Invited Paper

AUGMENTING AGRICULTURAL ECONOMICS AND AGRIBUSINESS EDUCATION WITH EXPERIENTIAL LEARNING

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Universities that teach business-related curricula are encouraged by industry to better prepare students for the business world. Often, educational shortcomings or deficiencies are not directed at curriculum content (i.e., an understanding of economic theory) but at the student's ability to apply those skills (Litzenberg and Schneider). Agricultural economics teachers are challenged to increase student opportunities to apply theoretical concepts and integrate a variety of interpersonal skills, including written and oral communication, conflict resolution, ethics, and negotiation. Departments use tools such as capstone courses, case studies, internships, writing assignments, and presentations to address these needs. Each has advantages and disadvantages in achieving these various objectives.

Experiential learning through role-playing simulation is one tool that has been less frequently utilized than other teaching alternatives in agricultural economics curricula. Experiential learning offers significant contributions and innovations in teaching agricultural economics (Koontz et al. 1994a). However, the strengths and weaknesses of this technique must be evaluated relative to the advantages and disadvantages, as well as the costs, of other teaching techniques. The following sections briefly describe the concept of experiential learning, an experiential teaching tool entitled the Fed Cattle Market Simulator (FCMS), and considers the relative costs and benefits of this learning technique. The article concludes with a discussion of the potential role of experiential learning in agricultural economics and agribusiness curricula.

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Comments by Gary Brester and an anonymous reviewer are appreciated.

What is Experiential Learning?

Experiential learning is learning by experience or, more simply, "learning by doing" (Gentry). Hoover and Whitehead more precisely defined experiential learning as, "experiential learning exists when a personally responsible participant cognitively, effectively, and behaviorally processes knowledge, skills, and/or attitudes in a learning situation characterized by a high level of active involvement" (p. 25).

Although specific experiential learning applications differ widely, several features are fundamental to each situation. Experiential learning is a learning process characterized by a high degree of individual participation in a decision/feedback environment. A repetitive or dynamic feature is central to experiential learning. Thus, in an economic context, experiential learning involves active participation by individuals and a high degree of interaction among economic agents in a dynamic decision-making environment. Experiential learning occurs within an iterative series of actions. Dewey's model (Kolb) of experiential learning describes the process as a series of loops with four stages in each loop: (1) Impulse; (2) Observation; (3) Knowledge; and (4) Judgement (see Figure 1). Few traditional educational approaches are able to accommodate active participation in such a dynamic learning environment.

The Fed Cattle Market Simulator

The following observations regarding the use of experiential learning are based on the authors' experiences in developing and using the

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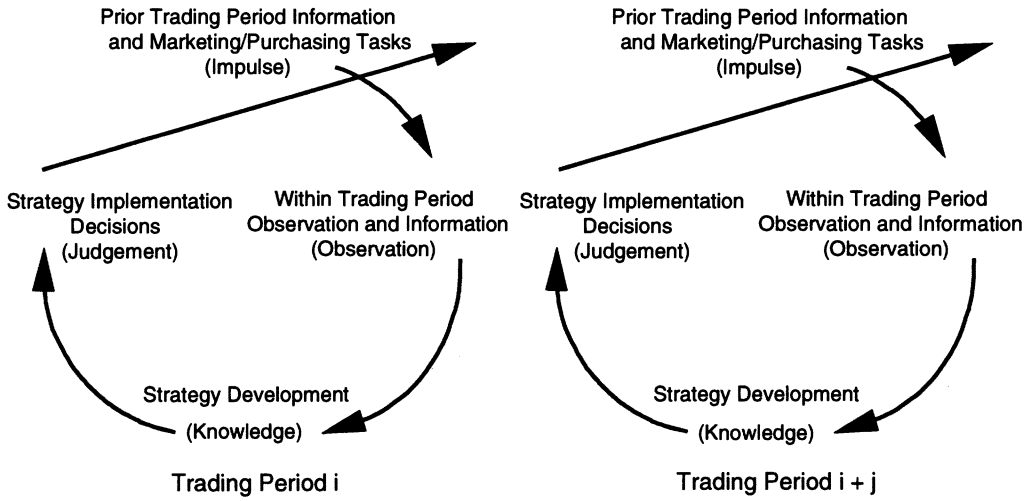

Figure 1. Experiential Learning Model of the FCMS[a]

[a]Modified from experiential learning models by Lewin and Dewey (Kolb).

Fed Cattle Market Simulator (FCMS). The Fed Cattle Market Simulator, dubbed the "Packer-Feeder Game" by students, creates a closed market for fed cattle that captures the market interface between feedlots and packing plants. Conceptually, the FCMS allows the interaction of supply and demand to endogenously control fed cattle prices through individual transactions. The market environment boundaries are fixed by exogenous feeder cattle supplies and boxed beef demand.

The FCMS agents are teams of three to four participants role-playing as either feedlot marketing managers or packing plant managers. Feedlots sell cattle from a five-period "showlist" of market-ready cattle, and packers buy cattle to control the volume of meat production in their packing plants. In the simplest terms, feedlots determine in which of five trading periods a pen of cattle will be sold. Packers are concerned with both volume and price of cattle slaughtered in each trading period. The decisions of buyers and sellers, spread across eight feedlot teams and four packer teams, create a robust simulation of the economic activities, dynamics, and psychology of the real fed cattle market.

Additional realism is injected into the decision-making environment as feedlot teams calculate break-even sale prices that vary according to both the date of feeder cattle purchase and the length of time on feed. Packers incur risk as they: (1) anticipate changes in boxed beef prices; (2) control plant volume; and (3) calculate break-even prices for sets of fed cattle that vary in weight/quality. A live cattle futures market is also available to allow participants to trade in both cash and futures markets and experiment with a variety of contracting and risk-management alternatives.

The simulation time frame or trading period represents one week of fed cattle marketings. Each weekly trading period includes a five-to-eight minute negotiating period and two-to-four minutes to summarize transactions and provide feedback before a new trading period begins. Figure 1 illustrates this process as a modification of Lewin's and Dewey's models of experiential learning. All market transactions involve face-to-face negotiation between people from feedlot and packer teams.

The FCMS uses a computer, an optical scanner, a high-speed laser printer, and electronic

digital displays to input, process, and provide summary output during each trading period. Feedlot managers and packers are provided "public" market price ranges and volumes during the negotiation period as well as weekly average prices, volumes, and other information at the end of each trading period. In addition, each feedlot and packer team is given a profit/loss statement that details the outcome of the previous week's transactions. Use of the computer and other electronic technology is essential only to meet the logistical demands for inputting, processing, summarizing, and outputting information within the relatively intensive time frame of the simulation. Participants do not trade against the computer, and the economic functions of price discovery and matching buyers and sellers in the marketplace do not depend on the technology used in the simulator. Koontz et al. (1992) provided a complete description of the simulator components and activities.

Benefits of Experiential Learning

One of the most obvious benefits of experiential learning to the casual observer is the *motivation* of participants. In the case of the FCMS, this motivation seems to be the product of the inherent personal involvement of participants; the realism resulting from the application to a specific market, namely, the fed cattle market; and the natural competitive nature of humans. The FCMS requires participation by students and is thus an active rather than a passive learning tool. The simulator creates a "need to know" which stimulates student desire and action to understand the concepts embodied in the simulator. For nonmajors especially, the experiential learning environment generates enthusiasm and appreciation for abstract economic concepts (Koontz et al. 1995b).

Realism of the simulated market is enhanced because the FCMS is defined for a specific real market rather than an abstract "widget" market. Participants are drawn into the market dynamics and emotion of the simulator because they relate to the representation of a real industry. Although the majority of students at Oklahoma State University have a natural affinity or at least awareness of the fed cattle market, those with no background or inherent interest in the industry relate well to the realistic market environment. When asked to rate the industry and market realism of the FCMS on a seven-point scale (1=very realistic to 7=not very realistic), undergraduate students gave the simulator an average rating of 2.57, with 82.9 percent of the responses being a 3 or better (Koontz et al. 1994a). For some students, the realism of the FCMS provides information to personally evaluate career alternatives. The intense trading environment of the FCMS, which at times approaches that of a commodity trading floor, may either be appealing, or alternatively, something very uncomfortable for students. This is another way in which experiential learning prepares students for job situations.

Another benefit of the FCMS is the *integration of economic concepts* embodied in the simulator. Students recognize and use a wide variety of economic concepts including supply and demand, break-even purchase and sale prices, price determination, price discovery, marketing, risk management, and price forecasting among others. To the extent that the FCMS draws elements from many classes, it embodies a capstone nature by helping students to synthesize curriculum components. An especially unique feature of the FCMS is the integration of micro-level concepts with a macro view of the industry. Many students participating in the FCMS are able, often for the first time, to see the relationship between individual firm actions and the resulting structure and performance of the industry.

The FCMS routinely creates numerous *teachable moments* that instructors can use for discussion and illustration. For example, situations often arise that illustrate concepts such as the impact of forward contracting, collusion, and the availability and quality of public price information. The authors contend that students who participate rather than merely listen will have a deeper understanding and retention of economic concepts. The simulator allows on-the-job training where students gain experience and adult participants are able to experiment with strategies or ideas that would be financially detrimental in a real market. The FCMS also creates a heightened appreciation for research

issues. Discussions are generated regarding such topics as the implications of changing structure and the value of market information.

Experiential learning is an *inductive learning* technique in contrast to the deductive learning of traditional lectures. Inductive learning is used only to a limited degree in agricultural economics and agribusiness curricula, although use has increased as case studies, internships, and capstone courses have become more prevalent. Inductive learning techniques complement deductive learning and provide students with a more complete learning experience. Students learn different skills with the FCMS than they do in traditional lectures (Table 1). Some students are inherently more able to learn by induction rather than deduction, and the FCMS enhances their understanding of concepts previously covered in lecture courses. The FCMS realistically captures the emotion and psychology of markets that cannot be captured in a lecture. Previously-learned abstract concepts of supply and demand take on new meaning for students who experience the supply and demand forces in an intensive dynamic environment characterized by the "greed, fear, and ego" that often drive individual decisions.

The FCMS also incorporates a host of *noneconomic concepts* in addition to the simulated economic environment. In this regard, FCMS does the most to address industry concerns about preparedness of agricultural economics and agribusiness graduates. Student participants work in teams in a fast-paced decision-making environment. Successful teams must learn to manage time, delegate responsibilities among team members, and handle differences in personalities. The dynamic simulation environment teaches participants that timely decisions must be made, often with less than complete information.

Face-to-face negotiation is an integral part of the FCMS and inevitable conflicts arise that must be resolved. The simulator is one of the few academic opportunities available for students to build and practice negotiation and conflict resolution skills. Our philosophy is to treat the FCMS environment as a "jungle" where participants are left to resolve conflicts among themselves. The *ethics* of individuals and teams influence the nature and quantity of conflicts. Students experience the consequences of poor business ethics on both individual transactions and long-term business relationships. Because students must trade over an extended time period, the immediate gain of an unscrupulous deal may be offset by subsequent trading patterns among teams.

Similarly, we do not attempt to impose the legal environment of the real world in the simulator. Students are free to collude or organize cartels and experience the potential gains as well as the difficulties of controlling and maintaining such arrangements. Students learn economics from this experience, and they also learn the impact of legal institutions on markets. The FCMS also helps students understand the motivations for and impacts of vertical alliances.

Off-Campus and Nontraditional Teaching Applications

The FCMS was intended from the outset to be suitable for use with adult audiences in extension programs. The FCMS is very effective in workshop sessions with agricultural producers, agribusiness employees and managers, lenders, and other adult audiences. Although a single session application of the FCMS limits the amount of trading experience and usually restricts the full range of learning opportunities (such as having participants rotate through different decision-making roles), the value of the FCMS for adult education has been documented (Koontz et al. 1994b, 1995a). The FCMS has also been used by large agribusiness firms with the specific objective of cross-training employees to increase understanding of various company roles (Koontz et al. 1995a).

Inductive learning is ideally suited to adult learners for several reasons. First, the FCMS allows each individual to learn and participate at many levels of competency simultaneously. The diversity of skills and background of typical extension audiences has long presented a challenge for traditional teaching methods. In the FCMS, two parties to a transaction function

Table 1. Top Ten Students-Identified Managerial Skills Learned from Role-Playing Simulation and Lectures

Rank	Managerial Skills Learned from Role-Playing Simulation	Managerial Skills Learned from Lectures
1	Develop People/Teams	Reflective Listening
2	Adapt to New Tasks	Planning
3	Make Decisions	Solve Problems Systematically
4	Assess Situations Quickly	Schedule and Coordinate
5	Forecast	Set Objectives
6	Analyze Data	Analyze Data
7	Persuade	Set Goals
8	See the "Big" Picture	Make Presentations
9	Analyze Problems	Manage Time
10	Lead	Analyze Problems

Source: Trapp et al.

simultaneously, but one individual may be struggling to understand break-even calculations while another is implementing a sophisticated marketing strategy. Learning takes place at the appropriate level for each individual. Second, because of their experience, adult audiences relate well to the inductive learning mode. The FCMS capitalizes on the individual decision-making environment that is familiar to adult learners and demonstrates how that micro level relates to the broader picture of market structure and performance. Third, inductive teaching techniques are very efficient for teaching adult audiences. Rarely do extension teaching environments allow an instructor to do much justice to the broad-based theoretical foundation of a four-year university degree. Adult audiences may have little use for abstract supply and demand theory, but they certainly relate to the forces of supply and demand in action as captured in the FCMS.

Research Applications

Although this article is devoted to a description of experiential learning using the FCMS, research considerations of the FCMS should not be overlooked. The simulator was originally conceived as an experimental economics tool. Research applications of the FCMS have evolved more slowly than teaching uses; however, experience has revealed potential uses of the FCMS for studying the impacts of changes in industry structure, pricing arrangements, price discovery, value of information, and other industry issues. Both undergraduate students and adult audiences have participated in preliminary research experiments using the FCMS.

Costs of Experiential Learning

The benefits of the FCMS discussed above must be weighed against the costs of developing and using this teaching tool. An important distinction must be made between the one-time costs incurred in developing FCMS and the operating costs of maintaining and using FCMS in teaching programs.

Development of the FCMS required a substantial investment of faculty time and other resources. Significant portions of four faculty members' time were intermittently used over three years. The FCMS development was further supported by approximately $100,000 in grants from several sources, the major one being a United States Department of Agriculture Higher Education Challenge Grant. The labor-intensive nature of early versions of the simulator for support and operation were reduced with the subsequent investments in programming and technology. Total development costs are

estimated to exceed $250,000. Although many applications of experiential learning could be envisioned, the decision to develop new applications should be carefully considered. The commitment of faculty time and other resources is considerable and the likely need for outside support is high. Like any computer software product that intelligently processes data, considerable human expertise and other resources are required in the development stage. However, once the education program (software and support materials) is developed, it is relatively self contained and can be transferred to other educators. With some initial educator/user training, programs such as the FCMS may be more economically transferable than other experiential learning programs such as internships.

In addition to faculty/educator commitment, use of the FCMS requires specific equipment that may imply additional investment for users. Although many potential users would have a suitable computer and printer, the FCMS works best when an optical scanner is used for data input. In addition, one or two digital electronic displays are used to present cash and futures market information. The FCMS uses paper trading forms to record transactions and generates cash and futures market financial statements at the end of each trading week. Each FCMS application requires support staff time to print trading forms and other setup materials.[1] In total, the FCMS is a relatively intensive user of replenishable supplies, such as paper, pencils, and printing materials. Although operating costs are small relative to development costs, they may be significantly higher than lecture courses.

[1]A one-to-four-hour class or workshop requires two to three hours of support staff time and up to one hour of equipment set-up/take-down time. Administration of the simulator during the class/workshop requires two to four people (depending on the number of participants, their background, and the speed with which materials are presented). Minimally, one of these individuals must be an experienced professional supported by one or more teaching assistants with a rudimentary familiarity with the equipment, forms, and other materials.

The Role of Experiential Learning in the Agricultural Economics and Agribusiness Curriculum

The teaching successes of the FCMS and its relatively low operating costs suggest that experiential learning should have a permanent place in agricultural economics and agribusiness curricula. Philosophically, the FCMS is complementary to other courses and extends the educational value of previous courses by synthesizing and integrating economic theory into a very real experience for students. However, experiential learning should not be viewed as a replacement or substitute for traditional theory courses. The inductive learning style of experiential learning complements the deductive nature of traditional agricultural economics and agribusiness curriculum. Student participants in the FCMS completed a survey instrument, developed by Teach and Govahi, which compares simulation role-playing to other teaching methods. The results indicate that simulation role-playing was the most effective method for teaching a set of 41 key business management skills. Moreover, simulation role-playing is the most likely method to complement lectures; that is, it is most likely to strengthen areas that are weakest in lecture courses (Trapp et al.). Table 1 clearly shows that while role-playing simulation reinforces some skills learned in lectures (e.g., analyzing data and problems), it also broadens the total set of skills of students. This results in a richer educational experience for all students and is especially beneficial for students who inherently respond better to inductive learning. One might expect that students from other majors would, in general, respond more positively and effectively to experiential economic learning than to traditional lecture courses.

As a practical matter, experiential learning can be used in a variety of ways in agricultural economics and agribusiness curricula. At Oklahoma State University, the FCMS has been offered as a one-hour special problems class, mostly for juniors and seniors. Students were recruited from price analysis, commodity futures, and some animal science classes. The FCMS has been used occasionally as a special lab session

for price analysis or commodity futures classes. These are usually done as a single two-to-three-hour evening session for extra credit.[2]

On a permanent basis, we have considered establishing the FCMS as a permanent lab section attached to the price analysis and commodity futures or other courses. This could be accomplished with the current semester schedule (meeting one to two hours weekly) or as a limited number of scheduled special sessions (three or more hours in evenings or Saturdays). There are advantages and disadvantages to each scheduling approach. Intermittent sessions require less resources and demand on students. However, semester-long trading enriches the learning experience by allowing students to participate in more than one role, facilitating emphasis on long-term strategies and planning/forecasting, and increasing experience with the market environment. The FCMS could also be used as the foundation for a stand-alone course. The integrative nature of the FCMS, combined with additional writing and oral presentation opportunities, suggests the potential for a capstone course. In the case of the FCMS (which has a strong business and market focus), additional aspects of the class would need to emphasize other disciplines of the agricultural economics profession and formal teaching of topics such as negotiation, conflict resolution, strategic management, risk management, and quantitative skills to produce a complete capstone course.

Additionally, the FCMS works well for workshops, short courses, and other teaching formats both on and off campus. FCMS has been successful as a format for extension and other adult education programs and with secondary school students. We expect continued use and growth in application for these nontraditional teaching environments. Finally, but not insignificantly, the FCMS creates a fun learning environment. The FCMS is the best thing we have found to give some life to the "dismal" science. The experience is invigorating for both students and instructors.

[2]The FCMS is also being used in this fashion for undergraduate and extension teaching at Kansas State University.

Summary

Experiential learning strengthens traditional agricultural economics and agribusiness curricula. This type of learning encompasses unique attributes that are highly complementary to lecture courses and other inductive learning methods such as case studies and internships. Given the development costs, it is unlikely that every agricultural economics department could or should attempt to develop an experiential economics application. However, a limited number of alternative applications, used across agricultural economics and agribusiness curricula, will better prepare students and benefit both graduates and their employers.

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