Effectiveness of Multimedia in Teaching Descriptive Geometry

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This study demonstrates the instructional value of supplementary media presentations. A total of 187 first-year engineering students were randomly assigned to 11 descriptive geometry classes. Five classes received multimedia instruction, including televised and 35mm slide programs, in addition to the classroom lectures. The remaining students received no media instruction but completed the same assignments and tests. Data compared each study group in relation to (a) competency in the subject, (b) achievement, (c) visualization of spatial relationships, and (d) attitude toward the subject.

Accelerated growth of knowledge and change in society and technology places increased pressure on the educational community. Educators must fit new information into the curriculum and are called on to prepare students to compete successfully in a more complex society. Media materials can be useful in transmitting knowledge, in facilitating learning, in teaching skills, in motivating students, and in influencing attitudes. However, the problem is fitting the use of materials effectively and efficiently to specific situations.

A large number of research studies compare traditional teaching methods with media utilization practices and seek evidence of the instructional value of specific media materials in specific situations. From such narrow research comparisons can be extrapolated the effectiveness of technology in more general applications (Kemp, 1975).

This study was designed to determine the effectiveness of multimedia materials in teaching the basic principles of descriptive geometry. The need for the study arose as planning was directed to revising the course.

The investigators recognized the supportive attitude of the college administration toward efforts to improve instruction. However, that attitude did not remove the constraints imposed by lack of funding and clerical support. Additional constraints were the absence of media services...
and instructional design assistance on the campus. However, the investigators could provide the design and production skills. The senior investigator was one of the two course instructors. The university provided television facilities for videotaping and playback and also made available a limited supply of audiovisual equipment.

Evaluation of the constraints and resources led the investigators to design a study based on developing media materials for only a small portion of the course. The study would be the means of collecting data to support future requests for funding from the college to complete the revision of the course.

After reviewing the learning tasks in the descriptive geometry course, the investigators chose three areas in which to concentrate efforts to improve student achievement:

1. Attitude toward descriptive geometry.
2. Visualizing three-dimensional geometric figures.
3. Solving problems in three dimensions.

Developing a positive attitude is fundamental to the learning process, and learning in the remaining two areas is fundamental to the mastery of the subject matter.

**PROBLEM**

This study sought to answer the following question: How do first-year college students instructed by a multimedia classroom approach compare with those taught by the conventional approach in (a) competency in solving descriptive geometry problems, (b) informational achievement in descriptive geometry, (c) visualization of three-dimensional spatial relationships, and (d) attitudes toward descriptive geometry? In this report, the conventional approach refers to instruction in which the chalkboard is used for the diagramatic presentation accompanying the lecture. The multimedia approach refers to the use of videotaped lessons with study guides and 35mm slides to augment the conventional lecture.

**PROCEDURE**

To test the hypothesis that there will be no significant difference between students instructed via a multimedia classroom approach and those instructed by the conventional approach, the investigators employed the pre- and posttest research design. Two instructors cooperated in the study. Each taught classes using both the multimedia and conventional approaches with random assignment of instructors to treatments.

A multivariate t test (Hotellings t) was used to demonstrate that student outcomes were similar for both instructors whether using the conventional approach or the multimedia approach. The instructors followed lesson plans strictly to prevent any discrepancy between classes.

**Subjects**

Subjects for this investigation were 187 freshman engineering students enrolled in the fall and spring terms of Engineering Graphics at a private urban university. All were graduates of an approved secondary school and had completed 3 years each of high school English and mathematics and 1 year of chemistry and physics. Students must have scored a minimum of 500 points in math on the Scholastic Aptitude Tests (CEEB SAT) and a total for math and verbal of 1,000 points. The students were of mixed social and ethnic backgrounds and met minimum scholastic requirements to enter the College of Engineering. No consideration was given to sex differences, since women students comprised less than 2% of the population.

**Method**

Students were randomly assigned to one of 11 geometry classes when they registered. Five classes were employed in the reliability study. The remaining six were given the identical battery of pre- and posttests. The subjects were not informed that an experiment was in progress. All subjects received identical reading, laboratory, and homework assignments. For all groups, the course time included two 1-hour lec-