dependent variable, namely, level of achievement in Science on the topic "Electromagnetic Induction" and also the level of achievement in Mathematics on the topic "Quadratic Equation" the above said analysis were done separately.

Findings of the study

The experimental treatment using a specially designed courseware materials in terms of e-learning was found to be significantly more effective than the conventional teaching-learning approach in bringing out an enhancement in learning in the chosen units, namely, Quadratic Equation in Mathematics and Electromagnetic Induction in Science. This was observed among all the students belonging to both the schools and in both the medium of instruction.

The experimental treatment which was there in terms of intervention of computers and e-learning approach in teaching-learning process seems to be more effective than that of conventional teaching in both the schools irrespective of Government aided or a school run by a private management. However, there was variation in the relative effectiveness from school to school which could be attributed to the "School" and its nature, its infrastructure facilities, teacher's qualification and teacher effectiveness. But, it is still a positive point to be noted that in both the schools the use of computers and e-learning approach through courseware materials was significantly effective.

The study has demonstrated its effectiveness in terms of use of computers and e-learning approach for teaching-learning process in bringing out an enhancement in

learning outcome through the technique called "Infusion". Thereby, it substantiates the technique which has a potential power for further applications.

Educational Implications

The present study has demonstrated the effectiveness of the intervention of computers and e-learning approach through courseware materials for teaching-learning process in enhancing the learning outcomes among the students of 10th standard studying in state syllabus. The program also has demonstrated that such courseware is feasible from three points of view, namely,

(i)   It can be infused into the existing curriculum in general and in Science and Mathematics in particular.

(ii)   It can be perceived by any teacher who teaches either Science or Mathematics for 10th standard of state syllabus.

(iii)   It can be implemented effectively in any type of school and in Kannada and English medium of instruction which follow the state syllabus.

It is implied from the findings of the study that the intervention of computers and e-learning approach definitely will bring a quality learning outcome which is ought to be achieved but have not been tried out with adequate emphasis in the present curriculum in school could be developed through the **"infusion technique".**

An enhancement in learning outcome or achievement could be more effectively brought into practice by teaching the prescribed concepts through infusion (plug-in) them by means of e-learning approach as it is shown in the present study. This approach is more effective than just a oral explanation by the teachers in which learning itself becomes a chance factor or incidental. Thus, similar attempts could be made by developing courseware materials in both Kannada and English medium of instruction for the other chapters in the subjects Science and Mathematics and also in other subject areas like, Social studies and the second language English. Because most of the failures are occurring in these fields.

Keeping in mind the inadequacy of the Science and Mathematics textbook prescribed and the lack of teacher support material to transact as teaching-learning

process the same if prepared and presented as a support material during the curricular transactions many problems are going to be solved out.

However, the so prepared courseware materials were delimited to the specific area in Science and Mathematics content prescribed by the state Government for 10th standard. This implies that the entire textbooks of Science and Mathematics and the curriculum for other subjects also can have such a treatment.

It is further implied that teacher orientation programs are to be organized to make them confident enough for the use of computers and application of e-learning approach during the teaching-learning session is of utmost important.

Suggestions for further research

In the present study the courseware material was prepared as a teacher support material which demanded the intervention of computers and e-learning approach. This material has played a dual role, as "Teacher support material" for teachers and "Self-learning material" for students. The chapters which were excluded in the study are also coming under the need of such a treatment.

The research program has prepared the courseware materials which were compatible for the infusion technique for 10th standard. Similar attempts could be made for different standards under secondary school level.

The need assessment be done to find out to what extent the level of learning in the subject Science and Mathematics. Such an assessment can be made with specific references to the locale- like rural and urban. Then the curriculum for an infusion technique, e-learning approach and intervention of computers may be developed or modified on the basis of such a need assessment.

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