Student Learning Outcome Report
Agricultural and Biosystems Engineering Department
May 2007

SECTION I: Mission and Student Learning Outcomes (Graduating Student Profile)

Departmental Mission

To prepare professionals, by means of education and research, and to help society implement new knowledge and technology through public outreach in the areas of agricultural and environmental system management and engineering.

Student Learning Outcomes

Upon completion of the degree, students will be able to perform the following tasks.

- Apply the principles, techniques and engineering practices to the areas of Agricultural Power and Machinery, Soil and Water Management, Agricultural Structures and Environmental Control, Farm Electrification and Processing of Agricultural Products.
- Identify and solve problems, think critically, and synthesize knowledge appropriate to their discipline.
- Communicate effectively in both written and oral forms (in Spanish and English).
- Apply mathematical reasoning skills, scientific inquiry methods, and tools of information technology.
- Develop successful teamwork skills.

SECTION II: Results

TMAG 4015 – Agricultural Machinery

Sub-section		Content
Focus of Assessment Project		• Acquired knowledge from TMAG 4015 – Agricultural Machinery • First Semester 2006-2007 • Learning Outcome #1: Apply the principles, techniques and engineering practices to the areas of **Agricultural Power and Machinery**, Soil and Water Management, Agricultural Structures and Environmental Control, Farm Electrification and Processing of Agricultural Products.
Justification (data-based)		• There was no previous official data. We needed to establish a baseline for comparison.
POPULATION ***Student*** ***Faculty***		• 42 undergraduates from different fields within the College of Agricultural Sciences • 1 faculty member (Dr. Francisco Monroig Saltar)
Assessment Cycle	***Pre-intervention***	• Pre-intervention survey to measure students' self-perceived knowledge on the course topics. • See Appendix A.
	Intervention	• Lectures and exercises as described in the syllabus.
	Post-intervention	• Post-intervention survey to measure students' self-perceived knowledge on the course topics. • Results tabulated and analyzed using spreadsheet.
Results		• Initial measurement showed students' self-perceived knowledge was 2.3 (maximum of 5) overall topics. • Final measurement showed students' self-perceived knowledge was 4.3 overall topics. • Improvement shown for all topics, including those with high initial score.
Dissemination of Results		• Results have not yet been disseminated. We plan to prepare e-mail reporting results and perform a brief presentation at the Departmental meeting.
Possible Reasons or Hypotheses		• Course material has been developed over course of many years. Professor keeps content current and relevant with updated information.
Course of Action		• No specific need for action has been identified. Monitoring will continue.

TMAG 4029 Processing of Agricultural Products

Sub-section		Content
Focus of Assessment Project		• Acquired knowledge from TMAG 4029 – Agricultural Products Processing • First semester 2006-2007 • Learning Outcome #1: Apply the principles, techniques and engineering practices to the areas of Agricultural Power and Machinery, Soil and Water Management, Agricultural Structures and Environmental Control, Farm Electrification and **Processing of Agricultural Products**.
Justification (data-based)		• There was no previous official data. We needed to establish a baseline for comparison.
POPULATION ***Student*** ***Faculty***		• 10 undergraduates from Agricultural Mechanization Technology • 1 faculty member (Dr. Carol Harper)
Assessment Cycle	***Pre-intervention***	• Pre-intervention test to measure students' knowledge on key course topics. • See Appendix B.
	Intervention	• Lectures and exercises as described in the syllabus.
	Post-intervention	• Post-intervention test to measure students' knowledge on key course topics. • Results tabulated and analyzed using spreadsheet.
Results		• Test score increased from 38.6% to 72%
Dissemination of Results		• Results have not yet been disseminated. We plan to prepare e-mail reporting results and perform a brief presentation at the Departmental meeting.
Possible Reasons or Hypotheses		• Course material has been developed over course of many years. Professor keeps content current and relevant with updated information.
Course of Action		• No specific need for action has been identified. Monitoring will continue.

TMAG 4005 Rural Electrification

Sub-section		Content
Focus of Assessment Project		• Acquired knowledge from TMAG 4005 – Rural Electrification • Learning Outcome #1: Apply the principles, techniques and engineering practices to the areas of Agricultural Power and Machinery, Soil and Water Management, Agricultural Structures and Environmental Control, **Farm Electrification** and Processing of Agricultural Products.
Justification (data-based)		• There was no previous official data. We needed to establish a baseline for comparison.
POPULATION ***Student*** ***Faculty***		• 6 undergraduates from Agricultural Mechanization Technology • 1 faculty member (Dr. Fernando Pérez Muñoz)
Assessment Cycle	***Pre-intervention***	• Pre-intervention quiz to measure students' knowledge on basic course topics. • See Appendix C.
	Intervention	• Lectures and exercises as described in the syllabus.
	Post-intervention	• Post-intervention survey to measure students' self-perceived knowledge on the course topics. • Results tabulated and analyzed using spreadsheet.
Results		• Initial measurement showed students' self-perceived knowledge was 3.0 (maximum of 7) overall topics. • Final measurement showed students' self-perceived knowledge was 5.6 overall topics. • One of the quiz questions was confusing and led to wrong answer.
Dissemination of Results		• Results have not yet been disseminated. We plan to prepare e-mail reporting results and perform a brief presentation at the Departmental meeting.
Possible Reasons or Hypotheses		• Course material has been developed over course of many years. Professor keeps content current and relevant with updated information.
Course of Action		• No specific need for action has been identified. Monitoring will continue.

TMAG 4028 Agricultural Structures

Sub-section		Content
Focus of Assessment Project		• Acquired knowledge from TMAG 4028 – Agricultural Structures • Learning Outcome #1: Apply the principles, techniques and engineering practices to the areas of Agricultural Power and Machinery, Soil and Water Management, **Agricultural Structures and Environmental Control**, Farm Electrification and Processing of Agricultural Products.
Justification (data-based)		• There was no previous official data. We needed to establish a baseline for comparison.
POPULATION ***Student*** ***Faculty***		• 7 undergraduates from Agricultural Mechanization Technology • 1 faculty member (Prof. Héctor O. López Méndez)
Assessment Cycle	***Pre-intervention***	• Pre-intervention survey to measure students' self-perceived knowledge on the course topics. • Pre-intervention quiz to determine deficiencies in pre-requisite knowledge. • See Appendix D.
	Intervention	• Lectures and exercises as described in the syllabus. • Special emphasis on identified areas of deficiency from pre-intervention quiz.
	Post-intervention	• Post-intervention survey to measure students' self-perceived knowledge on the course topics. • Results tabulated and analyzed using spreadsheet.
Results		• Pre-intervention quiz showed students were deficient in basic geometry and simple algebra concepts. • Initial measurement showed students' self-perceived knowledge was 2.5 (maximum of 5) overall topics. • Final measurement showed students' self-perceived knowledge was 4.6 overall topics. • Improvement shown for all topics, including those with high initial score.
Dissemination of Results		• Results have not yet been disseminated. We plan to prepare e-mail reporting results and perform a brief presentation at the Departmental meeting.
Possible Reasons or Hypotheses		• Course material has been developed over course of many years. Professor keeps content current and relevant with updated information.
Course of Action		• No specific need for action has been identified. Monitoring will continue.

Next Assessment Priority	• Evaluate impact of TMAG 4008 on student self perception • Learning Outcome #2: Identify and solve problems, think critically, and synthesize knowledge appropriate to their discipline.

Appendix A: TMAG 4015 Assessment Tool and Results

Excelente	Sobresaliente	Bueno	Regular	Deficiente
5	4	3	2	1

Descripción
1. Reconozco el papel que juega la mecanización en la producción agrícola moderna.
2. Reconozco los conceptos mecánicos fundamentales y los elementos de las máquinas utilizados en los implementos agrícolas.
3. Tengo la información y experiencia necesaria para la selección, uso y mantenimiento de la maquinaria agrícola.
4. Tengo conocimientos sobre los conceptos mecánicos fundamentales (fuerza, trabajo, torque y potencia)
5. Tengo conocimientos sobre los materiales de construcción utilizados en la maquinara agrícola.
6. Puedo identificar las máquinas simples, cómo funcionan y sus aplicaciones.
7. Tengo conocimientos sobre los sistemas hidráulicos, sus componentes y sus funciones.
8. Tengo conocimiento sobre los mecanismos utilizados para transmitir potencia, su funcionamiento y sus aplicaciones.
9. Tengo conocimientos sobre los tipos de tractores agrícolas y sus partes principales.
10. Tengo conocimientos y experiencia en el manejo seguro del tractor agrícola.
11. Tengo conocimientos para determinar la capacidad y eficiencia de campo de implementos agrícolas.
12. Tengo conocimientos sobre los tipos de implementos de labranza de terreno, sus componentes principales, mantenimiento y sus aplicaciones en la agricultura moderna.
13. Soy capaz de determinar la potencia disponible ó requerida para labores de labranza de terreno.
14. Tengo los conocimientos y la experiencia sobre los implementos utilizados para la siembra, sus partes principales, aplicaciones y calibración.
15. Tengo conocimientos sobre los equipos utilizados para el control de malezas.
16. Tengo conocimientos y experiencia sobre los equipos de aspersión, sus partes principales, usos, calibración y mantenimiento.
17. Tengo conocimientos sobre los equipos utilizados para la cosecha mecanizada de cultivos.
18. Tengo los conocimientos para calcular los costos asociados con los equipos agrícolas.
19. Tengo los conocimientos para la selección de maquinaria agrícola basado en su costo, potencia requerida y necesidades de la finca.
20. El curso de Maquinaria Agrícola será / fue de mucha importancia para mi carrera profesional.

First Semester 2006 - 2007 *Section 036, 037 and 038*			*First Semester 2006 - 2007* *Section 026, 027 and 028*		
Principio 17 Estudiantes	*Final* 21 Estudiantes	Porciento de Cambio	*Principio* 20 Estudiantes	*Final* 21 Estudiantes	Porciento de Cambio
3.9	4.6	18.3%	3.8	4.7	24%
2.6	4.3	65.1%	2.2	4.7	112%
2.8	4.3	51.3%	2.2	4.5	110%
1.9	4.5	131.8%	1.6	4.8	207%
2.6	4.3	61.4%	2.7	4.4	67%
2.2	4.6	113.0%	1.8	4.8	164%
2.3	4.4	93.9%	1.9	4.6	144%
1.8	4.5	152.4%	1.6	4.7	201%
2.0	4.7	134.1%	1.6	4.8	210%
2.1	4.5	118.6%	1.5	4.8	221%
2.1	4.6	118.9%	1.5	4.6	203%
2.1	4.4	108.2%	1.9	4.5	142%
1.6	4.5	173.2%	1.3	4.6	251%
1.7	4.2	147.8%	1.6	4.5	189%
2.2	4.2	87.1%	1.8	4.6	164%
2.4	4.2	73.4%	1.8	4.7	159%
2.1	4.4	106.1%	2.0	4.8	138%
1.5	4.2	184.4%	1.8	4.5	159%
1.6	4.2	166.2%	1.5	4.6	215%
4.2	4.5	6.7%	3.7	4.6	24%
45.7	**87.9**	**92.3%**	**39.3**	**92.6**	**135.6%**

Appendix B: TMAG 4029 Assessment Tool and Results

1. Newtonian and non-Newtonian are used to describe:
   a. gravities b. fluids c. gases d. solids
2. Plate, tubular, scraped-surface and steam-infusion are different types of:
   a. mixers b. evaporators c. heat exchangers d. freezers
3. Ionic polarization and dipole rotation are used by to do their job.
   a. microwave ovens b. high pressure pasteurizers
   c. trash compactors d. garbage disposals
4. Conduction, convection and radiation are all methods of ____ transfer.
   a. mass b. heat c. fluid d. sound
5. Tray, tunnel, fluid-bed, spray are different types of _____.
   a. electric ovens b. microwave ovens
   c. condensors d. driers
6. Batch, rising/falling film, natural circulation and forced circulation are types of
   a. condensors b. evaporators
   c. freezers d. all of the above
7. The pitot tube, orifice meter, and venturi meter measure
   a. pressure b. humidity c. fluid flow d. temperature
8. Ohm's law is used to help design:
   a. electrical circuits b. pumps c. refrigerators d. ovens
9. Psychrometrics are most commonly used with the _____.
   a. Freon refrigeration system b. weightless gravity system
   c. modified atmosphere packaging system d. air-water fluid system
10. Measuring the resistant force of a fluid is determining its _____.
    a. density b. viscosity c. temperature d. degree Brix

Student	Precourse Evaluation	Postcourse Evaluation
1	60%	80%
2	40%	80%
3		60%
4	20%	70%
5	10%	70%
6		60%
7	60%	80%
8	30%	70%
9		70%
10	50%	80%
Average	38.6%	72.0%

Appendix C: TMAG 4005 Assessment Tool and Results

Escoja la mejor contestación.

1. La ley de Ohm
    a. Es la ley que rige el comportamiento de todos los circuitos eléctricos.
    b. Es un postulado que establece la relación entre el voltaje y la potencia.
    c. Solo nos da información de la corriente que debe tener un circuito.
    d. Establece la relación entre el voltaje y la corriente si conocemos la resistencia.
2. La batería de un carro provee 12 voltios. Esto implica
    a. Que es voltaje AC.
    b. Que la corriente es baja.
    c. Que no hay riesgo de electrocución.
    d. Ninguna de las anteriores.
3. Cierta resistencia de 100 Ohmios sostiene un voltaje de 10 voltios. La corriente a través de la resistencia es de
    a. 1000 Amperios
    b. 1000 Vatios
    c. 0.1 Amperios
    d. 0.1 Vatios
4. Una plancha de 500 vatios se mantiene encendida por 2 horas. ¿Cuánto es el consumo?
    a. 500 kW.h
    b. 250 W
    c. 1000 W
    d. Ninguna de las anteriores.
5. Un cuarto de 100 pies cuadrados se va a iluminar con bombillas incandescentes de 60 W. El requerimiento de energía es de 6W/ft^2. ¿Cuántas bombillas se necesitan?
    a. 600.
    b. 60
    c. 100
    d. 10
6. Un circuito de uso general
    a. Requiere tres alambres: vivo, neutral y “ground”.
    b. Permite que el neutral y el “ground” sean el mismo alambre.
    c. Se utiliza para conectar cualquier motor.
    d. Todas las anteriores.
7. Un circuito a 120V utiliza 0.1 Amperios. ¿Cuánto será la potencia consumida?
    a. 120 W
    b. 120 Ω
    c. 1200 Ω
    d. 12 W

	1er Semestre 2006-07	
	Pre-Prueba	Post-Prueba
	2	3
	5	6
	4	6
	1	7
	3	6
Promedio	3.0	5.6
Des Std	1.6	1.5
Puntuación Máxima	7	

Appendix C: TMAG 4005 Assessment Tool and Results

Excelente	Sobresaliente	Bueno	Regular	Deficiente
5	4	3	2	1

Contenido del Curso

Descripción	***Resultado Promedio por Pregunta***		
	Principio 7Est.	*Final 7 Est.*	*% Cambio*
1. Tengo conocimiento del rol de las construcciones agrícolas en la producción agrícola.	2.3	4.4	91.30
2. Tengo conocimiento en la selección de materiales de construcción en estructuras agrícolas.	2.7	4.6	70.37
3. Tengo conocimientos en la preparación preliminar de planos.	2.4	4.0	66.67
4. Estoy familiarizado con las distribuciones de espacio de las estructuras agrícolas.	2.0	4.4	120.00
5. Estoy familiarizado con el código de construcción y planos de estructuras agrícolas.	1.6	4.7	193.75
6. Tengo conocimientos de las propiedades del hormigón.	2.9	4.9	68.97
7. Tengo conocimiento en la selección de materiales para una mezcla de hormigón.	3.3	4.9	48.48
8. Tengo conocimiento de las propiedades de la madera.	2.7	4.4	62.96
9. Tengo conocimiento en las propiedades del acero.	2.4	4.4	83.33
10. Tengo conocimiento en la documentación y procedimiento para someter proyectos de construcción.	1.7	4.7	176.47
11. Estoy familiarizado con las agencias para someter proyectos agrícolas.	1.7	4.6	170.59
12. Estoy familiarizado para diseñar componentes agrícolas. (charcas, pozos sépticos, tanque agua, etc.)	1.9	4.1	115.79
13. Estoy familiarizado en la preparación de planos de Situación y Localización	2.0	4.6	130.00
14. Tengo conocimiento en la preparación de estimados de costo.	2.6	4.9	88.46
15. Estoy familiarizado con los detalles y especificaciones técnicas de planos agrícolas.	1.9	4.4	131.58
16. Estoy familiarizado con la documentación necesaria para someter proyectos agrícolas.	1.6	4.7	193.75
17. Estoy familiarizado con las necesidades de espacio de los equipos, animales y productos agrícolas.	2.0	4.7	135.00
18. El curso de construcciones agrícolas es de importancia para mi carrera profesional.	4.6	4.7	2.17
19. El curso de construcciones agrícolas cumple con mis expectativas.	4.1	4.6	12.20
20. Recomendaría este curso a otros estudiantes.	4.4	4.9	11.36
Puntuación Total	50.8	91.6	80.31

Resuelve los siguientes problemas:

1. Un Pozo séptico tiene una altura de 10 pies, un ancho de 20 pies y un volumen de 2,000 pies cúbicos. Determine el largo del pozo séptico.

   $V = h \times a \times l$

Evaluación: 57% correctas

2. Resuelve la siguiente ecuación por X: $(X + 2)(Y - 3) = Z$

Evaluación: 0% correctas

3. Un círculo tiene un diámetro de 20 pies y una altura de 10 pies. Determine el volumen del cilindro.

   $V = \pi r^2 \times h$

Evaluación: 57% correctas

4. Resuelva la siguiente ecuación por a.

   $V = (l \times a \times h) + (l \times h)$

Evaluación: 43% correctas