

ABSTRACT of the Ph.D. Thesis

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Development of instructional multimedia module and evaluating its effectiveness on critical thinking, problem solving and achievement of secondary school science students

Key Words: Instructional Multimedia Module effectiveness, critical thinking, problem solving, achievement.

If new generation education system wants to achieve the edge, instructional processes must undergo paradigm shift. With the technological revolution, education can no longer ignore the social and psychological impact of technology on human minds. Technology therefore has a strong pedagogical justification in the rejuvenation of instructional processes leading to new value creation.

Present research attempts to focus upon the integration and evaluation of technology used as multimedia module in classroom environment for teaching science at secondary school level in order to enhance achievement, critical thinking and problem solving abilities of the students. Three different English medium private schools affiliated to CBSE, from the identified zone of Delhi were selected as a sample through criterion purposive sampling, keeping in consideration the availability of computer laboratory facilities, permission granted by school authorities and no ability grouping of the students. The sample size for this study comprised of 227 students studying science in tenth standard, where one section was exposed to Instructional Multimedia Module developed on topic of Biology, "Reproduction" and another section was taught through conventional teaching procedure by the researcher. Of all the three schools, Experimental group consisted of 111 students and control group consisted of 116 students. The study was delimited to the process skills problem solving, critical thinking and achievement level of the students. Quasi-Experimental Design was considered for the study, as researcher experimented with intact classes in the schools.

The present study was undertaken with following objectives into consideration:

- To develop Instructional Multimedia Module in science subject on the basis of Gagne's instructional strategy for secondary school students.
- To study the effect of Instructional Multimedia Module on critical thinking of students
- To study the effect of Instructional Multimedia Module on problem solving ability of students
- To study the effect of Instructional Multimedia Module on achievement of students.
- To study the effectiveness of Instructional Multimedia Module as perceived by the Secondary School students.

Secondary Objective:

- To develop the profile of the students selected as a sample group for the study.

In order to collect data from the sample group to conduct a research, following tools and techniques were developed:

- Focus Group Discussion to select topic for module development:
- Self Developed Instructional Multimedia Module on the topic-Reproduction:
- Modified Watson Glaser Critical Thinking Appraisal
- Self Developed Problem Solving Ability Test based on Polya's 4-step plan
- Self Developed parallel-form Achievement Test to collect pre-test and post-test scores
- Self Developed Questionnaire for studying perceived effectiveness of Instructional Multimedia Module

Also, to check the entry level of the students before intervention on three variables; critical thinking, problem solving and achievement, Mann-Whitney U-Test was applied.

The findings revealed

- Schools were still using conventional teaching procedures and use of multimedia modules was very less even when smart classes are available in schools. Students were more interested in learning through modules as it provides them visual aspect thereby putting less emphasis on abstract vision.
- Results concluded that, the effect of Instructional Multimedia Module in experimental group is found to be significantly better than, the effect of conventional methods followed in case of control group on critical thinking, problem solving and achievement levels of the students.
- The data received on the effectiveness of **Instructional Multimedia Module**, reflected positive perception of students towards Instructional Multimedia Module in terms of three domains- Conceptual design, Graphic design and User Attitude further categorized into instructional design, navigation and orientation, interactivity, individualized attention, sequencing, consistency, textual graphics, visual graphics, sound graphics, mix of graphics, level of exposure and comparative self learning.

Implications of the study:

- Since the students of secondary school in focus group discussion mentioned that teachers use more conventional methods and not technology in classrooms, re-view and re-vision of the curricula of pre-service teacher education, laying more stress on educational technology and their practical usage, developing pre-service teachers competent in technological use is needed.
- Review and revision of school curricula-specifying with scope of specific smart class periods using instructional multimedia module, wherever required for the chapters.
- Making the availability of smart classroom fully equipped with modules and resource person as mandatory requirement for all the schools.
- Equip the teachers to cope with emerging trends due to advent of modern technologies in learning environments as students reported that they want more technology to be used by their teachers.
- Schools should provide a platform to teachers by organizing capacity building programmes, making them aware of current trends and thereby developing their potentials for using Instructional Multimedia Module, as students reported that teachers do not use IMM technology as a regular feature.
- Schools should incorporate multimedia applications like instructional multimedia module for teaching –learning as they enhance critical thinking and problem solving skills of the students.
- Teachers should plan their lesson and instructional strategies using Instructional Multimedia Module as students reported, they are more interested in learning through technology and results of the study also show IMM enhanced problem solving, critical thinking and achievement level of the students.
- Teachers should encompass technological skills with full understanding to deliver the lesson effectively.
- As discussed in focus group discussion with students, science subject deals with abstract concepts; multimedia can help visualize them and understand them. So multimedia as an instructional tool in science teaching should be incorporated.
- As revealed by feedback of students through perceived effectiveness questionnaire for Instructional Multimedia Module, learning facilitated through instructional multimedia module develops student's study behavior towards science and usage of multimedia module as a pedagogical agent in science teaching should be enhanced.

Suggestions for Further Researches:

For further researches, the areas that can be explored are-

- The study can be extended at senior secondary level or higher education levels,
- As the present study was confined to Science subject, research can be done in other subjects also like mathematics.
- Instructional Multimedia Modules for other subjects based on Gagne's nine events of instruction can also be developed.
- The study can be extended to study the effect of instructional multimedia module on gender basis, whether girls developed more critical thinking skills, problem solving skills and achievement levels or boys developed more high order thinking skills
- A study can be undertaken to study the attitude of students and teachers towards use of instructional multimedia module as instructional tool in classroom settings.