Effectiveness Of Role Playing, Case Studies, and Simulation Games in Teaching Agricultural Economics

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This paper assesses the impact of introducing role playing, case studies, and simulation games into undergraduate courses in agricultural economics. An educational impact model is used in a qualitative evaluation of the teaching aids and to generate hypotheses. Quantitative experimental results are used to test the hypotheses. Results indicate that each aid can improve students' performance when used in appropriate situations. However, there is a definite trade-off between student contact time requirements and the effect of these aids.

Role playing, case studies, and simulation games are three of the many teaching aids being used by university instructors to supplement the lecture format for teaching (O'Connor and Osterman; Siegfried and Fels; French; Kendrick). All three of these techniques are simulations which can be classified as learning tools (Blank, p. 215). A simulation is an operating model which demonstrates the structure of a system. Simulations designed as learning tools are those that provide participants with a new or improved understanding of the system which has been modeled. These techniques cannot compare with the lecture format when the objective is to convey large volumes of information, but they can improve the level of understanding concerning specific points (Kolb). Often techniques such as these are used because the learning process of typical students in some disciplines necessitates using teaching methods that rely less on intuition and reading and more on sensing and factual materials (Roberts and Lee). Yet, despite the increased use of these teaching aids, studies of their ability to increase the effectiveness of learning have had mixed results (Siegfried and Fels).

This study was developed to contribute insight into these issues. Presentation of the findings is organized into four major sections. First, the objectives and methodology are discussed, emphasizing the experimental design used. Next, a brief description of the three teaching aids is presented. Third, the analysis of experimental results for each aid is presented. Finally, conclusions and limitations of the study are outlined.

Objectives and Methodology

The purpose of this paper is to assess the impact of introducing role playing, case studies, and simulation games into undergraduate courses in agricultural economics. The educational impact model developed by Joyce and Showers will be

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used in a qualitative evaluation of the contents and expected effectiveness of the teaching aids. In addition, the results of an experiment designed to quantify each technique's actual educational impact will be presented.

Educational Impact Model

Joyce and Showers state that when students use what has been learned to solve problems they are demonstrating that their training has had the highest level of impact possible. The level of impact a teaching program will have, in turn, is affected by the following training components:

1. presentation of theory or description of skill or strategy,
2. model or demonstration of skills or models of teaching,
3. practice in simulated and classroom settings,
4. structured and open-ended feedback, and
5. coaching for application.

Joyce and Showers indicate that components 1 through 5 above have increasingly greater levels of impact on students' abilities to solve problems. When all five components are included in a teaching program, up to 75 percent of students are able to apply what has been learned.

The model by Joyce and Showers implies that teaching aids which incorporate more of the five components will have greater impact than aids involving fewer training components. This hypothesis will be considered here by using the results from an experiment conducted over a period of one academic year. The experiment uses average test scores as an indicator of student performance.

Experiment Used

Student test scores were evaluated during a three-year period. During the first year, three different courses were taught

by a single instructor using primarily the standard lecture format. During the year-end review of each course the instructor decided that the level of student performance was not satisfactory. Therefore, the instructor decided to incorporate the teaching aids into the course presentation. During the second academic year the aids were used (as described in the next section) and evaluated informally.

At the end of the second year the instructor decided to eliminate doubts concerning the results of the informal analysis by conducting a formal experiment. During one term of the third year, each of the three aids was tested using a Posttest-Only Control Group (POCG) design.[1] This design, considered a "true experiment" (Blank, p. 198), is diagrammed

$$R \quad X \quad O_1$$
$$R \qquad O_2$$

where an "X" represents the introduction of an experimental stimulus to a group, an "O" identifies a measurement or observation event, and an "R" indicates that the group members have been selected randomly. The Xs and Os are read from left to right in terms of time periods, and symbols which are vertical to each other take place simultaneously. Threats to both internal and external validity are handled adequately by this design. The effect of each teaching aid (X) is measured by the difference $O_1 - O_2$ in separate experimental iterations.

The POCG experiments involved comparing the performance of two separate sections of the same course. During the same academic term, the instructor had two sections of the course, one which was taught using only the lecture style, the other taught by using the relevant teaching aid in addition to the lecture. The sections were offered on the same days and

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[1] Each aid was tested during a different term in the three-quarter academic year.

the control groups were the second (later) section so as to benefit from any improvements in instructor performance and to downward-bias the observed improvement of the experimental groups. Student performance was measured using scores from the relevant course examinations. Each section was given the same exam on the same day. The form of each exam (about ⅔ multiple choice and ⅓ short answer questions) facilitated objective grading.

The Aids as Teaching Devices

The three aids (role playing, case studies, and simulation games) are all used by the Agricultural Management (AM) department of California Polytechnic State University, San Luis Obispo (CPSU). That department will serve as the source for all examples presented here. A brief description of how each aid was used follows.

Role Playing

Role playing, as most often used in a classroom, requires physical involvement on the part of students. Two or more people "act out" the part of individuals in a hypothetical situation (Black). One example comes from an introductory agricultural economics course. While presenting the subject of price determination, a role-playing exercise patterned around the open-outcry market typical of commodity futures markets was used. Sixteen students participated in three successive auctions, some acting as farmers and others acting as wholesalers. Information concerning quantities to be bought or sold and profit/cost levels per pound was provided on index cards given to each participant by the instructor. During each three-minute auction the students had to negotiate transaction prices with one another. After the third auction, the three sets of resulting prices were analyzed by the entire class. After the instructor told the class which

set of prices were generated in an equilibrium, surplus, and shortage situation the students could see that the theory presented in their textbooks did, in fact, describe what happened in their exercise.

Using role playing ensures that students will be exposed to training components 1 through 3 of Joyce and Showers' impact model. Whereas lectures utilize only the first two components, role playing is designed to give students classroom practice in solving particular types of problems. Component 4 is often excluded from being part of this teaching aid.

Case Studies

Case studies are used widely. An undergraduate research methods course at CPSU used cases analyzed by small teams of students in an effort to tie together the skills learned in a number of other courses.

The purpose of studying business cases in the research methods course is not always to learn specific answers to specific problems, but to become familiar with analysis and decision making, with the process of arriving at answers rather than with answers themselves (Ladd). In this situation students analyzed each case in teams of 3 to 5 with the entire group being responsible for submitting a single written report. This method forced each student to come in contact with others in the class. During the academic term the composition of the teams was continually changed so that each student worked with a different group on each case. The teams worked together both in and out of class to prepare the written report. That forced them to deal with the real problems of allocating their scarce time and resources to completing the case assignment while working with people that they did not select themselves.

Using case studies incorporates components 1 through 4 of the impact model. The students practice applying their new

TABLE 1. Impact of Teaching Aids on Exam Scores in Different Agricultural Economics Courses.

Aid (Course)	Average Exam Score[a]		% Change		
	Control Group	Test Group	Topic[b]	Total	% Δ/hr[c]
Role-playing[d] (Introductory)	65	68	3	4.6	4.6
Case studies[e] (Research Methods)	70	78	—	11.4	2.3
Computer game[f] (Marketing)	72	83	—	15.3	1.7

[a] Score is from a maximum possible of 100.
[b] Change in scores related to the topic of price determination only.
[c] The average student contact time was one, five and nine hours per term, respectively, for role playing, case studies, and the computer game.
[d] Sample size for each group: 45.
[e] Sample size for each group: 30.
[f] Sample size for each group: 32.

problem-solving skills both inside and outside the classroom. They receive structured feedback from the instructor as well as open-ended feedback from other students while the teams are working together.

Simulation Games

Simulation games in economics and management tend to be computerized (Litzenberg). One of the most comprehensive games used in the AM department of CPSU was part of an advanced marketing course. In that course students were divided into three-person teams. Each team performed as the management of a separate company in a computerized simulation game. All of the teams were part of a single industry, competing with one another. Decisions concerning all aspects of company operations were submitted by each team on a regular basis and the results of those actions were calculated. Having to make the decisions gives students valuable insight into how various aspects of a company are interrelated (Boehlje and Eidman). This perspective could not be given to students using only a lecture format (Baker and Babb).

Computerized simulation games combine the contents of case studies and role-playing exercises (White). As a result simulation games expose students to training components 1 through 4 and provide more depth of exposure than either of the other techniques. This is due principally to the relatively long period of time that simulation games require to complete. Therefore, simulation games provide students with many more opportunities to practice problem solving and to receive feedback from both instructors and other students.

Hypotheses Implied by the Model

Implied by the qualitative assessment of the aids above is the hypothesis that each of the three teaching devices will improve student performance over that observed when a lecture-only approach is used. All three aids are expected to improve on the lecture-only approach because lecturing involves just the first two training components of Joyce and Showers' model while role playing, case studies, and simulation games each include at least three components. A quantitative assessment of the hypothesis is presented below.

Analysis of the Aids

The effects that role playing, case studies, and simulation games had on the performance of students in the experiment

described above are presented in Table 1. Average test scores improved in all cases, as did student evaluations of the courses when the teaching aids were introduced.

The results for the experiment concerning use of a role-playing exercise provide some insight into the impact of that teaching aid and possibly others. Although role playing had a small direct effect on exam scores, covering only the relevant topic (a 3 percent increase on scores concerning price determination), course total scores from the experiment improved 4.6 percent, on average (Table 1). An analysis of variance (ANOVA) of the scores from the control and experimental groups found a statistical difference at the 90% significance level. Written comments made by students evaluating the course indicate that role playing may have raised student enjoyment enough to have had a significant indirect effect on course grades. Seventy-three percent of participants mentioned the exercise in their answer to the open-ended question, "What were the most favorable attributes of the course?" Only 3 percent listed the exercise as one of the "least favorable" attributes in response to the next question on the course evaluation form.

There was an 11.4 percent increase in the average test score in the research methods course after case studies were introduced. An ANOVA found this difference between control and experimental groups to be significant at the 95% level. In general, there was improvement across the range of students: more "A" and fewer "F" course grades were given.

In the marketing course there was a 15.3 percent increase in exam scores when the computer simulation game was used. As a result, the average course grade issued rose from a "C" to a "B." The difference in scores was found to be significant at the 95% level using an ANOVA.

It is likely that some of the improvements made in the research and market-

ing courses were due to the indirect effects of the teaching aids, as was the case in the introductory course. Students evaluating each of the two courses often noted that the cases and the game presented them with an interesting challenge which they enjoyed.[2]

Care must be taken when interpreting the results of these experiments. Although the total percent change in test scores reported in Table 1 support the hypothesis posed, it must be kept in mind that the level of impact noted here for each teaching aid is not necessarily indicative of the level of impact that the technique would have if used in other courses. Also, the results for the three teaching aids are not directly comparable because they came from three different courses. The changes in test scores were used here simply to indicate whether the teaching aids had any impact on the effectiveness of learning, not to assess which technique is "best."

To make the results between aids more comparable, the impacts must be modified to allow for differences in student contact time. Each teaching aid required a different amount of students' time per academic term (1, 5, and 9 hours, respectively, for role playing, case studies, and the computer game).[3] As a result, it is not surprising that the aid requiring the most time, the computer game, had the highest *absolute* level of impact on students' performance. This result corresponds to that of Siegfried and Fels. A better measure of the relative impact a teaching aid had on learning would be one which reflected the "return on investment" received from stu-

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[2] The percentage of "most favorable" and "least favorable" comments for case studies were 61 and 6, respectively. The responses for the computer game were 80% favorable, 2% unfavorable.

[3] These are the average amounts of student contact time reported by students for case studies and the computer game, and from observation by the instructor for the role-playing exercise.

dent contact time. This modification led to the last column in Table 1, which reports the percent change in exam scores per hour of average student contact time.[4]

Such a modification still does not make the results from the three aids directly comparable, but it does give a different impression of the impacts generated. To be comparable the results would have to all come from applications in the same course (not three different courses). Nevertheless, by shifting the focus of a quantitative assessment of the aids from the absolute level of impact to a return on time invested framework, the modified results of this study raise some questions for future research.

For example, the relationship between inputs (time) required of students/faculty and resulting outputs (educational impacts) for particular teaching aids may be an important factor in determining which learning devices are most appropriate in specific circumstances. Equally important might be the choice of how outputs are to be measured—on a total or marginal basis. Plotting the experimental results reported here for all three aids on a graph with total student contact hours on the horizontal axis and total percent change in test scores on the vertical axis illustrates a positive relationship (nearly a straight line sloping upward to the right). However, placing percent change in test scores per hour of contact time on the vertical axis transforms the relationship into a negatively sloped curvilinear figure. In other words, it appears that use of the marginal physical product concept may be appropriate in selecting teaching aids. First, it will be necessary to test an assortment of devices requiring varying amounts of student contact time to provide a representative sample. From such a sample, an in-

put-output relationship for teaching aids might be estimated to allow relative educational impacts to be measured.

Conclusions

The general conclusion reached in this brief analysis is that role playing, case studies, and simulation games can all improve the effectiveness of learning when used as teaching aids. The results of the experiment reported here indicate that these techniques improve students' understanding of complicated material when combined with lecture presentations. However, the amount of impact each technique has on students varies directly with the amount of time required, as would be expected.

Role playing helps in giving students a better understanding of the decision-making environment, but does not allow for much detail in the information presented or in the variables being studied. Students are exposed to the stresses of a particular situation of interest, yet the exercise lasts only a short time.

Case studies can present detailed information about situations, but often do not allow students to "feel" the decision maker's position. It is difficult for students to fully understand the nature of the environment being described in a case if those students are analyzing the case data in a relaxed, academic atmosphere while having no personal stake in the outcome of decisions being made. Therefore, case studies can be useful when an instructor's goals include presenting large amounts of technical data in the form of a problem to be solved, or when placing some emphasis on the mechanics of the management/decision-making process itself.

Computer-based simulation games give students both repeated exposure to the decision-making environment and the opportunity to deal with a large amount of detailed information. While participating

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[4] Essentially the same results were obtained in an informal experiment conducted during the first year that the aids were used.

in a simulation game, students must work together to make decisions concerning a wide range of variables over a period of time in a competitive environment. This means that students must analyze detailed information, as in case studies, but they must do so in an environment filled with real stresses, just as in role-playing situations.

The results of this study do not mean that simulation games are considered to be more valuable than either case studies or role playing as teaching aids. There is a definite trade-off between student contact time requirements and the effect of these teaching aids. The simulation game had the greatest total effect here, but simulations often require previous exposure to certain topics and/or methods of analysis. As a result, games such as the one described here may not be appropriate for use in introductory level courses. Also, the time required to conduct a simulation game may not be justified when attempting to illustrate relatively minor points. Case studies and role playing, however, require less time and can be used in many different situations with little difficulty, but have less total effect. Yet, the return on time invested was found to be highest for role playing and lowest for the game. This result is the reverse of the ordering of the impacts for the aids when total effects were measured. Therefore, it is clear that all three teaching aids can be valuable additions to a program of instruction when used in appropriate situations.

The limitations of this study center on the unresolved problems of measuring all outputs and assigning them weights. Also, different teaching aids have different impacts on different students, so the distribution of outputs needs to be measured. As suggested in the analysis section, research efforts need to be focused on the input-output relationship for teaching aids so that guidelines can be developed to assist in choosing effective devices for par-

ticular situations. In this way improved educational impact models will become available to teachers as tools for use in improving the quality of the learning environment.

References

Baker, G. and E. Babb. "Managerial Goals and Firm Performance: A Laboratory Experiment." *North Central Journal of Agricultural Economics,* 6(1984): 88–94.

Black, R. "Psychodrama in Classroom Teaching." *Improving College and University Teaching,* 26(Spring 1978): 118–20.

Blank, S. *Practical Business Research Methods.* AVI Publishing Company, Westport, Connecticut, 1984.

Boehlje, M. and V. Eidman. "Simulation and Gaming Models: Application in Teaching and Extension Programs." *American Journal of Agricultural Economics,* 60(1978): 987–92.

French, C. "Selected Alternative Programs for Bringing the Real World to the Undergraduate Classroom." *American Journal of Agricultural Economics,* 56(1974): 1163–75.

Joyce, B. and B. Showers. "Improving Inservice Training: The Messages of Research." *Educational Leadership,* 37(1980): 379–85.

Kendrick, J. "Techniques for Motivating Students." *American Journal of Agricultural Economics,* 55(1973): 762–66.

Kolb, D. "Individual Learning Styles and the Learning Process." Sloan School Working Papers No. 535–7, Massachusetts Institute of Technology, 1971.

Ladd, D. "Notes on Use of the Case Method." Paper distributed by the Intercollegiate Case Clearing House, 1978.

Litzenberg, K. "Computer Use in the Agricultural Economics Classroom." *American Journal of Agricultural Economics,* 64(1982): 970–77.

O'Connor, C. and D. Osterman. "Innovations in Teaching: An Introduction." *American Journal of Agricultural Economics,* 60(1978): 985–86.

Roberts, D. and H. Lee. "Personalized Learning Processes in Agricultural Economics." *American Journal of Agricultural Economics,* 59(1977): 1022–26.

Siegfried, J. and R. Fels. "Research of Teaching College Economics: A Survey." *Journal of Economic Literature,* 17(1979): 923–69.

White, F. "Simulation of Agricultural Policy Formation as a Teaching Approach." *American Journal of Agricultural Economics,* 59(1977): 225–27.