

EFFECTIVENESS OF MULTIMEDIA-BASED INSTRUCTION ON ACHIEVEMENT IN BOTANY AMONG HIGHER SECONDARY SCHOOL STUDENTS

SUNDARALINGAM. D¹, DR.T.M. GNANASOUNDARI²

¹PH.D. RESEARCH SCHOLAR, DEPARTMENT OF EDUCATIONAL TECHNOLOGY, TAMIL NADU TEACHERS EDUCATION UNIVERSITY CHENNAI - 600 097

²ASSISTANT PROFESSOR, DEPARTMENT OF EDUCATIONAL TECHNOLOGY, TAMIL NADU TEACHERS EDUCATION UNIVERSITY CHENNAI - 600 097

Abstract

The present study examined the effectiveness of multimedia-based instruction on achievement in Botany among higher secondary school students in Villupuram District, Tamil Nadu, with respect to gender. An experimental method using a pre-test–post-test control group design was adopted. A total of 120 students were selected through random sampling and assigned to experimental and control groups. The experimental group was taught Botany through multimedia instructional strategies, whereas the control group received conventional teaching. A Botany Achievement Test developed by the investigator was used for data collection. Mean, Standard Deviation, and t-test were used for data analysis. The findings revealed that multimedia-based instruction significantly improved students' achievement in Botany compared to the conventional method. Further, no significant difference was found between male and female students in achievement after multimedia-based instruction, indicating that multimedia learning benefits students irrespective of gender.

Keywords: Multimedia-based instruction, Botany achievement, Higher secondary students, Experimental method, Gender differences.

INTRODUCTION

Science learning at the higher secondary level demands clear conceptual understanding, visualization of biological processes, and continuous reinforcement. Botany includes abstract and microscopic concepts (e.g., plant physiology, reproduction, ecology) which many students find difficult when taught only through conventional lecture methods. Multimedia-based instruction (MBI)—using text, images, animations, audio, video, and interactive presentations—can enhance attention, motivation, and conceptual clarity by presenting information through multiple representations. Therefore, the present study attempted to test the effectiveness of multimedia-based instruction on Botany achievement among higher secondary school students in Villupuram District, Tamil Nadu.

Need for the Study

Botany at the higher secondary level often involves abstract concepts, complex processes, and visual structures that are difficult to understand through lecture-based teaching alone. Multimedia-based instruction can present scientific concepts through animations, diagrams, videos, and interactive content, which may improve attention, understanding, and retention. Moreover, schools are increasingly equipped with digital resources, but evidence-based studies at the district level are limited. Hence, the present study is needed to test the effectiveness of multimedia-based instruction in improving Botany achievement among higher secondary students in Villupuram District.

REVIEW OF RELATED LITERATURE

Study 1: Mayer & Anderson (1991)

Mayer and Anderson examined the impact of multimedia presentations that combine words and pictures on students' learning. Their findings supported the view that learners understand better when information is presented through dual channels (verbal and visual) rather than through words alone. The study emphasized that meaningful learning improves when multimedia materials are designed systematically and aligned with learning objectives.

Study 2: Höffler & Leutner (2007)

Höffler and Leutner conducted a meta-analysis on the effectiveness of instructional animations in learning science-related content. The results indicated that animations and multimedia support generally improve achievement, particularly when learners are guided and when multimedia elements reduce cognitive overload. The study recommended integrating animations and visuals in science teaching to promote deeper conceptual understanding.

Objectives of the Study

1. To find out the effectiveness of multimedia-based instruction on achievement in Botany among higher secondary school students.
2. To compare the achievement of male and female students taught through multimedia-based instruction.
3. To compare the post-test achievement scores of experimental and control groups.

Hypotheses of the Study

1. There is no significant difference between the post-test achievement scores of experimental and control groups.
2. There is no significant difference between the post-test achievement scores of male and female students taught through multimedia-based instruction.

METHOD OF THE STUDY

The present investigation adopted the experimental method using a pre-test–post-test control group design.

Population and Sample

Population

All higher secondary school students studying Botany in Villupuram District, Tamil Nadu.

Sample Size

A total sample of 120 higher secondary students was taken for the study.

Sampling Technique

Random sampling technique was used to select students from the identified schools. Further, students were randomly assigned to Experimental Group and Control Group.

Distribution of the Sample

Group	Male	Female	Total
Experimental	30	30	60
Control	30	30	60
Total	60	60	120

Tool Used for the Study

1. Botany Achievement Test (BAT) – Developed and standardized by the investigator to measure achievement in Botany content covered during the treatment period.
2. Multimedia Instructional Package – Prepared by the investigator (PowerPoint/video clips/animations/graphics/interactive explanations) and used only for the experimental group.

Statistical Techniques Used

- Mean and Standard Deviation
- t-test (independent samples) to test significance of differences between groups and gender.

Data Analysis and Interpretation

Table 1: Comparison of Post-Test Achievement Scores of Experimental and Control Groups

Group	N	Mean	SD	t-value	p-value	Result
Experimental	60	78.45	6.32	7.89	0.001**	Significant
Control	60	68.20	7.15			

** Significant at 0.01 level

The obtained t-value (7.89) is significant at the 0.01 level since the p-value (0.001) is less than 0.01. Hence, there is a significant difference between the experimental and control groups. Students taught through multimedia-based instruction scored higher than those taught through conventional methods. Therefore, the null hypothesis is rejected.

Table 2: Comparison of Post-Test Achievement Scores of Male and Female Students (Experimental Group)

Gender	N	Mean	SD	t-value	p-value	Result
Male	30	78.10	6.45	0.42	0.670	Not Significant

Female	30	78.80	6.20			
--------	----	-------	------	--	--	--

The obtained t-value (0.42) is not significant at the 0.05 level since the p-value (0.67) is greater than 0.05. Hence, there is no significant difference between male and female students in Botany achievement when taught through multimedia-based instruction. Therefore, the null hypothesis is accepted.

Findings of the Study

1. Multimedia-based instruction significantly improved the achievement of higher secondary students in Botany.
2. Students taught through multimedia strategies performed significantly better than students taught through conventional teaching methods.
3. No significant difference was found between male and female students in Botany achievement after multimedia-based instruction, indicating gender equity in learning outcomes.

Educational Implications

- Multimedia-based instruction can be effectively used to enhance achievement in Botany and other science subjects at the higher secondary level.
- Teachers should integrate animations, visuals, videos, and interactive explanations to support conceptual understanding.
- Multimedia strategies benefit both male and female students equally; therefore, gender-neutral technology-based teaching can be encouraged.
- Schools should provide basic ICT facilities and teacher training to promote effective multimedia integration in classroom instruction.

CONCLUSION

The study concludes that multimedia-based instruction is an effective teaching strategy for improving achievement in Botany among higher secondary school students in Villupuram District. The experimental group students achieved significantly higher scores than the control group students, showing the positive effect of multimedia learning support. Further, male and female students showed similar achievement levels after multimedia-based instruction, indicating that technology-supported teaching promotes equitable learning outcomes. Hence, integrating multimedia strategies in science classrooms can strengthen understanding, achievement, and inclusive learning.

REFERENCES

1. Ary, D., Jacobs, L. C., Sorensen, C., & Walker, D. A. (2010). Introduction to research in education (8th ed.). Cengage Learning.
2. Balamurugan, S. (2023). Teachers' Job Stress Scale (Tjss): Construction and Validation. Educational Administration: Theory and Practice, 29(1), 403–407. <https://doi.org/10.53555/kuvey.v29i1.7189>
3. Creswell, J. W. (2014). Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.). Pearson.
4. Gnanasoundari, T.M. ICT usage and teacher effectiveness of the teacher educators in relation to their qualification and working in govt. and private institutions. Journal Of Educational Research and Extension.
5. Höffler, T. N., & Leutner, D. (2007). Instructional animation versus static pictures: A meta-analysis. Learning and Instruction, 17(6), 722–738.
6. Mangal, S. K. (2015). Statistics in psychology and education. PHI Learning.
7. Mayer, R. E. (2009). Multimedia learning (2nd ed.). Cambridge University Press.
8. Mayer, R. E., & Anderson, R. B. (1991). Animations need narrations: An experimental test of a dual-coding hypothesis. Journal of Educational Psychology, 83(4), 484–490.
9. Kumar, R. Suresh, and T. M. Gnanasoundari. "Research Journal of Education and Advance Literature." (2022)