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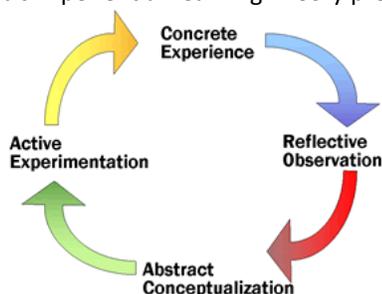


2. Teaching Innovation: Description and Application

This innovation is based on a comprehensive **multi-step Experiential Learning** Project and **various assessment tools** designed to evaluate its impact on student learning. Experiential learning is defined as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb, 1984).

What makes this project novel is that it is not just a 'hands-on' activity but also **incorporates several mental processes** to develop a deeper understanding of the concept. It embraces all the four components of the Kolb's Experiential Learning cycle described below (Figure 1), which is often missing in hands-on activities employed in most courses. Often experiential learning is incorrectly equated with *only* hands-on or the "do it" part of the process ignoring the other equally important components of the learning cycle. For instance, in an informal survey of several students and faculty from NMSU, most people described experiential learning as *something hands-on*, and had only a partial understanding of the experiential learning concept (unpublished, personal communication).

Kolb's Experiential Learning Theory presents a cycle of four elements as shown in Fig. 1.



According to this model, in order to gain genuine knowledge from a learning experience, the students must go through the following **4 steps**:

1. **"Do It"**: actively involved in doing something (**Concrete Experience**);
2. **"What"**: reflect on what happened; what were the results (**Reflective Observation**).
3. **"So What"**: analyze what do these results imply; how do I influence the outcome (**Abstract Conceptualization**); and
4. **"Now What"**: problem solve and decide what I will do differently next time based on ideas gained from the experience (**Active Experimentation**).

Fig. 1 Kolb's Experiential Learning Cycle

This project was designed in such a way as to ensure that students actually participate in all the four stages of the Experiential Learning model. Additionally, **several assessment tools** were designed to evaluate the effectiveness of each step of the experiential learning model, which further added to uniqueness and strength of this project.

Why: "Tell me and I will forget, show me and I may remember, involve me and I will understand" (Confucius, 450 BC).

Importance of experiential learning has long been recognized as evident from the ancient Chinese proverb above. This is particularly true in the field of Agricultural Science because of its applied, dynamic, and complex nature and while teaching new concepts such as cover crops. To better prepare the Agronomists of the future, faculty must teach skills that tackle complex situations, and experiential learning is one of the best ways to teach such skills. Moreover, students also demand more experience based projects as learned through students' feedback when I taught the Principles of Crop Production (AGRO/HORT 365) course first time in the fall of 2010.

How was the Innovation applied?

Project: A comprehensive Cover Crop and Vegetable Management Project was introduced in the AGRO/HORT 365 course in Fall, 2011 incorporating all the four steps of the experiential learning model and its assessment through various tools. The students worked in pairs and managed 13 different cover crops and 6 vegetable crops throughout the semester. They were actively involved in planting, weeding, caring for, and harvesting their crops (**Step 1: "Do It"**). During the project, students recorded crop growth and soil quality parameters (**Step 2: "What"**), reflected on their observations of their own crop plots as well as those of others, and synthesized concepts (**Step 3: "So What"**). Students also documented issues they faced, how they

addressed those issues, what decisions they made in their efforts to grow the best possible crop, and what they would do differently if they grew the same crop again (**Step 4: “Now What”**).

Assessment: Assessment of any new teaching method is critical to ensure that students learning objectives are met. This was particularly important for this project as it was done “on the fly”. A significant effort was involved in developing several quizzes to evaluate impact of this project on student learning and to identify areas of improvement for the project. In addition, students recorded what they believed were the most important lessons they learned from this project, including commentary on how the project reinforced the concepts learned in the classroom.

3. Positive Impact on Student Learning

Results from the multiple exercises including students’ self and instructor assessment quizzes during 2011 and 2012 clearly demonstrate a strong positive impact on student learning as indicated below.

Self-Assessment of Conceptual Knowledge: In the self-assessment quiz, students were asked to rate their knowledge about multiple topics of crop management on a Knowledge scale of “A lot” “A little”, and “Nothing” before and after the project. Table 1 shows the results from the self-assessment which reveal that before taking this course, only a few students knew much about cover crops, while by the end of the course, a majority of the students felt they had acquired significant knowledge about each topic.

Instructor Assessment of Conceptual Knowledge: In this direct assessment, students were given a quiz on selected topics to test their actual knowledge at the end of the project. Table 2 shows the results from students’ actual performance on the direct assessment quiz about those topics and shows that a majority of the students did demonstrate a high level of knowledge and expertise about cover crops at the end of this project: Indications are that the project was highly effective in promoting student learning.

Table 1. Self-Assessment of Students’ Conceptual Knowledge Before and After the Project in 2011 and 2012 (n=19, 10).

Topic		% students who knew about the topic					
		2011			2012		
		“A Lot”	“A Little”	Nothing”	“A Lot”	“A Little”	Nothing”
Principles of growing cover crops	Before	5	32	63	10	50	40
	After	94	0	5	90	10	0
Role of cover crops	Before	11	47	42	20	40	40
	After	95	0	5	100	0	0
Criteria to evaluate cover crops	Before	11	16	74	10	60	30
	After	79	16	5	90	10	0

Table 2. Instructor Assessment of Students’ Conceptual Knowledge After the Project in 2011 and 2012 (n=19, 10).

Topic	% students who knew about the topic					
	2011			2012		
	“A Lot”	“A Little”	Nothing”	“A Lot”	“A Little”	Nothing”
Principles of growing cover crops	68	26	5	90	10	0
Role of cover crops	74	26	0	90	10	0
Criteria to evaluate cover crops	79	11	11	90	10	0

Instructor Assessment of Application: Another direct assessment included a crop evaluation exercise in which students had to apply their knowledge by rating all 13 cover crops, and making recommendations about what crops could be successfully grown in the region. This assessment of students’ abilities to apply knowledge also indicated a high level of achievement - up to 89% of students correctly rated the performance of the cover crops, and made correct recommendations which matched instructor ratings and recommendations.

Instructor Assessment of Synthesis: The fourth assessment was also direct, and evaluated students' abilities to interpret their observations on crops, synthesize information, think critically, solve problems, and make decisions. This was done through student responses to 15 open ended questions. In this assessment, more than 90% of students earned a grade of 95-100%, indicating their mastery over those critical aspects of experiential learning. Overall, the assessments together indicated that the experiential learning project was highly effective and had a very positive impact on student learning. This fact is further substantiated by the students' comments about the project, included with their pictures on the following page.

Student evaluations: The student ratings of this course showed a significant improvement from the first offering in the fall of 2010 when this experiential learning project was not implemented. For instance, 75% of the students rated teaching of this course as superior compared with other courses taken at NMSU in the fall of 2012.

4. Relationship with Teaching Academy:

I have been able to take advantage of the wonderful programs offered by the Teaching Academy and have been a 'distinguished member' since joining NMSU in 2009. I was also recently selected for the NMHEAR Conference Scholarship Award 2012 by the Teaching Academy in which I presented a workshop based on results from the experiential learning project, entitled "Student-Centered Teaching through Experiential Learning and Assessment" at the NMHEAR Conference, ABQ, Feb. 23-24, 2012. Having attended many Teaching Academy workshops, I have learned several new ideas through various workshops and interactions with other participants, including the learning experience and effective assessment strategies. Some of the workshops attended at the Teaching Academy include: *Five Easy Ways to Teach for Retention, Sept 1, 2009; Becoming a Critically Reflective Teacher, June 5, 2009; Discussion as a Way of Teaching, June 5, 2009; Effective Grading and Assessment: Strategies to Enhance Student Learning and Faculty Satisfaction. Nov. 12, 2010; Documenting Effective Teaching in a Scholarly Manner, July 20-22, 2010; ChaMPION Program, July 2010- June, 2011.*

I was also invited to present a workshop on the experiential learning project at the Teaching Academy in the Fall of 2012.

AGRO/HORT 365 students sharing their experiences about the Cover Crop and Vegetable Management Project:



5. **Students Letters of Support:** Three student letters are attached on pages 4-6.