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LECTURE VS. LABORATORY INSTRUCTION IN AGRICULTURAL MECHANICS

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The area of agricultural mechanis has expanded rapidly in recent years to encompass much more than just farm shop operation. Agricultural mechanics involves a knowledge of the six areas described by the American Society of Agricultural Engineers: (1) agricultural power and machinery, (2) agricultural construction, (3) agricultural electrification, (4) soil and water management, (5) agricultural and shop processes, and (6) agricultural products handling.

The need for more agricultural mechanics instructors and more efficient methods of teaching has become apparent as increases in enrollment have created additional work loads on existing facilities and staff. Overcrowded classrooms and laboratories make it necessary to utilize more efficient methods of teaching agricultural mechanics.

The use of laboratory facilities to enhance the ability of learners in developing the needed skills has long been applauded as a necessary element in teaching agricultual mechanics. However, the introductory courses offered at many institutions of higher learning often secure enrollments far in excess of what might be considered suitable for the laboratory situation. This presents a dilemma in providing adequate instruction in appropriate areas due to size of class and/or the lack of facilities.

The Study

The study reported on here was to investigate the effect of laboratory experience on the education of students enrolled in an introductory class in agricultural mechanics at Northwest Missouri State Universtiy, Maryville, Missouri. Previously, the course consisted of three, one-hour lectures per week with no opportunity to develop skills or supplement learning through a laboratory session. The investigation centered around the determination of which teaching method, i.e., lecture vs. laboratory, provided the most opportune learning situation.

The students were self-selected by enrolling in Introduction to Agricultural Mechanization during the fall semester, 1975.

The objective of the experiment was to determine the difference in achievement of students taught a unit of instruction in soil and water management using lecture and laboratory techniques.

The study involved 46 students who completed the unit on the principles of soil and water management. The unit was divided into six main classifications, as follows: (1) public land survey, (2) watershed characteristics, (3) care of surveying equipment, (4) use of surveying equipment, (5) differential leveling, and (6) profile leveling. Eight class periods of 50 minutes each were devoted to the unit of instruction. Public land survey and watershed characteristics were taught in the classroom by lecture. For the remainder of the unit, one group of randomly selected students was taught using lecture techniques and the other randomly selected group was taught using laboratory techniques. The concern of the study reported here was the material taught using lecture and laboratory techniques.

The general instructional objectives were: (1) to enable the student to recognize and operate surveying equipment, (2) to enable the student to perform two types of leveling surveys, and (3) to enable the student to record and interpret survey notes. Accomplishments of the instructional objectives were measured by the students achievement on the cognitive and motor skill tests.

The lecture group remained in the classroom and the laboratory group worked outside the classroom for the duration of the study. The lecture group was provided demonstrations and a slide series on the use of surveying equipment, and worked examples of survey note-taking. The lecture group was not allowed to work with the surveying equipment but only to observe its proper use. The laboratory group conducted several surveys and recorded the information in survey notebooks. The laboratory group operated the surveying equipment and practiced its proper use. Both groups were given identical handouts each day to supplement instruction. The lecture group and laboratory group met at the same hour at separate locations during the period of instruction.

The entire class was given a pretest before the unit of instruction. The pretest consisted of a written examination with 26 questions. At the conclusion of the instruction, a posttest consisting of 26 questions was given. Automated answer sheets were used to score both tests to eliminate test grading errors.

A motor skill test was also administered. The motor skill test involved the adjustment of a tripod and level, and making readings of two rods placed in fixed positions. Each student was measured on the time required to adjust the instrument and make two readings. After the second reading, the following items were checked for proper adjustment: tripod thumb screws, leveling screws, and level instrument.

Analysis of variance was used to determine statistical differences in the pretest-posttest scores between the lecture and laboratory groups. A t test was used to determine the differences in the ability of the students to make correct rod readings in each group. The t test was also used to determine differences in the time required by students of each group to complete the motor skill test. The Chi-square test was used to determine if there were any significant associations between the groups and factors relating to proper adjustment of the equipment during the motor skill test.

Findings

Students did accomplish the instructional objectives during the unit of instruction as shown by a significant difference ($P \leq .01$) in the analysis of variance between the cognitive pretest and posttest scores in both the lecture and laboratory groups. The analysis of variance also revealed no significant difference in learning of students exposed to the lecture or laboratory techniques of teaching.

On the basis of the t test it was concluded that there was no significant difference in the ability of students to make correct rod readings in lecture and laboratory groups. It was observed that the laboratory group did make the rod readings in significantly less time ($P \leq .10$) than the lecture group.

No significant difference was found between groups when a Chi-square test was used on the skill of leveling the instrument. A definite association appeared in Chi-square analyses of tripod thumb screws ($P \leq .25$) and instrument leveling screws ($P \leq .025$). In both cases the lecture group had a greater number of improper adjustments than the laboratory group.

Conclusions and Summary

It was concluded from this study that students in both groups did learn the material presented and there was no difference in learning at the cognitive level. Also, students in both groups understood the importance of making correct rod readings, and developed similar capabilities to make correct readings for the motor skill test. The laboratory group did make rod readings in significantly less time than students in the lecture group. This was most likely due to the ability of the laboratory group to properly level the instrument making it unnecessary to readjust the instrument for the second reading.

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