Experiential Learning in a Cross-Disciplinary Student-Directed Research Course

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Abstract

Professionals entering today's job market need to have attitudes and abilities that permit them to independently identify and solve problems, and to communicate results to others. They also need to have skills for collaboration with people who are like and different from them. Post secondary educators can use specific instructional strategies that result in self-directed graduates who are skilled in problem analysis, communication, and collaboration.

Instruction for preparing professionals for the next decade in agricultural and family sciences must be action oriented. Graduates will need to integrate information from a variety of subject areas, ask questions that identify and solve problems, collaborate with interdisciplinary teams, and use technology to develop and communicate concepts.

Graduates must be prepared differently than the "generalist" or "specialist". Employers want a "totalist" who can bring specialized skills to teams, retrain when needed, collaborate on projects, and overlap skills and knowledge with other disciplines. To solve problems in the work place, professionals must have the ability to work with others to plan and carry out applied research. Such skills are promoted when instructional methods are used that involve students as partners in problem-based research projects.

Traditional programs of study typically are not responsive to interdisciplinary concerns of the totalist. Graduates often have narrow training that is driven by the content of their majors. They usually study and communicate with students and faculty in their own discipline. One solution to this problem might be to take more courses outside one's major. However, requirements in most majors are so numerous that there is little opportunity to add additional courses or to work with others across disciplines.

When instructed with traditional lectures and demonstrations, students are primarily passive learners. They have limited opportunities to generalize concepts to applied settings. Problem solving abilities may be poorly developed, since there is little need on the passive learner's part to hypothesize or reach conclusions independent of the lecture or visual presentation. Students take few risks to succeed and may make a limited investment in the learning.

Theory and research support active learning, specifically cooperative learning, as effective methods to encourage team building and collaboration skills. John Dewey (1916) recommended that group investigation should be the basic model for social and academic education in a democratic society. Johnson and Johnson (1987) suggest that teamwork, communication, effective coordination, and division of labor are inherent in most real-life situations.

Joyce and Weil (1986) examined the research on cooperative learning. They concluded, "Classrooms organized so that students work in pairs and larger groups, tutor each other, and share rewards, are characterized by greater mastery of material than the common individual-study recitation pattern. Also, the shared responsibility and interaction produce more positive feelings toward tasks and others, generate better intergroup relations, and result in better self-images for students..."(p. 216).

Beveja, Showers, and Joyce (1985) conducted a study in which concept and inductive thinking procedures were carried out in cooperative groups. They found that students in cooperative learning models of instruction had gains twice those of a comparison group that received intensive individual and group tutoring over the same material (p. 217).

Van Dieijen (1990) reported positive results for cooperative, problem based instruction in a dietetics program in the Netherlands. Students and faculty in the program reported increased motivation, success in team working skills, and increases in interdisciplinary contacts.

An Active Learner Model

Professors at the University of Idaho School of Family and Consumer Sciences developed a cross-disciplinary, experiential learning course that focused on student-directed, professor supported research studies (See Figure 1). Undergraduate students, including sophomores, juniors, and seniors, identified problems, designed and conducted research, and analyzed and disseminated results. Decision making and communication skills were used as students worked together to solve problems within the research target. Students from a variety of disciplines participated in this cooperative learning experience with support from an interdisciplinary team of faculty.

Nutrition and child development faculty originally designed the course as an interdisciplinary investigation of satiety feeding versus restrained feeding of young children. Students from both disciplines were invited to be assistants for data collection. The intent of including students in the original research study was to give them opportunities to work in collection of data. As the project progressed students began to personally invest in the research by involv-

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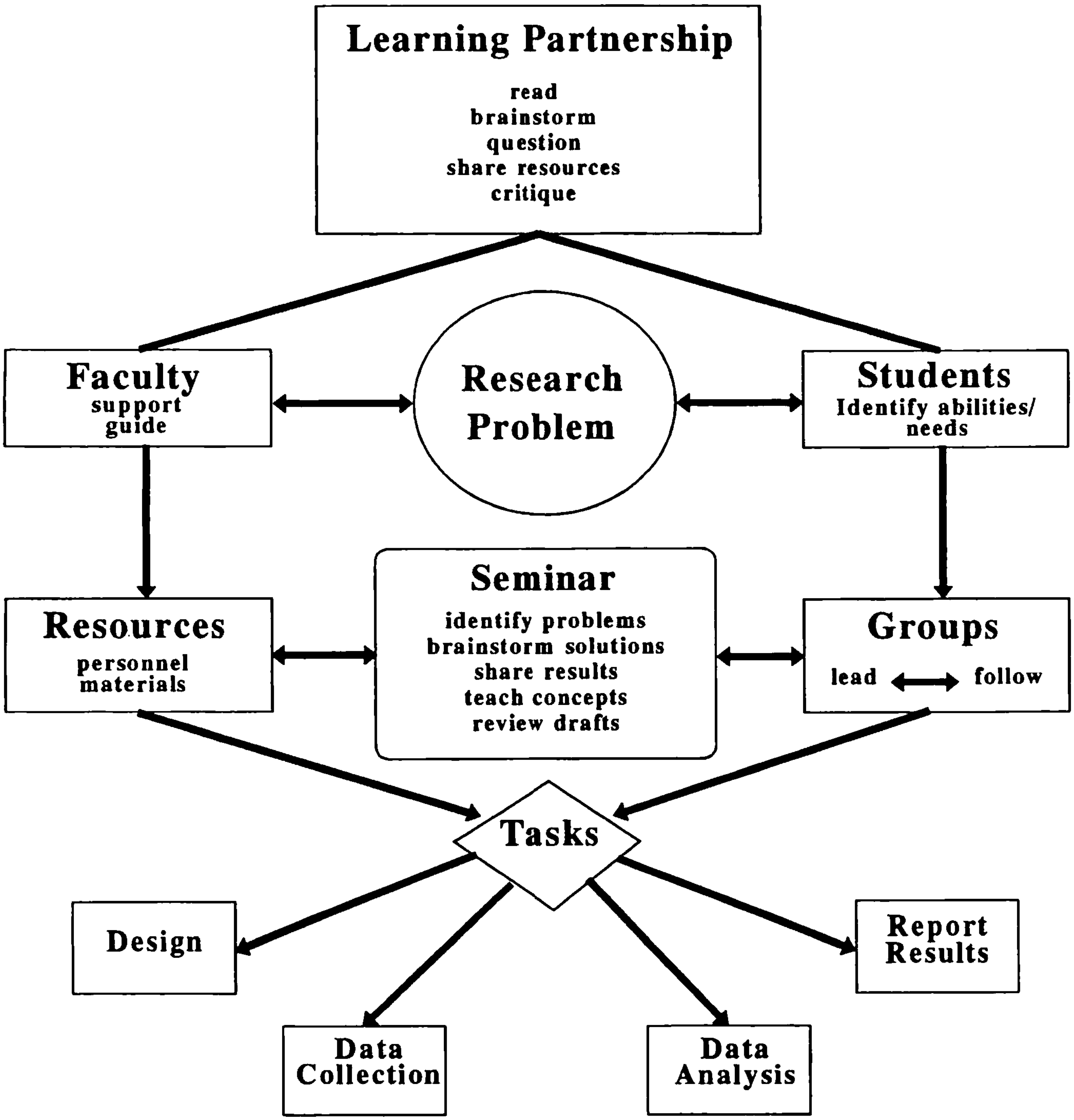
Figure 1. Model of Student-Directed Research Course.



ing themselves in more than data collection and analysis. They asked questions that resulted in hypothesis building and testing. They found areas in their knowledge that were missing and searched for additional information or readings. The students offered to teach each other skills that were absent or weak. They used several computer software packages for data analysis. They eventually developed materials for presentations to audiences outside the class.

The students consulted with faculty from nutrition, child development, and statistics. As questions were posed to the faculty, they responded by offering suggestions for resources or by probing the student with related questions. In most cases, the instructors encouraged student-directed learning by refraining from directly answering the questions. The teaching role was supportive rather than directive.

Course Strategies

The course has been offered eight semesters. We have identified a variety of strategies that accompany the method.

Class research projects were centered around real issues. Four projects were completed over eight semesters: an experimental study of restrained versus satiety feeding among young children; a focus group and resulting survey about eating behaviors to 1000 young adults; a piloted survey of parents of young children regarding feeding practices that resulted in a statewide survey of parenting practices; and a pilot of an experimental study of differences between children's eating behaviors when they re presented with foods that were made into shapes such as rabbit faces or cream cheese and cucumber snakes, and when they are fed the same foods in a natural state.

The general area for research was decided before the class convened. The team of professors initially set some boundaries, while providing students with choices and flexibility in selecting tasks that they wanted to do. The boundaries were expanded as ideas arose from student needs or research activities.

Students were invited to participate the first time the course was offered. Thereafter, some students were invited while others asked to participate. Sophomores, juniors, and seniors were enrolled. Many students registered for the course for multiple semesters. The more experienced student researchers taught the new students, and as they became confident, took on more responsibility for leading groups

A weekly seminar was held. Groups evolved from the needs identified in the seminars. Students usually chose to participate in groups that were tackling a task for which they were prepared, or in a group which was challenging but not frustrating. Professors conferred with student groups about their progress and activities before each seminar. Based on these discussions, the professors guided the agenda. Students brought up additional issues and were the primary discussants.

Students were encouraged to read, talk, and brainstorm. All ideas were considered. Students' resourcefulness was rewarded by seeing their ideas, reading, and products incorporated into class projects.

The ratio of teacher talk to student talk was low. Students' ideas were the driving element of the course. The professors listened and managed the activities. The possibility of mistakes was lessened by guiding students to discuss, defend, and critique all major activities.

Students and faculty identified necessary tasks. Students volunteered to lead or to participate in groups that were responsible for completing the tasks. Students across disciplines routinely worked together. They volunteered to take responsibility for group record keeping for data and class assignments and activities. Few needed a gentle push in the form of an actual assignment.

Students formally and informally taught each other concepts from their fields. As problems or issues arose, students who had answers shared with each other or with the group. Sometimes seminar time was used for students to explain strategies used in research activities.

Faculty rarely answered questions. They questioned the group or rephrased a student's idea to a question for students to investigate. Questions that arose about procedures were presented to the whole group. Individuals agreed to find more information or groups were formed to find possible solutions.

Faculty were liaisons between students and needed resources. Resources such as books, journals, computer programs, and sources of funding were suggested. Campus experts such as statistical consultants were identified.

One to one sessions with a professor were frequent. Since students chose what they wished to question or solve, learning needs varied among the students. Some students needed to talk about the statistical packages that were used. Others wanted to discuss the way the data sheets were formatted. Another was concerned about the ethics of one of the research strategies that was chosen.

Students created many products as they worked through the design, data collection, data analyses, and reporting of results. As students created materials such as questionnaires or data collection forms, they were encouraged to do multiple drafts, each time submitting their work for group critique, then incorporating group suggestions. Professional quality was expected.

A shared course assumption was that the results of the research would be shared with professional audiences. Students could choose to work on literature reviews, data collection, data entry, data analysis, written products, or oral presentations. They wrote papers, and made presentations at conferences and to practitioners.

Methodology Cautions

As with any instructional method, the success of this method depends upon the attitudes and behaviors of the instructor. Some thoughtful attention to the following cautions can help instructors decide if this method will work for them.

Upfront planning by the professors is critical. Anticipating student questions and needs for resources to answer the questions is necessary for offering guidance. Deciding the general destination of the projects is the role of the professors. Planning and taking the journey with sidetrips is the student's role.

A basic tenet of the method is that class participants choose the areas in which they want to invest. Each student reports personal progress. Since one person's progress often affects everyone's progress, students rarely misjudge their responsibilities.

All students must be invested in the research. Draw out the passive student. Reel in the overly aggressive student. Everyone has to play. The teacher's role is to ask questions, and lead the students to ask questions. The role of the teacher and all of the students is to find the answers together.

This method presumes that students can set their own objectives within the bounds of the cooperative project. They challenge themselves with the tasks that fit their current skills or those that are the next step above their current skills.

Instructors must be willing to give up their powerful roles as "the experts". Acceptance of the power of the students' ideas is necessary for them to be able to seize the creative opportunities.

Each student has different beginning skills and different outcomes. They have a variety of different courses behind them for support as well as different academic abilities. The fact that the class includes sophomores, juniors, and seniors means that a wide range of skills is inherent. Not all students must know the same things. Cooperative learning and teaching is a desired outcome of this method.

To make a group project work, all participants have to carry their loads. Twenty year old students who have been schooled in classes where responsibility for their assignments traditionally affects only themselves will have to have the instructor's commitment in respecting that they will get their task done. No nagging. No threats.

The students' investments will likely surpass that which is normally seen in traditional classes. The instructor should be prepared to match their investments.

It is unrealistic to think that students in a course such as this will learn all there is to know about research. Support from other courses such as basic statistics and computer courses is necessary.

Prepare to be patient when using student-directed instructional methodology. Though it is often quicker and easier for the professor to answer a question than to direct students to resources for answering their own questions, the learning is greater when students make the search.

Avoid thinking that this method is a "get rich quick" method of getting data collected for your pet research project. Although the student-directed method can result in data collection, be aware that it is a slower process than if you told them how to do the research or even if you did it yourself. Professors must be willing to decrease their investments in speedy and efficient data collection and increase their investments in helping students develop skills in research. This method requires careful supervision, acceptance of mistakes, corrective teaching, and tolerance of the time, blind alleys and frustrations that face the students as they search for answers.

Someone must keep records. The group should decide how this will be done. A system for accountability is essential.

Because so much of the work for this course occurs in groups, it is essential to make frequent checks on the evolving skills, attitudes and knowledge that each student acquires. Regular analysis of the student's activities and learning helps the instructor to decide when to ask the enabling question or when to offer a variety of resources.

Students have to be tenderly shaped to accept the value of doing multiple drafts of products. This is difficult for students who are used to doing an assignment, turning it in, getting a grade, and being finished. Group critique of individual efforts requires nursing of bruised egos. The quality of the final products usually heals the hurts. As students get comfortable with the strength of critical review and multiple rewrites, they more easily submit their work for scrutiny and revision.

Results and Outcomes

Student outcomes were:

+ increased ability to identify problems
+ more understanding of other disciplines
+ expanded ability to use and conduct research for solving problems
+ increased skills for collaboration, including written and verbal communication.

Students worked directly with young children and their parents, as well as teachers in the child development laboratory, statisticians, computer scientists, and other faculty. Such contact and need for communication resulted in an increase in professional interpersonal skills.

Involvement with human subjects resulted in opportunities to discuss the ethics of research. A special twist was added to the topic of rights of human subjects, since some of the research subjects were young children who needed special protections. Students were asked to list what they had learned in this class. One wrote, "I was impressed with how the class participants were so careful of the rights of the children in the study."

Ames and Archer (1988) suggest that the instructional environment influences a students' desires and willingness to engage or persist in learning. A mastery orientation means that students attach importance to developing new knowledge or skills. The process of learning is valued. Attainment of mastery is seen as dependent upon effort. Performance orientation means that the students' concerns are judged able, shown by being successful and outperforming others. They value ability an normatively high outcomes. Students who are mastery oriented rather than performance oriented are more likely to use effective strategies, prefer challenging tasks, like their class more, and believe that effort and success are related.

An achievement orientation survey which was devel-

Figure 2. Classroom Achievement Orientation Survey: Sample Questionnaire Items.

Mastery Items

"In this class...

Students often do work because they want to learn new things.
Students are encouraged to find answers on their own.
I work hard because I want to learn new things.
The teacher makes sure I understand the work.
The teacher wants us to learn how to solve problems on our own."

Performance Items

"In this class...

Doing better than others is important to me.
Students compete to see who can do the best work.
I really don't like to make mistakes.
The teacher favors some students more than others.
Students feel bad when they do not do as well as others."

Ames, C. and Archer, J. (1988). Achievement goals in the classroom. Journal of Educational Psychology, 80, 260-267.

oped by Ames (1988) was completed by each student at the end of the course in the Spring Semester, 1993. The questionnaire, which is given at the end of a class, directs students to respond concerning their orientation toward learning for a specific class. It does not test for learning orientation in general. Some items are statements which indicate a mastery orientation, others indicate a performance orientation. (See Figure 2 for sample questions.) Questions test either performance or mastery orientation and the responses are grouped into performance and mastery categories. Students responded using a five point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The class average on mastery orientation was 4.73 with a range of 4.31 to 4.89. The class average on the performance orientation was 2.5, with a range of 2.0 and to 3.1. These numbers imply that the cross-disciplinary, student-directed course resulted in student perceptions of the class as one in which they could be mastery oriented.

Summary

If we expect students to be successful professionals, we must provide a variety of learning settings for them. They need to have classes that provide them with content, concepts, and opportunities for practicing problem identification and problem solving. Opportunities to learn complex skills of leading and following must be offered in cooperative, team-building experiences. An undergraduate education should also have the outcome of building students' confidence and beliefs in their abilities to think and be productive.

Integral to the selection of instructional strategies is the philosophical orientation underlying the strategy. College professors can select strategies to match the needs of their students. Certainly students can learn from teacher directed strategies such as lectures and demonstrations. But to meet the many needs of today's active learners, cooperative, student-initiated and student-directed learning is fitting. Active undergraduate learners in the agricultural and family sciences can be challenged and reinforced by directing their own learning as they identify problems, find solutions, and work together.

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