



A CRITICAL STUDY ON THE IMPACT OF E-LEARNING RESOURCES (ELRS) ON THE ACADEMIC ACHIEVEMENT OF SECONDARY STUDENTS IN BIOLOGICAL SCIENCE

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Abstract

The present study is an experimental study conducted to analyse the impact of use of E-learning resources (ELRs) particularly using Slides Presentations (PPP), Educational Videos blended with Audio Explanations on the academic achievement of Secondary students (standard VIII) in Biological Science.

The study covered 70 students from two different types of schools, where one is Private Aided School and the second one is a Private Unaided school located in the city of Mysore, Karnataka. Pre-Post test design was developed for this experimental study. Students of both the groups were equated on achievement before the intervention of experimental treatment. The experiment was conducted over a period of two months.

The intervention included a differential teaching approach where selected topics from Secondary level Biological Science were taught using Conventional or Normally practiced methods / approaches in the beginning for a period of four weeks, followed by a pre-test; and later the same students were taught selected topics from Biology with the same nature and difficulty level for the next four weeks, followed by a Post test. In parallel, the performance of students with Gender-wise analysis was also conducted to observe differences in academic progress between boys and girls.

Results revealed a statistically significant improvement in students' academic performance, with both the school types and genders benefiting, although slight differences were noted. The findings affirm that integrating E-Learning Resources into classroom instruction positively influences student learning outcomes in Secondary Biological Science.

Introduction

Biological Science is a foundational discipline that plays a crucial role in fostering cognitive development, logical reasoning, and problem-solving skills specially related to environment, life sustaining ecosystems, ecological balancing, sustainability, species conservation etc. among students. Studying Biological Science also enhances critical thinking, analytical abilities, and decision-making capabilities—skills that are essential not just within academics, but in everyday life. Despite its importance, many students perceive Life Science as a very useful subject, primarily because of its abstract but seem to be simple concepts, symbolic language, technical and scientific terms and procedural difficulty. This perception may lead

to anxiety, slight frustration, lack of interest with disengagement, especially when conventional or normally practiced methods and approaches are employed by teachers.

In this context, enhancing the interest levels of students with inquisitiveness in the learning of Biological science and its various secondary disciplines finds significance, especially in the present context of severe environmental issues that threatens the very existence of life on the Earth. As a matter of boon, in the evolving landscape of education, E-Learning Resources have emerged as powerful tools to make learning of Biological Science more easy, interesting and inquisitive. The subject becomes more accessible, relatable, and engaging with the intervention of E-Learning Resources. These resources—ranging from PowerPoint presentations to interactive videos and audio-based concept explanations—facilitate multimodal and multi sensory but semi-virtual learning by integrating text, images, animations, and sound. In simple terms, this multimodal approach stimulates multiple senses, enabling learners to visualize Biology concepts, comprehend relationships, and retain knowledge for long terms with contextual application more effectively in life.

Lecture method or so called Traditional chalk-and-board instruction though foundational and structured, often adopts a one-size-fits-all strategy, which may not be effective for all types of learners—especially those who are differentially visual, auditory, or kinesthetic in their learning preferences. In contrast, E-Learning Resources (ELRs) provide interactive and differentiated instruction that can accommodate diverse learning styles, pace, and abilities. In this sense, the present study finds significance and reflects a need to explore the need to employ E-Learning methods and reveal their impact on learning Biological Science at Sec. Level.

Major Objectives of the Study:

The study has the following main objectives.

1. To assess and analyse the impact of E-Learning Resources on the academic achievement of Secondary students (Class 8) in Biological Science.
2. To compare the academic achievement of students of Private aided and Private unaided schools in Biological Science before and after the experimental intervention
3. To analyse the differential academic progresses of boys and girls after using E-Learning Resources.
4. To determine whether E-Learning Resources enhance conceptual clarity, engagement, and retention in Biological science among secondary students.

Hypotheses:

The following null hypotheses (H_0) were formulated for the present study.

- There is no significant improvement in the levels of academic achievement after the intervention with E-Learning Resources.
 - There is no significant difference in the levels of academic achievement between the students of private-aided and private-unaided schools.
 - There is no significant difference in the performance levels of boys and girls
- In parallel, the following alternative hypotheses (H_1) were also formulated.
- There is a significant improvement in the levels of academic achievement after the intervention with E-Learning Resources.
 - There is a significant difference in the levels of academic achievement among the students of private-aided and private-unaided schools.
 - There is a significant difference in the performance levels of boys and girls

Methodology**a. Research Design**

A **pre-equated one-group pre-test and post-test design** was adopted across both schools—one aided and one unaided—each consisting of 35 students (total $N=70$). Performance before and after the use of E-Learning Resources was measured.

b. Sample

School Type	Boys	Girls	Total Students
Aided School	17	18	35
Unaided School	16	19	35
Total	33	37	70

c. Duration of the Study:

The study was in operation for two months, i.e. eight weeks. The conventional approach or normally practiced method was adopted in the beginning (Week 1- Week 4), followed by teaching of other concepts of Biology with similar difficulty levels or levels of abstractness

- Weeks 1–4: Traditional teaching
- Weeks 5–8: Teaching employing E-Learning Resources

d. Tools developed and used in the study

The following tools were developed and administered by the researcher

- **Achievement Tests (Pre-test) in Sec. Biology**
- **Achievement Test (Post-Test) in Sec. Biology:**

(Test Parameters Description: 36 Test items / 50 marks / 60 Minutes)

- **E-Learning Resources:** Power Point presentations, Instructional Videos, and Audio Summaries

e. Statistical Techniques used and Data Analysis

The study employed simple statistical techniques such as Range, Mean, Standard Deviation, Quartile Deviation and t-test

Overall Pre-test and Post-test Scores

Group	Mean Pre-Test	Mean Post-Test	Mean Gain
Aided School	26.4	34.2	7.8
Unaided School	25.4	33.0	4.6
Boys (Overall)	25.8	32.8	7.0
Girls (Overall)	26.0	34.4	8.4
Overall Mean Total	25.9	33.6	7.7

Observations:

- Students of both schools showed significant improvement in their achievement.
- Girls showed a slightly higher achievement mean gain when compared to boys.
- There is a significant gain in the achievement levels of students of private aided school after the intervention with E-Learning Resources.
- There is a significant gain in the achievement levels of students of private un-aided school after the intervention with E-Learning Resources.
- There is a significant gain in the achievement levels of boys after the intervention with E-Learning Resources.
- There is a significant gain in the achievement levels of girls after the intervention with E-Learning Resources.
- There is a very less difference in the levels of achievement of students of both types of schools both in pre and post tests
- There is a very less difference in the levels of achievement of both boys and girls in both pre and post tests

Paired Sample t-test Results

- Overall t-value: **12.27**
- p-value: < 0.0001 (highly significant)

A detailed analysis of the data obtained and statistical analysis reveals that there is a significant difference in the pre- and post-test scores, confirming the enhanced effectiveness

of achievement levels of all sub groups of sample selected for the study with the intervention of application of E-Learning Resources while teaching Biological Science at Secondary level.

Major Findings of the Study:

- **Significant Academic Gains:** Students across both schools showed improvement in achievement scores in Biology with intervention of ELRs
- **School Type Impact:** Students of both aided and unaided schools benefited almost equally, with negligible difference in mean gain.
- **Gender Differences:** Girls out performed boys in average gain, suggesting E-Learning Resources may particularly benefit female students in learning Biological Science.
- **Student Engagement:** Enhanced Interaction and Interest levels were reported during teaching using E-Learning Resources.
- **Conceptual Clarity:** Students were able to grasp abstract concepts better with animated visuals and real-world video texts.

Conclusions:

The study clearly demonstrated the positive impact of E-Learning Resources on the academic achievement of secondary students in Biology. E-Learning resources such as PowerPoint, video, and audio recordings enhance students' understanding, attention, and retention. While all students benefited, girls showed marginally higher gains than boys, and both aided and unaided schools responded well to the approach.

Obviously these findings recommend broader application of E-Learning Resources in school education, particularly in core subjects like Science, Maths and even Social Science where conceptual clarity is essential, especially at secondary level.

Recommendations of the Study

- **Widespread Use:** Promote the integration of E-Learning Resources in all types of schools, regardless of management type.
- **Gender Sensitivity:** Develop and adapt materials that are inclusive and support all learners, especially girls.
- **Equity in Access:** Provide resources and training for the teachers of all types of schools regardless of types of school management and ensure equal access to students too.
- **Subject Expansion:** Extend the use of E-Learning Resources to other subjects like Mathematics and Social Science.

- **Policy Implementation:** Encourage educational bodies to support digital and E-resource development for classrooms, especially in the context of digital learning.

9. Limitations of the Study

- The study was limited to only two schools in Mysore, which may restrict the generalization of the findings to other regions or educational contexts, i.e., external validity is slightly affected.
- The sample size of 70 students may not be a true representative of the broader student population that would lead to affect the external validity.
- The duration of the intervention was only sixteen weeks, which may not capture long-term impacts of E-Learning Resources on the academic achievement.
- Only a few selected types of E-Learning Resources (PowerPoint, video, and audio) were used; other forms like interactive simulations or Game-based platforms were not included.
- The study did not consider other intervening variables such as socio-economic status, medium of instruction, locale of the school etc. which may influence access to and familiarity with digital tools.
- Teacher-related variables, such as digital competence communication skills and instructional delivery style, were not fully controlled in the experiment.

10. References

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