(ISSN 0149-4910)

NACTA

north american colleges and teachers of agriculture

connect | develop | achieve

Vol. 58, No. 1 • March 2014

a publication of the NORTH AMERICAN COLLEGES AND TEACHERS OF AGRICULTURE

2013 - 2014 NACTA Officers

President

Jeff Hattey
Ohio State University, 100 Ag Admin Bldg,
2120 Fyffe Rd, Columbus, OH 43210
Ph: 614.688.5612
Email: hattey.3@osu.edu

Immediate Past President

Rick Rudd
Virginia Tech Dept of Ag & Ext Ed
268 Litton Reaves Hall, Blacksburg, VA 24061
Ph: 540.231.6836, Fax: 540.231.3824
Email: rrudd@vt.edu

President Elect

Bonnie Walters
University of Wisconsin-River Falls
410 S 3rd St, River Falls, WI 54022
Ph: 715.425.3704, Fax: 715.425.3785
bonnie.s.walters@uwrf.edu

Secretary-Treasurer

Marilyn B. Parker
151 West 100 South, Rupert, ID 83350
Ph: 208.436.0692, Fax: 208.436.1384
Email: NACTAsec@pmt.org

Journal Editor

Rick Parker
151 West 100 South, Rupert, ID 83350
Ph: 208.436.0692, Fax: 208.436.1384
Email: NACTAeditor@pmt.org

Historian

Kevin Donnelly
Kansas State University, Dept of Agronomy
3107 Throckmorton Hall, Manhattan, KS 66506
Ph: 785.532.5402, Fax: 785.532.6094
Email: kjd@ksu.edu

Membership Director

Ron Hanson
University of Nebraska, 204A Filley Hall
PO Box 830922, Lincoln, NE 68583-0922
Ph: 402.472.2055, Fax: 402.472.3460
Email: Rhanson1@unl.edu

Regional Directors

Canadian Director

Kent Mullinix
Kwantlen Polytechnic University
12666 72nd Ave, Surrey, BC, Canada
Ph: 604.612.1252
Email: Kent.mullinix@kwantlen.ca

Central Director

Ann Marie VanDerZanden
Iowa State University
141 Horticulture Hall, Ames, IA 50011
Ph: 515.294.5075
Email: Vanderza@iastate.edu

Eastern Director

Mark Russell
Purdue University, Dept of Animal Science
915 State St, West Lafayette, IN 47907
Ph: 765.494.7677, Fax: 765.494.9347
Email: mrussell@purdue.edu

Eastern Director-Elect

Lurline Marsh
University of Maryland-Eastern Shore
Dept of Ag
30921 Martin Court, Princess Anne, MD 21853
Email: lemarsh@ume.edu

Southern Director

Jean Bertrand
University of Georgia, College of Ag & Env Sci
102 Conner Hall, Athens, GA 30602
Ph: 706.542.1611, Fax: 706.542.2130
Email: Jeanbert@uga.edu

Southern Director-Elect

David Jones
North Carolina State University
Ag & Ext Education
Campus Box 7607, Raleigh, NC 27695
Ph 919.513.2187, Fax: 919.513.11169
Email:dwjones@ncsu.edu

Western Director

Brenda Seevers
New Mexico State University
Ag & Ext Edu, PO Box 30003, MSC 3501
Las Cruces, NM 88003
Ph: 505.646.4511, Fax: 505.646.4082
Email: Bseevers@nmsu.edu

Western Director-Elect

Bill Hoch
Montana State University
409 Leon Johnson Hall, Bozeman, MT 59717
Ph: 406.994.5064, Fax: 406.994.1848
Email: bhoch@montana.edu

Committee Chairs

Journal Awards:
Neil Douglas, Berea College, Kentucky

Membership & Public Relations:
Ron Hanson, University of Nebraska - Lincoln

Educational Issues and Teaching Improvement:
Kimberly Moore, Chair, University of Florida

Teacher Recognition:
Nick Fuhrman, Chair, University of Georgia

International Committee Chair:
Chris Morgan, Chair, University of Georgia

NACTA Foundation Advisory Council:
Jeannette Moore
North Carolina State University

Editorial Board

Andrew Barkley, Kansas State University
Melanie Bayles, Oklahoma State University
Kimberly Bellah, Murray State
Erika Berg, North Dakota State
Jean A. Bertrand, University of Georgia
Deborah Bridges, University Nebraska - Kearney
Ed Brokaw, Abilene Christian University
Ken Casavant, Washington State University
Naveen Chikthimmah, Univ. of WI -Stout
Susan Clark, Virginia Tech
Barry Croom, NC State University
Laura Deeter, Ohio State - ATI
Tracy Dougher, Montana State University
Neal Eash, University of Tennessee, Knoxville
Chanda Elbert, Texas A&M University
Levon Esters, Purdue University
John Ewing, Penn State University
Paula Faulkner, NC A&T
Connie Fisk, Sheridan College, WY
Billye B Foster, Tennessee Tech
Chuck Francis, University of Nebraska
Ed Franklin, University of Arizona
Chad Gasser, Southern Utah University
Kevin Gibson, Purdue University
Brad Greiman, University of Minnesota
Gail Hansen, University of Florida
William Hoch, Montana State University
Mark Hubbard, College of the Ozarks
Steve Keeley, Kansas State University
David Knauft, University of Georgia
Mickey Latour, Southern Illinois University
Harouna Maiga, Univ. of MN - Crookston
Stephanie McKenna, University of Arkansas
Florah Mhlanga, Lipscomb University, TN
Douglas Malo, South Dakota State University
Erdogan Memili, Mississippi State
Greg Miller, Iowa State University
Kimberly Moore, University of Florida
Jeannette Moore, NC State University
Kent Mullinix, Kwantlen Polytechnic University
Michael Nicodemus, Abilene Christian University
Kim Niewolny, Virginia Tech
Carol O'Neil, Louisiana State University
Michael Pate, Utah State
Pasha Peffer, Ohio State University
Greg Pillar, Queens University
Shea Porr, Virginia Tech
Shannon Pratt, NC State University
Steven J Rocca, California State - Fresno
David Rosch, Univ. of IL - Urbana-Champaign
Maud Roucan-Kane, Sam Houston State University
Mark Russell, Purdue University
Rebecca K. Splan, Virginia Tech
Pamela Scheffler, University of Hawaii
Phil Shuler, Fort Lewis College, Durango, CO
Manoj K Shukla, New Mexico State
Tammy Stephenson, University of Kentucky
Robert Strong, Texas A&M University
Kyle Stutts, Sam Houston State
Ben Swan, CalPoly
Shweta Trivedi, NC State University
Larae Watkins, University of Central Missouri
Judith White, University of New Mexico
Susie Whittington, Ohio State University
Karen Williams, University of Wyoming
Gary Wingenbach, Texas A&M University
Art Wolfskill, Sam Houston State University
Curtis Youngs, Iowa State University

NACTA
north american colleges and teachers of agriculture
connect | develop | achieve

Vol. 58, No. 1 • March 2014

NACTA Journal (ISSN 0149-4910) is published quarterly by the North American Colleges and Teachers of Agriculture (formerly the National Association of Colleges and Teachers of Agriculture). It is directed toward the scholarship of teaching and learning in agricultural, environmental, natural and life sciences by presenting articles covering topics that treat all aspects of teaching such as methods, problems, philosophy, and rewards at the college level. All manuscripts undergo double-blind peer review. An author's guide for manuscript preparation is available on the NACTA web page: http://www.nactateachers.org/ or are available upon request. Page charges of $75.00 per manuscript are waived if one of the authors is a NACTA member at the time of publication.

All manuscripts submitted to the NACTA Journal are submitted and reviewed electronically. To submit a manuscript to the NACTA Journal, go to this website: http://nacta.expressacademic.org/

Annual subscriptions ($USD): Library: $50.00; Institutional Active (your institution is a member): $75.00 or $200 for three years; Active: $100.00 or $275 for three years; Graduate Student: $25.00; Emeritus: $25.00; and Institutions: $150.00 (4-year schools) and $100 (2-year schools). Lifetime members one payment of $750 or 4 payments of $200. For questions about subscriptions contact the NACTA Secretary/Treasurer.

The Journal is published electronically/online and quarterly - March, June, September and December. The issues for the current year are available to NACTA members at this website: http://www.nactateachers.org/journal.html, a login and password obtained through membership is required.

Searchable past issues of the NACTA Journal are available to anyone at the same website – no login or password required.

A yearly hard copy of all four issues is printed in December.

Rick Parker, Editor
nactaeditor@pmt.org

NACTA Journal

the professional journal advancing the scholarship of teaching and learning in agricultural, environmental, natural and life sciences

Contents

Animal Science Student Perceived Benefits of Participation in an Undergraduate Research Club

E.L. Karcher[1] and N.L. Trottier[2]
Michigan State University
East Lansing, MI

Abstract

The Animal Science Undergraduate Research Student Association (ASURSA) at Michigan State University was developed to engage students interested in science and research in a club atmosphere. A survey was designed to determine student perceived benefits of club involvement. Survey items included demographic variables and the evaluation of benefits of club membership. Twenty-eight of the 36 dues paying members responded to the survey (77.8%). Results indicated that 84.6% of respondents agreed or strongly agreed that club participation allowed for better understanding of concepts discussed in the classroom. The majority of club members (92.3%) felt their level of interaction with livestock animals had increased since joining the club and that they had further developed connections with classmates (92.3%) and Animal Science faculty (84.6%). Students viewed their involvement in the club research projects as increasing their basic understanding of the scientific method (75% agreed or strongly agreed) and basic knowledge of animal husbandry (80.0% agreed or strongly agreed). Results of the survey demonstrate that the implementation of an undergraduate research club provided a number of perceived student benefits for club members.

Introduction

Traditional classroom strategies for conveying information, such as the 50-minute passive-learning lecture, are not always the most effective method of content delivery (Young et al., 2003). Likewise, these strategies may not be effective at meeting the overall learning outcomes and goals for Animal Science curricula. Increased student engagement in practices that promote active and experiential learning is one strategy to meet these goals.

Chickering and Gamson (1987) reported on the seven principles for good practice in undergraduate education. Active learning was included on this list, along with the following: encouragement of student-faculty contact, encouragement of cooperation among students, emphasizing time on task and communicating high expectations. Several practices, including undergraduate research, study abroad, first-year seminars, student learning communities, internships and service learning projects support the basic principles presented by Chickering and Gamson.

Lopatto (2004) reported that participation in a research project enhanced the overall undergraduate experience. Involvement in a research project sustained or increased interest in postgraduate education (Hathaway et al., 2002; Lopatto, 2007) as well as developed interpersonal skills (Zydney et al., 2002). Students participating in undergraduate research reported increased ability to work independently as well as increased tolerance for new obstacles (Lopatto, 2007). Involvement in undergraduate research allowed for further development of faculty-student relationships and gave students a sense of belonging to the science community (Hunter et al., 2007).

The Animal Science Undergraduate Research Student Association (ASURSA) at Michigan State University was created in 2009 to promote high impact learning activities while providing a social community for undergraduate students interested in animal science research. The development of research clubs at the department level addresses the university's goal of increasing the number of undergraduates participating in research programs. With increasing student interest in undergraduate research in Animal Science and limited published information available on the learning impact of an organized research club, the objective of the survey was to determine the student perceived impact of ASURSA club involvement on the undergraduate learning experience.

Materials and Methods

Survey Design

The survey and experimental design were approved by the Michigan State University Institutional Review Board. The survey consisted of 27 items, including demographic variables and evaluation of the benefits of club membership and participation in the club research

[1]Department of Animal Science, 474 S. Shaw Ln., 1290 Anthony, 48824; Email: ekarcher@msu.edu; Phone: 517-353-8518
[2]Department of Animal Science, 474 S. Shaw Ln., 1290 Anthony, 48824; Email: trottier@msu.edu; Phone: 517-432-5140

project. Students' responses were evaluated using a Likert scale (1 - strongly disagree, 2 - disagree, 3 - neither agree nor disagree, 4 - agree and 5 - strongly agree). The survey was located online and could be voluntarily accessed at the SurveyMonkey website during a regularly scheduled club meeting. The survey was only available to access for 20 min during this time. Individual computer IP addresses were tracked to ensure each participant responded only once to the survey.

Subject Selection

Undergraduate students who were members of ASURSA during the 2011 to 2012 academic year were invited to participate in the survey. Twenty-eight of the 36 members responded to the survey, for a response rate of 77.8%. Students were asked to provide demographic information but anonymity was maintained throughout the process.

Results and Discussion

In 2009, a need was recognized to establish a club in the Department of Animal Science for students interested in undergraduate research. The following objectives and goals were identified for the club: increase understanding and proficiency of the scientific method, engagement of students in an annual group undergraduate research project and increase in student-livestock interactions. Additionally, the club provides a forum for professional and social interactions. In its inaugural year, the club had eight members. This number has continued to grow to 36 members during the 2011 to 2012 academic year and 53 members during 2012 to 2013 academic year. Because the purpose of the study was to assess student perceived impact of club involvement on their undergraduate learning experience, the survey was not administered prior to student involvement in the club.

Demographic Description

Demographic information is presented in Table 1. Females comprise 89.3% of survey respondents, which is in line with the proportion of students currently in the Department of Animal Science at Michigan State University. In fall 2011, 83.8% of the 433 enrolled undergraduates were female. This demographic is similar to that reported by Lyvers-Peffer (2011), with 78.8% of females representing an introductory animal science course at The Ohio State University. Among the respondents for this survey, 64.3% were of junior (>59 credits) or senior (>89 credits) standing. The Animal Science major represented the greatest enrollment (89.3%). The club is open to all undergraduate students interested in animals and research. Therefore, a smaller percentage of students represented the following majors: Biochemistry/Molecular Biology (3.6%), Fisheries and Wildlife (3.6%) and Zoology (3.6%). A total of 64.3% of club members hoped to attend veterinary school (42.9%) or graduate school (21.4%). A smaller subset of survey respondents was interested in pursuing career goals related to agriculture business and animal production. A large percentage of respondents indicated their career goals related to veterinary medicine. This trend is reflected in a decreasing number of Animal Science undergraduate students intending to return to family farms and an increase in the number planning on applying to veterinary school (Buchanan, 2008).

The Animal Science Undergraduate Research Student Association grew from only eight members in fall 2009 to 36 members in spring 2012. Based on survey results, 60.7% of membership was new members with only 1 year of club involvement, reflecting a growing interest in the club. Only 19.2% of club members reported any previous research experience before joining ASURSA.

Table 1. Demographic information from the Animal Science Undergraduate Research Student Association survey respondents[a].

Demographic category	Percentage of respondents
Gender, n=28	
Female	89.3
Male	10.7
Class Standing, n=28	
Freshman	14.3
Sophomore	21.4
Junior	28.6
Senior	35.7
Major, n=28	
Animal Science	89.3
Biochemistry/Molecular Biology	3.6
Fisheries and Wildlife	3.6
Zoology	3.6
Career Goal, n=28	
Veterinary School	42.9
Graduate School	21.4
Agriculture Business (Sales/Service)	10.7
Animal Production (Farming/Ranching)	10.7
Laboratory (Technician)	7.2
Other[b]	7.2
Length of Club Membership (years)	
1	60.7
2	28.6
3	10.7
Prior Research Experience	
No	80.8
Yes	19.2

[a]Total respondents, n=28

[b]Students selecting other were asked to specify their career goal. One student responded 'Training, Breeding, and Raising' and 1 student responded 'Wildlife Conservation and Biology' (7.2% total).

Impact of Club Membership

In order to determine the perceived impact of club members on enhancement of the overall student experience, members were asked to answer a number of statements indicating their level of agreement (Table 2). One goal for the club was identified as enhancing the overall Animal Science curriculum. Of the members, 84.6% agreed or strongly agreed that club participation allowed for better understanding of concepts discussed in the classroom. All club members agreed or strongly agreed that club participation provided them with additional knowledge beyond what was gained in the classroom. Steffes (2004) reported that non-traditional classroom experiences facilitate a connection between concepts discussed in the classroom and practical, real world examples.

Table 2. Percentage of Animal Science Undergraduate Research Student Association survey respondents indicating level of agreement with statements relating to club membership.[a]

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
Participating in ASURSA has provided me with additional knowledge beyond what had been gained in the classroom.	0.0	0.0	0.0	76.9	23.1
I believe club participation has allowed me to better understand concepts discussed in my classes.	0.0	0.0	15.4	76.9	7.7
Club participation has increased my interaction with agricultural animals.	0.0	3.8	3.8	50.0	42.3
Club participation has allowed me to further develop connections/ relationships with my classmate.	0.0	0.0	7.7	53.8	38.5
Club participation has allowed me to further develop connections/ relationships with Animal Science faculty.	0.0	3.8	11.5	50.0	34.6
Club membership has provided me with opportunity for additional experiences on non-club research projects.	3.8	3.8	15.4	46.2	30.8
Club participation has changed my career path.	0.0	42.3	34.6	23.1	0.0

[a]Total Respondents, n=26

As an increasing number of Animal Science students enroll in the major with limited interaction with agriculture animals, it is becoming more critical to facilitate opportunities for such interactions into undergraduate programs. The majority of respondents (92.3%) reported their level of interaction with livestock animals had increased since joining the club, a goal that MSU Department of Animal Science set forth as part of their curriculum review. As a growing number of enrolled students come from an urban background, there is an increasing need for exposure to agricultural animals.

One club objective was identified as providing a forum for professional and social interactions. The majority of club members agreed or strongly agreed that club membership allowed for further development of connections and relationships with classmates (92.3%) and Animal Science faculty (84.6%). Out-of-class communication with faculty promotes greater social interaction, which has been reported to be influential in predicting student persistency in a program and academic integration (Milem and Berger, 1997). Students engaging in these types of interactions with faculty demonstrate greater academic and cognitive development (Terenzini et al., 1996). Finally, increased interaction with faculty opens opportunities to work on non-club research projects. Of the respondents, 77% indicated that they agreed or strongly agreed that their club involvement resulted in opportunities to participate on non-club research projects.

Only 23.1% of survey respondents agreed that club participation changed their anticipated career path. In fact, 42.3% disagreed with the statement. This was not unexpected given that a high percentage of club members were currently completing their junior or senior year. There was also a strong interest in respondents to attend veterinary or graduate school. As a student advances in their academic career, the ability to influence career choices may become more difficult. Therefore, it is important to increase visibility of the club and the scientific process to students earlier in their career. Underclassman involvement is important because students have reported an increased interest in the science, technology, engineering and mathematics disciplines as an outcome of undergraduate research projects (Zydney et al., 2002; Russell et al., 2007). Students who seek out research opportunities however may already be interested in continuing their science education and few students may be attracted to research programs if they have little interest in science (Lopatto, 2007).

Table 3. Responses (as times cited) to the open-ended question, 'what do you feel are the top 3 benefits of being a member of the Animal Science Undergraduate Research Student Association'.[a]

Development of relationships with peers and faculty in Animal Science	19
Exposure to the scientific process	12
Networking opportunities outside of club	11
Participation in the club research project	11
Increased animal interaction	6
Resume builder	3
Leadership opportunities	2
Learning how to work in a team	1
Learning how to manage time	1

[a]Total Respondents, n=25

Survey respondents were asked to compile the top three benefits of the ASURSA club membership. The results are listed in Table 3. Development of relationships with peers and faculty in Animal Science was the number one benefit reported corroborating the finding of Hunter et al. (2007) who reported an increased sense of belonging. The ability to participate in the club research project and increase exposure to the scientific method was also ranked highly by respondents. Members also appreciated the increased interaction with agricultural animals. Indeed, the non-traditional Animal Science student or the student from an urban community with no livestock experience is increasingly becoming the majority (Buchanan, 2008). Participation in undergraduate research in Animal Science is an excellent vehicle for exposing students to livestock. Finally, networking opportunities, between students and peers and students and faculty outside of the club, was a frequent response.

Impact of Club Research Project

A primary goal of the club is to conduct one research project each academic year using a different animal model across projects. In spring 2011, members

Table 4. Description of survey respondents participating in club research project.[a]

Demographic category	Percentage of respondents
Club Projects, n=25[b]	
1 (poultry)	4.0
2 (dairy)	60.0
Both	36.0
Role in Project	
Daily care of animals	100.0
Sample collection	48.0
Grant writer	24.0
Project manager[c]	24.0
Laboratory analysis	8.0
Hrs/wk spent on project	
0 to 1	12.0
1 to 2	52.0
2 to 4	8.0
4 to 6	8.0
6 to 8	8.0
>8	12.0

[a]Total respondents, n=25
[b]In Spring 2011 respondents could participate in a poultry project. In Spring 2012 respondents could participate in a dairy calf project.
[c]Project managers were responsible for organizing grant writing efforts, coordinating the daily care of the animals and sample collection, and assisting with manuscript writing.

completed the first ASURSA research project. This was a nutrition project aimed at evaluating the dietary inclusion of a snack food by-product on the performance of laying hens. Students were involved with all aspects of the project from grant writing to the daily care of the animals. During the bi-weekly club meetings, topics such as the institutional animal care and use forms and animal and research ethics were discussed. Club members presented the hypothesis and objectives of the study and gave updates on the project. The culminating experience was the submission and acceptance of the project to Poultry Science (Van Whye et al., 2012). In fall 2011, members wrote and submitted grants to fund a dairy calves nutrition project conducted over the spring 2012 semester. This later project led to the submission of an abstract and presentation (Nagengast et al., 2013) at a national scientific meeting and two presentations at the university and department research forums. A manuscript from this study will also be submitted.

Demographic information for research project participants is presented in Table 4. In total, 25 of the 28 respondents participated in the club research projects. Of the respondents, 36.0% were involved with both the poultry and calf project and 60.0% were involved with the calf project only. The increase in student involvement on the calf project most likely represents an increase in club membership during the second academic year. Additionally, respondents were asked to indicate what their role was in the project. All respondents were involved with the daily care of the animals, thus directly increasing student-animal interactions. The number of days a student was involved with the basic care was not recorded in this survey. Students assisted with feeding and orts collection, egg collection and general well-being assessments of the animals. A total of 48.0% of respondents were also involved with sample collection. This included weighing the calves and taking appropriate body measurements, blood collection and restraint for collection, weighing hens and recording number of eggs/day/treatment.

A smaller percentage (24.0%) of respondents were identified as project managers. Project managers were typically upperclassman and ideally had participated in at least one club project before accepting the leadership position. These members were responsible for identifying, preparing and submitting grants related to the projects under the club advisors' guidance, as well as coordinating schedules, animal daily care and sample collection. Finally, only 8.0% of respondents were involved with laboratory analysis of samples. One club goal is to increase the number of students involved with laboratory analysis, however, logistics associated with student laboratory training need to be assessed. Time dedicated to the club project was evaluated to further determine the level of involvement. Over half of all respondents (52.0%) reported spending 1 to 2 hr/wk on club project activities and 20% of respondents spent at least 6 hr/wk.

The ability to reinforce concepts discussed in the Animal Science curriculum was an important goal for the club research project. The majority of respondents (80.0%) agreed or strongly agreed that their basic knowledge of animal husbandry had increased through club research projects (Table 5). An additional goal of the project was to increase members' understanding of the scientific method. Although not directly assessed, 75.0% of respondents agreed or strongly agreed that their basic knowledge of the scientific method increased through participation in the club research project (Table 5). Another goal of the club research project was to stimulate interest in science. When asked if participation in a club research project stimulated professional interest in research the student did not previously have, 80.0% responded with agree or strongly agree.

Table 5. Percentage of Animal Science Undergraduate Research Student Association survey respondents indicating level of agreement with statements relating to club research project partipation.[1]

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
My basic knowledge of animal husbandry has increased through club research projects.	0.0	4.0	16.0	60.0	20.0
My basic knowledge of the scientific method has increased through club research projects.	0.0	0.0	25.0	45.8	29.2
Participation in research project stimulated professional interest in research I did not previously have.	0.0	12.0	8.0	40.0	40.0

[1]Total Respondents, n=25

Summary and Implications

The involvement of undergraduate students in an organized research club is one approach to implement active and experiential learning into the Animal Science curriculum. Survey respondents in this study felt their basic understanding of the scientific method as well as their ability to relate to classroom material increased as a result of club membership. Furthermore, increased interactions with livestock animals were seen as a benefit, which aligns with the changing Animal Science undergraduate student demographic. Undergraduate research clubs may increase relationships and connections with both peers and faculty. Based on our survey, overall career goals were not impacted in response to club membership. Information presented in this paper will be useful for other Animal Science departments to implement an organized undergraduate research program. The data reported is somewhat limited hence additional metrics are critically needed. Nonetheless, the reported data is unique in that it is the first to demonstrate the significance of an organized undergraduate research student association in the Animal Science curriculum on the student experience. Additional studies are needed to assess if student perceptions align with classroom performance and material retention.

Literature Cited

Buchanan, D.S. 2008. ASAS Centennial Paper: Animal Science teaching: A century of excellence. J. Anim. Sci. 86:3640-3646.

Chickering, A.W. and Z.F. Gamson. 1987. Seven principles for good practice in undergraduate education. AAHE Bulletin. 39:3-7.

Hathaway, R.S., B.A. Nagda and S.R. Gregerman. 2002. The relationship of undergraduate research participation to graduate and professional education pursuit: An empirical study. J. Coll. Student Dev. 43:614-631.

Hunter, A.B., S.L. Lauresen and E. Seymour. 2007. Becoming a scientist: The role of undergraduate research in students' cognitive, personal and professional development. Sci. Ed. 91:36-74.

Lopatto, D. 2004. Survey of undergraduate research experiences (SURE): First findings. Cell Biol. Educ. 3:270-277.

Lopatto, D. 2007. Undergraduate research experiences support science career decisions and active learning. CBE- Life Science Education. 6:297-306.

Lyvers-Peffer, P.A. 2011. Demographics of an undergraduate animal sciences course and the influence of gender and major on course performance. NACTA Journal 55:26-31.

Milem, J.F. and J.B. Berger. 1997. A modified model of college student persistence: Exploring the relationship between Astin's theory of involvement and Tinto's theory of student departure. J. Coll. Student Dev. 38:387-400.

Nagengast, L.C., A.L. Lock, S.N. Woodruff, C.M. Ylioja, N.A. Martinec, C.V. Vanderson, C.L. Preseault, N.L. Trottier, M.J. VandeHaar and E.L. Karcher. 2013. Increasing the dietary ratio of n-3 to n-6 fatty acids increases the n-3 concentration of peripheral blood mononuclear cells in Holstein calves. J. Dairy Sci. 96 (E-Supple. 1).

Russell, S.H., M.P. Hancock and J. McCullough. 2007. Benefits of undergraduate research experiences. Science 316:548-549.

Steffes, J.S. 2004. Creating powerful learning environments: Beyond the classroom. Change 36:46-50.

Terenzini, P.T., E.T. Pascarella and G.S. Blimling. 1996. Student's out-of-class experiences and their influence on learning and cognitive development: A literature review. J. Coll. Student Dev. 37:149-162.

Van Wyhe, R.C., S.E. Fraley, C.A. Szybisty, D.M. Karcher and E.L. Karcher. 2012. Effect of snack food by-product on production of laying hens. Poult. Sci. 91:1406-1409.

Young, M.R., B.R. Klemz and J.W. Murphy. 2003. Enhancing learning outcomes: The effects of instructional technology, learning styles, instructional methods and student behavior. J. Marketing Educ. 25:130-142.

Zydney, A.L., J.S. Bennett, A. Shahid and K.W. Bauer. 2002. Impact of undergraduate research experience in engineering. J. Eng. Educ. 91: 151-157.

Predicting Student Leadership in Agricultural Professional Preparation Organizations

David M. Rosch[1]
University of Illinois at Urbana-Champaign
Urbana, IL

Abstract

This study examined the role of students' motivation to lead in predicting the decision to become leaders of professional development organizations within the field of agriculture. A sample (N=112) of students at a research-extensive public university in the Midwest participated. Results showed that students' social-normative motivation, i.e., their motivation to lead based on a feeling of responsibility to the peers, emerged as a significant predictor. A logistic hierarchical regression showed that for every 1-point rise in students' scale scores, their chances of being involved rose 32%. This finding suggests the important role that positive peer influence can play in students' decision-making and provides a potential pathway for comprehensive recruitment strategies within agricultural organizations.

Keywords:
Leadership, motivation, peer influence, professional preparation, student organizations

Introduction

The need for trained and prepared professionals in agricultural fields can hardly be overstated. One of the six key research priorities of the American Association of Agricultural Educators (AAAE) is the training of a "scientific and professional workforce that addresses the challenges of the 21st Century: (Doerfert, 2011, p. 9). Moreover, given national and international priorities within the field of agriculture, the growth of professional development opportunities represents a strategic necessity, as each of the key federal agricultural priorities (food safety and security, biofuels, obesity, etc.) all require complex skills that are practiced and improved during formal schooling in high school and college. In response to these needs, the Board on Agriculture and Natural Resources (BANR) has called on the broad field of agricultural education to improve their learning experiences for students, in part, by increasing active learning that integrates curricular and co-curricular experiences (Committee on a Leadership Summit to Effect Change in Teaching Learning National Research Council, 2009). An educational learning experience that may be particularly effective in integrating curricular and co-curricular learning is taking on a leadership position within a professionally-oriented student organization. This research study focused on students' decisions to become involved as leaders within these organizations and pertinent factors, such as their motivation to lead and confidence in leading, that contribute to their decision.

Involvement in Student Organizations

In general, students who participate in co-curricular student organizations have a clear advantage over students who do not (Astin, 1999; Foubert and Grainger, 2006; Park and Dyer, 2010). Several benefits accrue to the development of workforce skills (Allen et al., 2007), likely related to the development of critical thinking (Gellin, 2003), psychosocial development (Renn and Arnold, 2003) and persistence in achieving long-term goals (Berger and Milem, 1999). In addition, evidence exists that occupying a position of leadership within organizations heightens these benefits (Cress et al., 2001; Dugan and Komives, 2007). A focused experience of involvement within a student organization dedicated to professional development within agriculture would, presumably, magnify the development of agriculturally-relevant professional skills even more.

While a generation of research on students has focused on the effects of involvement, the factors that lead a student to choose to become involved is curiously understudied. What little exists has been focused on demographic factors such as gender and race (Fischer, 2007) or specific academic learning environments, such as residential learning communities in college (Arboleda et al., 2003) or the relationships of students to faculty members (Kuh, 1995). Related to agriculture, Park and Dyer (2010) report that involved high school FFA and 4-H members are likely to be more involved in similar organizations as college students and adults. However, there is scant research on the internal characteristics of students that predict their involvement or decisions to lead their peers, especially in terms of the characteristics that may influence them to become engaged in co-curricular organizations related to their profession.

[1]Assistant Professor, Agricultural Education Program, 905 S. Goodwin Ave., 61801; Email: dmrosch@illinois.edu; Phone: 217-244-2134

Motivation to Lead

An internal characteristic worthy of study is students' motivation to lead. Dugan (2011) recently wrote that while research should continue to focus on programs and factors that develop skills, the field could benefit from greater examination of the internal characteristics of students that predict engagement in leadership behaviors. A crucial factor in predicting a wide range of positive behaviors in the business world is one's motivation to lead (MTL), defined as the intensity of effort and persistence in attempting to positively influence one's peers to achieve common goals (Chan and Drasgow, 2001). MTL has recently been shown to predict a person's occupancy of positions of influence within business (Arvey et al., 2007) and as a factor leading to the development of leadership-oriented expertise (Lord and Hall, 2005).

This study examined two parts of MTL: Affective Identity (AI) MTL, which measures the extent to which people envision themselves as leaders; and Social Normative (SN) MTL, which measures the extent to which a person seeks leadership due to the responsibility one feels toward a group (Chan and Drasgow, 2001). These two MTL factors may serve as predictive in students' decisions to engage in professional student organizations within agriculture. Moreover, if these factors prove significant, agricultural educators can utilize this emerging pathway to professional involvement as a tool in their recruitment of students to agricultural organizations. As a study control, the researchers also included a measure of leadership self-efficacy, which measures the degree to which a person feels comfortable and confident engaging in leadership behaviors (Hannah et al., 2008), which has already been shown as influential in a variety of environments regarding student involvement and growth (Dugan and Komives, 2010).

Research Question

The past findings discussed above guided us to the following research question: To what extent does students' affective-identity (AI) and social normative (SN) motivation to lead predict their decision to engage in agriculture-related professional development organizations?

Methods

Population and Sample

The research used data collected from a large, public, research-extensive university in the Midwestern United States as a part of the 2012 Multi-Institutional Study of Leadership (MSL), a national data collection effort involving 82 higher education institutions. An invitation was sent to a simple random sample of 4,000 undergraduates, where 1,338 provided usable data for a response rate of 33%. An item within the MSL asked students to identify their major "that best represents them" from a list of 20 choices, one of which was "agriculture and agriculture-related science." Another item asked students to report their leadership of "academic/departmental/professional development" student groups while enrolled. Of the 1,338, a total of 112 reported their academic major as agricultural-related and that they were involved in leading at least one organization related to it. Of the 112 students, 40% (n=42) identified as male. The sample was spread across all four undergraduate years, with 39% (n=44) identifying as seniors, 25% (n=28) as juniors and 18% (n=20) as either sophomores or freshmen. Just over 69% (n=78) reported their race as Caucasian, 6% (n=7) as Latino/a, 4% (n=5) as African-American and 13% (n=15) as an international student. The remainder did not report their race.

Measures

Students' AI and SN motivation to lead was measured by including two scales within Chan and Drasgow's (2001) Motivation to Lead Scale. The AI scale consisted of nine items, such as, "Most of the time, I prefer being a leader rather than a follower when working in a group." The SN scale also included nine items, such as, "People should volunteer to lead rather than wait for others to ask or vote for them." Both scales included 5-item response sets ranging from "Strongly disagree" to "Strongly Agree," and have demonstrated acceptable internal reliability in the past (Chan and Drasgow, 2001). Within this sample, Cronbach's alpha was calculated at 0.90 for AI and 0.73 for SN.

A measure of Leadership Self-efficacy (LSE) was also included within the study and consisted of four items and assessed students' belief in their own ability to successfully influence and lead others through items such as, "How confident are you that you can be successful at organizing a group's task to accomplish a goal?" Each items' response set included a 4-item Likert scale ranging from "Not at all confident" to "Very confident." Internal reliability has been demonstrated consistently in the past in studies that use the LSE as a predictor of student involvement and leadership capacity (Dugan et al., 2008; Dugan and Komives, 2010; Rosch and Coers, 2013), as well as within this sample (Cronbach's alpha = 0.86).

Data Analysis

We first calculated means and standard deviations for both scales and conducted a correlational analysis to determine the degree to which each of the three constructs – AI motivation, SN motivation and leadership efficacy – were related to each other. To determine the degree that each predicts students' engagement levels, we conducted a multiple logistic regression, using the dichotomous variable "involvement in academic/departmental/professional development" student groups as the dependent variable, which allowed us to control for each variable's degree of influence on the students' engagement decisions independent of the other two.

Results and Discussion

The sample of agriculture students who reported involvement in professional development student organizations scored as follows on the relevant leadership measures: 1) Their AI MTL mean was 3.53 and a standard deviation of 0.75; 2) Their SN MTL mean was 3.69 and a standard deviation of 0.47; 3) Their LEF mean was 3.25 and a standard deviation of 0.62. While the LEF mean is in an absolute sense the lowest score, note that the scale varies only from 1 to 4, while the MTL scales vary from 1 to 5.

The researchers constructed a correlation matrix using Pearson's correlation coefficient to examine the associative relationships among each of the scale variables. Each of the scales was inter-correlated to a significant and similar degree, ranging only from .53 to .56 with all p values falling below .01, indicating the need for statistical analysis that attempts to control for the effects of these variables on relevant dependent variables.

We then conducted a logistic regression, entering AI MTL, SN MTL and LEF scores as independent variables, using the involvement in leading relevant student organizations as the dependent variable. A Hosmer-Lemeshow test yielded a $X^2(8)$ of 7.89 and was insignificant ($p>.05$), implying a good model fit for the prediction of involvement. The results of the analysis can be found in Table 1. When controlling for other variables, SN MTL was the only scale with a significant result ($p\leq.05$). The logistic beta scores show that for every 1-point increase in students' social-normative motivation to lead score, they are 32% more likely to become involved. Moreover, the Wald chi-square statistic shows that this factor possessed twice the unique contribution as leadership efficacy to predicting the involvement decision and almost ten times the contribution of affective-identity motivation to lead.

Table 1. Logistic Regression of Students' Decision to Become Involved

	β	SE β	Wald's X^2	Df	p	e^{β}
Constant	4.61	1.78	6.72	1	.01	101.02
AI MTL	-.24	.38	.39	1	.53	1.27
SN MTL	1.13	.59	3.70	1	.05	.32
LEF	.55	.43	1.60	1	.20	.58

These results suggest that, for the sample of agricultural students surveyed, students' social normative motivation to lead served as the strongest and only significant predictor in the decision to become involved in leading student organizations that are focused on professional development within the field of agriculture. The findings reinforce previous results (Arvey et al., 2007; Chan and Drasgow, 2001) that suggest the importance of one's motivation orientation in decisions to become involved in influencing organizations, even as more important than one's confidence.

Pathways to Professional Involvement and Leadership

Our research findings imply that the responsibility that students feel towards their peers may provide a stronger influence on their decision to become involved in leading professional preparation organizations than both their confidence in leading others and their sense of themselves as leaders of their peers. The finding is counter-intuitive, as educators may assume that students become involved in leading professional development organizations as a result of individual goals and priorities rather than as a result of their sense of attachment to the group. Our results suggest a different pathway to leadership involvement.

If valid, these findings possess important implications for agricultural educators who recruit and advertise professional development opportunities and organizations to their students. A message based on individual growth, development and influence may not provide a spur to leadership as often as a message related to responsibility to one's community and the agricultural profession as a whole. This may also provide justification for evidence showing FFA and 4-H involvement predicts college-level involvement and leadership (Park and Dyer, 2010) in that students who become involved in these organizations in high school often learn both the value of teamwork and the degree to which they possess a responsibility to the field of agriculture – each of which may result in an increased sense of social-normative motivation to lead.

Future Steps

The pathways to involvement and leadership are just now beginning to be studied in the field of education. While educators may benefit from applying suggestions as a result of this study, we interpret our results as exploratory. More research is necessary before a more complete picture may be drawn. For example, while the sample of student participants in this study was randomly selected from a larger pool, a more representative study of a national or multi-campus population might inform the field more fully. In addition, the inclusion of high school students is necessary in future research, as a segment of that population chooses not to continue to higher education after high school graduation. Agricultural educators may also benefit from studies with a similar design that examine additional characteristics. For example, the development of students' social skills or their relationship with mentors in the profession may play significant roles in paving a path to professional leadership and involvement.

Conclusion

This research study investigated individual student characteristics that predicted their decision to become involved in student organizations designed for future professional success in the field of agriculture. Specifically, we focused on affective-identity motivation to lead (e.g.

their internal sense of self as a leader of their peers) and social-normative motivation to lead (e.g. their sense of responsibility to lead based on their relationships with peers). Our results showed that social-normative motivation significantly predicted students' decisions to engage in leadership and did so more powerfully than either affective-identity motivation as well as leadership self-efficacy. These findings may help to identify the pathways to leadership in environments that have been shown to result in professional agricultural skills and success and suggest that agricultural educators might attend to social responsibility and peer allegiance at least as much as individualized development in recruiting students to leadership of professional development organizations.

Literature Cited

Allen, J., J.C. Ricketts and K. Priest. 2007. Contributions of pre-collegiate and collegiate leadership experiences to alumni leadership development. NACTA Journal 51(3), 56-61.

Arboleda, A., Y. Wang, M.C. Shelley and D. Whalen. 2003. Predictors of residence hall involvement. Journal of College Student Development 44(4), 517-531. DOI: 10.1353/csd.2003.0036.

Arvey, R. D., Z. Zhang, B.J. Avolio and R.F. Krueger. 2007. Developmental and genetic determinants of leadership role occupancy among women. Journal of Applied Psychology 92(3), 693-706. DOI: 10.1037/0021-9010.92.3.693

Astin, A.W.1999. Involvement in learning revisited: Lessons we have learned. Journal of College Student Development, 40(5), 587-598.

Berger, J. B. and J.F. Milem. 1999. The role of student involvement and perceptions of integration in a causal model of student persistence. Research in Higher Education 40(6), 641-664. DOI: 10.1023/A:1018708813711.

Chan, K.Y. and F. Drasgow. 2001. Toward a theory of individual differences and leadership: Understanding the motivation to lead. Journal of Applied Psychology 86(3), 481-498. DOI: 10.1037/0021-9010.86.3.481.

Committee on a Leadership Summit to Effect Change in Teaching Learning National Research Council. 2009. Transforming agricultural education for a changing world: The National Academies Press.

Cress, C.M., H. Astin, K. Zimmerman-Oster and J.C. Burkhardt. 2001. Developmental outcomes of college students' involvement in leadership activities. Journal of College Student Development 42(1), 15-27.

Doerfert, D.L. 2011. National research agenda: American Association for Agricultural Education's research priority areas for 2011-2015. Lubbock, TX: Texas Tech University, Department of Agricultural Education and Communications.

Dugan, J.P. 2011. Pervasive myths in leadership development: Unpacking constraints on leadership learning. Journal of Leadership Studies 5(2), 79-84. DOI: 10.1002/jls.20223

Dugan, J.P., J.L. Garland, B. Jacoby and A. Gasiorski. 2008. Understanding commuter student self-efficacy for leadership: A within-group analysis. NASPA Journal 45(2), 282-310.

Dugan, J.P. and S.R. Komives. 2007. Developing leadership capacity in college students: Findings from a national study. A report from the Multi-Institutional Study of Leadership. College Park, MD: National Clearinghouse for Leadership Programs.

Dugan, J. P. and S.R. Komives. 2010. Influences on college students' capacities for socially responsible leadership. Journal of College Student Development 51(5), 525-549. DOI: 10.1353/csd.2010.0009.

Fischer, M.J. 2007. Settling into campus life: Differences by race ethnicity in college involvement and outcomes. The Journal of Higher Education 78(2), 125-161. DOI: 10.1353/jhe.2007.0009.

Foubert, J.D. and L.U. Grainger. 2006. Effects of involvement in clubs and organizations on the psychosocial development of first-year and senior college students. NASPA Journal 43(1), 166-182.

Gellin, A. 2003. The effect of undergraduate student involvement on critical thinking: A meta-analysis of the literature 1991-2000. Journal of College Student Development 44(6), 746-762. DOI: 10.1353/csd.2003.0066.

Hannah, S.T., B.J. Avolio, F. Luthans and P.D. Harms. 2008. Leadership efficacy: Review and future directions. The Leadership Quarterly 19(6), 669-692. DOI: 10.10.1016/leaqua.2008.09.007.

Kuh, G.D. 1995. The other curriculum: Out of class experiences associated with student learning. Journal of Higher Education 66(2) 123-155.

Lord, R.G. and R.J. Hall. 2005. Identity deep structure and the development of leadership skill. The Leadership Quarterly, 16(4) 591-615. DOI: 10.1016/j.leaqua.2005.06.003

Park, T.D. and J.E. Dyer. 2010. Contributions of agricultural education, FFA and 4-H to student leadership in agricultural colleges. Journal of Agricultural Education 46(2), 83-95. DOI: 10.5032/jae.2005.02083.

Renn, K.A. and K.D. Arnold 2003. Reconceptualizing research on college student peer culture. Journal of Higher Education 74(3), 261. DOI: 10.1353/jhe.2003.0025.

Rosch, D.M. and N. Coers. 2013. A national profile of leadership capacities and involvement in college: Agricultural students compared to peers. Journal of Agricultural Education 54(1), 83-96. DOI: 10.5032/jae.2013.01083

The Perceptions of the Quality of Education Received from PhD Graduate Teaching Assistant Instructors through the Eyes of Four Agricultural Education Preservice Teachers

N. W. Conner[1]
Tennessee Tech University
Cookeville, TN

E. D. Rubenstein[2]
University of Florida
Gainesville, FL

Abstract

University faculty members have been challenged with increased teaching and research responsibilities. As a result, universities have employed graduate teaching assistants (GTAs) to serve undergraduate students. This study used a qualitative approach in order to explore the perceptions of the quality of education received from PhD GTAs. Four in–depth interviews were conducted with preservice agricultural teachers and domain analysis was conducted to identify the preservice teacher's feelings regarding the quality of education received from PhD GTAs. Three domains were delineated from the findings and revealed that the four participant's felt that PhD GTAs served a vital role in their education and provided a quality education. The findings from this study should be used to improve instructional capabilities of PhD GTAs in order for preservice agricultural teachers to continue to receive a high quality education.

Introduction

In 2011, the United States Department of Education reported that 2.4 million graduate students were currently working on a degree within the United States, while the number of professors in the United States exceeded 1.7 million (The United States Bureau of Labor Statistics, 2011). While completing graduate degree programs, graduate students have been commonly employed as graduate teaching assistants (GTAs) and frequently used in large universities to help the university operate smoothly and to serve undergraduate students (Austin, 2002), since university faculty member's teaching and research responsibilities have increased (Pillar et al., 2008; Shannon et al., 1998). GTAs are accepted as an integral part of the higher education system in North America through their research and teaching roles (Park, 2004).

GTAs, with teaching roles, are expected to be experts in their field and to provide undergraduates with an excellent and effective education, through the utilization of appropriate pedagogical strategies (Luft et al., 2004). According to the National Research Council (2009), the teaching methods and styles that instructors integrate into the classroom are often based on how the instructors were taught. As university budgets are constrained, GTAs are likely to face increased workloads (Bettinger and Long, 2004; Luft et al., 2004; National Research Council, 1996; Park, 2004). However, faculty and higher education institutions have acknowledged that expertise in teaching takes time to develop (Luft, et al, 2004). In turn, GTAs need proper training and support in order to perfect their teaching abilities (Luft et al., 2004; Shoulders et al., 2013).

Parents, employers and legislators are interested in the quality of teaching provided at universities and colleges across the United States. This includes teaching methods used by individuals who provide instruction in the collegiate classroom (Austin, 2002). Since GTAs are a major part of the university system in the United States (Park, 2004), it is critical to examine the quality of education provided by GTAs.

Bettinger and Long (2004) found that when a graduate student serves as the lead instructor of a course, students will often take fewer credits within the particular content area. This experience reduces the likelihood of the student choosing that content area as a major. Shoulders et al. (2013) found that undergraduate students that had bad prior experiences with GTAs were hesitant to take additional courses taught by GTAs.

[1]Assistant Professor, College of Agriculture and Human Ecology, P.O. Box 5034 Cookeville, TN 38505; Tel: 931-372-6131; Email:nconner@tntech.edu
[2]Doctoral Candidate, Agricultural Education and Communication, P.O. Box 110540 Gainesville, FL; Tel: 352-273-2614; Email:erubenstein@ufl.edu

However, if the GTA had prior teaching experience and established credibility at the beginning of the course, undergraduate students could be influenced to change their opinion of the course and GTA instructor.

Furthermore, Schuckman (1990) found that GTAs in introductory courses received higher teaching evaluations than professors that taught the same course. A study conducted by Prieto and Altmajer (1994) found that GTAs self-efficacy increased as the GTAs prior teaching experience increased, or when the GTA attended training to help prepare them for their teaching responsibilities. However, Luft et al. (2004) reported that the majority of GTAs that attended university led trainings did not feel the trainings were effective. The GTAs reported that the trainings were too generalized and needed to be more focused in order to effectively prepare them for their teaching responsibilities (Luft et al., 2004). GTAs often have little to no training or prior teaching experience upon entering the college classroom (Lumsden, 1993), causing GTAs to be placed under an extreme amount of stress and being unprepared to be an effective classroom instructor (Bettinger and Long, 2004).

Shoulders et al. (2013) found that undergraduate preservice agricultural education students' perception of GTAs may change when the preservice teachers recognizes that GTAs have recent experiences that relate to their future. However, additional perceptions from undergraduate students regarding the quality of education received from PhD student lead instructors are lacking from the literature. Shoulders et al. (2013) argued that a need exists to better understand the relationship between a GTA, who has teaching experience and preservice agricultural education teachers.

Theoretical Perspective/Epistemological Perspective

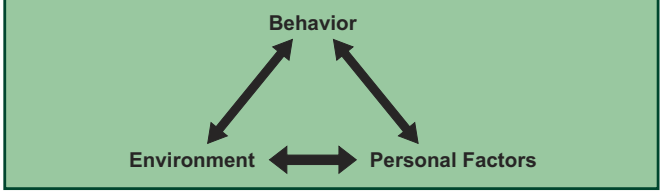
This study utilized constructivism as the theoretical perspective. Constructivism posits that people individually create their own knowledge based on personal experiences (Crotty, 1998); furthermore, social interactions can influence an individual's construction of reality and knowledge (Flick, 2006). Crotty stated, "constructivism describes the individual human subject engaging with objects (inanimate or animate) in the world and making sense of them" (p. 79). Constructivism takes into consideration each person's unique experience and views their experience and knowledge formation as valid (Crotty, 1998). This study sought to describe preservice agricultural education students perceptions of education received from PhD GTA lead instructors. The theoretical perspective of constructivism allowed the researchers to obtain, focus on and analyze the individual experiences that shaped the participants view of education received from PhD GTA student instructors.

Additionally, the epistemology for this study was constructionism. Crotty (1998) asserted that the epistemology provides a theory of knowledge, which is part of the theoretical perspective and the methodology of the study. The epistemology of constructionism was used due its assertion that humans construct their own reality through interactions with the external environment (Crotty, 1998).

Theoretical Framework

Bandura's (1986) social cognitive theory served as the theoretical framework for this study. The social cognitive theory asserts that learning happens through observation, imitation and modeling (Ormrod, 2008). According to Bandura (1986), interactions between the individuals' internal cognitive processes and external factors combine to produce learning. The model of triadic reciprocality was used due to its emphasis on the interaction between behavior, personal factors and the environment (Bandura, 1986). Bandura (1989) described the determinants of the triadic reciprocality model (Figure 1) as interacting determinants that exert influence on one another, but do not always exert an equal amount of influence on each factor.

Figure 1. Triadic Reciprocality (Bandura, 1986, p.24)



Purpose

The purpose of this study was to describe preservice agricultural education students perceptions of education received from lead PhD GTAs to gain further understanding the qualities of a Phd GTA instructor. The National Research Agenda calls for research to "deepen our understanding of effective teaching and learning process in all agricultural education environments" (Doerfert, 2011, p 9). The research question addressed in this paper was: How do preservice agricultural education students perceive their experiences in classes where their lead instructors are PhD students?

Subjectivity

According to Glense (1999), the subjectivity statement within a qualitative research study allows the researchers to share their personal experiences and beliefs that may influence the research study. Subjectivity statements have been provided by both of the researchers and will be presented in first person.

Researcher A

The research question investigated in this study is a question that I have much experience with. I have been a doctoral student TA for 3 classes and the doctoral lead instructor for 3 classes. I have often wondered how the students feel about having a course taught by someone other than a professor. I am connected to the topic of finding out the perceptions of undergraduate students regarding the quality of education received from a GTA.

I hope and want to find that the undergraduate students feel that they are receiving a high quality of education from their GTA. My feelings could potentially influence the way I interrupt and code the data. However, if the findings do not support what I hope they do, I would like to grow from this experience and alter my teaching in order to provide a higher quality of education to the students.

The participants for the study are not my own students so hopefully they will be inclined to give honest answers to the questions. I do not know the participants and am not expecting certain answers from them. I do not feel that my relationship or lack of relationship with the participants will affect how the participants answer the questions.

Researcher B

Growing up in a rural community, I have experienced a variety of instructional techniques both in high school and during my collegiate coursework. As an undergraduate student, I found that having a GTA as an instructor was a normal occurrence. These experiences varied in relation to the effectiveness of the PhD student as an instructor. This could be attributed to a variety of reasons such as: the area in which they were earning their PhD, the instructional training they received, or even their interest in teaching an undergraduate course.

The most memorable experience that I had while working with a PhD student was during my public speaking course. My PhD GTA instructor was expected to graduate at the end of the summer term. She was extremely engaging and would enter the classroom every day with a smile on her face. When we were required to present a speech to the class, she always provided positive comments. She would note areas for improvement on your grading rubric instead of announcing them in front of the entire class. This experience may seem normal to some individuals, but I found that most of the PhD GTAs that I had as instructors were not courteous to students and were not as in-tuned with their instructional needs.

As a current PhD GTA instructor for an undergraduate course, I find myself attempting to emulate my public speaking course instructor. Each day I enter the classroom excited to present new information and to provide a positive environment for my students to learn and grow professionally. I can only hope that I have a positive impact on my students' career paths. Additionally, the participants of this study are not currently my students and will hopefully provide honest information. I feel this research will benefit my instructional abilities and assist me in becoming a better instructor both as a PhD GTA and as a professor.

Methods

Participants/Sampling

This study consisted of four undergraduate students studying agricultural education at the University of Florida within the College of Agricultural and Life Sciences. Participants were recruited by email. An email was sent to the College of Agricultural and Life Sciences administrative secretary, who forwarded the email to the undergraduate students on the college's list serve. The four students in this study were purposively selected based on their enrollment in the agricultural education teacher preparation program. A purposive sample was collected to examine the specific objectives of the study. Specifically, typical sampling was utilized to seek the average participant (Merriam, 1998).

The participants included one male and three female students. Three of the participants were in their senior year and planned to conduct their student teaching experience in the spring of 2012. The fourth student was in her junior year and had three more semesters to complete in her program. Three of the four participants had GTAs both inside the [Department] as well as in their general education courses. One participant only had experiences with GTAs within the [Department]. The educational training that all four of the participants have received played a role in constructing their perceptions of GTAs.

Data Collection

The protocol was approved by the University of Florida's Institutional Review Board and participants provided written consent prior to data collection. This study used individual interviews to determine the perceptions that preservice agricultural education students, within the Agricultural Education and Communication department at the University of Florida, have regarding the quality of education provided by GTAs that were lead instructors of a course. Semi-structured interviews were developed and used for this study. According to Koro-Ljungberg et al. (2009), when using a constructivist methodology, one of the proper data collection methods is the use of individual interviews. Dooley (2007) purported that *"most qualitative researchers are guided by a set of basic questions and issues to explore but deviations may occur in order to capture nuances and emerging trends not previously determined"* (p.36).

Participants were asked a variety of questions related to the experiences they had with PhD students as instructors. Additionally, participants were asked questions about qualities that aided GTAs in being successful or unsuccessful as an instructor. Questions were also used to compare the quality of instruction provided by a professor that taught a course. The interviews lasted between 30 and 45 minutes and were audio recorded on a digital voice recorder. The data files were transcribed verbatim using an audio program called Express Scribe. Pseudonyms were used to protect the identity of the participants. There were two researchers for this study and each researcher was responsible for conducting interviews with two participants with identical semi-structured questions.

Data Analysis

Domain analysis was used to analyze the collected data. The domain analysis method breaks data sets into small units of cultural knowledge or key topics called domains (Spradley, 1980). The domain analysis method examines the transcripts for common words or phrases that exist within each interview. The four steps of a domain analysis include:

1. Select a single semantic relationship
2. Prepare a domain analysis worksheet
3. Select a sample of field–note entries
4. Search for possible cover terms and included terms that fit the semantic relationship (Spradley, 1980)

However, the researchers deviated from Spradley's (1980) process of domain analysis. Overarching themes were established and then broken down into domains which consisted of the cover term. Included terms were pulled from the data set and matched with the appropriate cover term (domain). The last step that the researchers completed was to identify the semantic relationship between the cover term (domain) and the included terms. The entire domain analysis procedure was completed and consisted of one domain analysis worksheet for each domain.

Each interview transcription was reviewed three times in order to gain contextual understanding of the data. With each reading a separate theme was examined and key words and phrases were determined. The key words assisted the researcher in establishing the cover terms that were extracted. The researcher delineated broad and narrow terms that described the domains that were established. Spradley (1980) reported that researchers can omit or adapt steps based on the individual research program.

Trustworthiness

In order to ensure the trustworthiness of the findings, attention was given to the credibility, transferability, dependability and confirmability of the research. Credibility was achieved through the use of triangulation, peer debriefing and member checking (Lincoln and Guba, 1985). Triangulation was attained through the use of multiple interviews and multiple researchers. Member checking was verbally done throughout the interview process to ensure the appropriate meaning of the respondent's statement was recorded. Additionally, peer debriefing was utilized throughout the research process and allowed the researchers to remove themselves from the research and gain a fresh perspective from a qualitative researcher that was not directly involved in this research study (Erlandson et al., 1993). Transferability was addressed through the use of thick description within the data (Dooley, 2007). The context, findings and thick description should be reviewed by readers in order to determine if the findings, from this study, could transfer to their situation and context (Lincoln and Guba, 1985). In order to trace data to the original source, a methodological journal was used to document the researchers' methodological decisions in order to demonstrate dependability and confirmability (Dooley, 2007).

Limitations

Due to short interview times, only four participants and only agricultural education students participating in the study, the conclusions and results could be swayed. The findings from this study could be influenced by the participant's coursework and interest in the education field. In addition, the participants primarily experienced GTAs in small classroom setting within agricultural education classrooms.

Furthermore, the researchers found that the questions included in the interview guide did not provide as much detail, as initially perceived, about undergraduate students' perceptions of the qualities of PhD GTA lead instructors. The lack of participant review of the transcripts could also be a limitation of the study. These limitations suggest a need for further investigation on the topic both in a qualitative and quantitative manner.

Findings

The findings were broken down into overarching domains and then into sub-domains. The findings will be described one domain/sub-domain at a time. The following three domains were delineated from the transcripts:

1. Relationship between GTAs and undergraduate students
2. Qualities of GTA student instructors
3. Qualities of a Professor

Relationship between GTAs and Undergraduate Students

When examining the preservice agricultural education students' responses, the researchers determined that a relationship existed between PhD GTA lead instructors and undergraduates. It was found that GTAs can benefit and hinder a student's success. Sub-domains were used to describe the students' responses.

Personable

Two participants focused on the importance of building positive relationships with their GTAs. They strongly felt that GTAs need to be personable with their students. Sara said, *"We were trying to . . . get to know her more on the personal side which makes it easier for her to help us."* She wanted a GTA that was willing to talk to her about classroom activities as well as life outside of the classroom. She felt that being personable showed how much the GTA cared about her and it enhanced their relationship. Jenny said, *"they [GTAs] are always willing to sit down and talk to me and it doesn't even have to do with school."* Jenny wants the GTA to be personable and willing to take the time and talk with her.

Understanding/Lack of Understanding

One participant felt that the GTAs better understood their individual situations. Jenny said, *"I feel like they [GTAs] are more willing just to sit down because they understand what you are going through a little better than your professors do."* She felt that GTAs understood her situation because, typically, GTAs had recently graduated with their undergraduate degrees and were current students. Thus, understanding from a GTA demonstrated how they cared for their students and were willing to take the time to listen and help their students succeed in the course. This participant felt more comfortable asking for guidance when they knew that the GTAs would understand their current situation.

However, sometimes GTAs lack understanding regarding undergraduate knowledge. Jason stated, *"They were saying she was too easy . . . with her testing and the way that she taught. They said it was more of a middle school/high school base than a collegiate level style of learning."* The students' prior knowledge was not always recognized and integrated into the course content/learning activities. The failure to recognize undergraduate knowledge gave the impression that GTAs have low expectations for their students.

Relatable/Unrelatable

Another domain that was evident was the GTAs ability to relate to their students. The participants felt that the undergraduate students were better able to relate to the GTAs than their professors. Sara said, *"I think with the TA you get more, you like connect and they put it down on your level and make it connect with the real world."* It was clear that Sara felt more comfortable with GTAs and counted on them to help her understand the material and make it relevant to her and her future career. Since Sara could relate to the GTAs she was much more comfortable working and talking with them. Additionally, Sara felt that she could talk to the GTAs due to the relationship they had built. Jenny also felt GTAs related well with their students. Jenny stated, *"They understand what you are talking about and they know what you are going through."* The personal connection established between the participants and their GTAs helped foster a positive learning environment.

However, one participant reported that GTAs take their role extremely seriously and at times do not provide for the instructional needs of the students. Jessica echoed this by stating, *"If that TA umm took time to just kinda chill out I guess and not be so serious and not almost put a face on. Umm for me I would learn better from that TA."*

Outgoing

The willingness of the GTAs to go the extra mile helped foster a positive relationship between the GTAs and the students. Jenny said, *"I feel like they're [GTAs] more willing at times to spend the extra minute."* The extra effort that the GTAs put into the course came off as a positive aspect and made for a better learning environment. Therefore, Jenny expected GTAs that go above and beyond their job requirements. Jenny stated, *"I know that they [GTAs] are willing to help."* The awareness of the GTA being willing to help, stems from the relationships that the PhD GTA lead instructors formed with the students.

Qualities of a GTA

Experience

The participants found that GTAs have a broad knowledge base due to their personal course requirements. They felt GTAs were currently learning themselves, that there was a higher interest level in sharing information with others. In addition, the participants felt that GTAs have more relevant experiences that would influence undergraduate students' learning. The participants felt strongly about the importance of their GTAs having several years of experience teaching agricultural education in the public school system. Sara said: *"They [GTAs] should be able to know what they are teaching about and have at least a couple years of experience just so they can give us real world scenarios they've encountered."* Jessica stated, *"A lot of times when I will be there teaching I have done something she [GTAs] has done in her classroom, umm she is able to relate how to make it more effective."* The GTAs public school teaching experience helped to show the participants that a PhD GTA lead instructor had valuable knowledge to share.

Additionally, the GTA was capable of understanding what their students were currently experiencing and what they may experience in the future. Sara stated, *"Umm being knowledgeable and having that real world experience [teaching] so it's like this going to happen just wait, you'll see it will happen."* Sara expressed the importance of having GTAs with high school teaching experience. She felt that the experience her GTAs had enhanced their teaching at the University level. It validated what the GTAs said and the teaching methods that they were advocating. It is evident in the following quote that Sara also valued the teaching experience of her GTAs. Sara stated, *"In the agricultural education department I feel like having the experience of being a teacher and relaying that to us in the classroom and letting us know well this is what I did in this type of situation definitely makes me understand more of what I am going to be doing in the near future."*

The sub-domain of teaching experience came up often in a positive way. The participants felt that GTAs should have prior teaching experience if they are in the field of education. If the GTAs are in a field outside of education, they should attend university workshops that prepare GTAs to teach and utilize various teaching methods.

Age Proximity

The participants felt very comfortable with their GTAs and one reason was due to age proximity between the GTAs and preservice agricultural education students. Jenny said, *"PhD students can relate to students better*

because not only often are they younger than a lot of professors, but they are still a student." The participants felt more comfortable working with and talking to GTAs since they were typically closer to their age than professors. Age proximity helped the student be relaxed around the GTAs and focus on the course material without feeling uncomfortable. Furthermore, GTAs were found to be more helpful and approachable. Jason stated, *"I feel like he [GTAs] is more on a level with the students more than a professor."*

Workload

The participants felt that the GTAs had a large work load, but were still willing to help them succeed. This made the participants feel more comfortable about asking the GTAs for assistance. Jenny said, *"PhD students have tons on their plate, but I feel like they're more willing at times to spend the extra minute."* The participants acknowledge the time commitments that GTAs have and felt that they were still willing to help. That made the participants feel at ease with their GTAs and they did not feel as if they were disturbing their GTAs when they had questions or concerns.

Intimidation/Lack of Intimidation

The participants felt comfortable engaging in conversation with their GTAs. Jenny stated, *"I feel like they [GTAs] are often much more approachable than a professor because there are professors that are kind of intimidating and you don't want to bother them."* The approachability of the GTAs allowed the participants to feel confident and comfortable going to their GTAs and asking for guidance. Participants did not feel intimidated by their GTAs and were willing to communicate with them.

Additionally, one of the four participants felt that it was beneficial to take a class taught by GTAs because they were typically less intimidating, easier graders and had lower expectations than a professor. Jason stated: *"The average of the class prior to her teaching [taught by professor] was the average C and everyone in the class received A's and B's that semester."* The thought of receiving a higher grade encouraged the participant to become more engaged in the course.

Finally, one of the participants felt that GTAs were less intimidating than professors because of the amount of time the GTAs have put towards developing and implementing the course. Jessica perceived that GTAs often perform a large amount of the legwork in preparing a course. The involvement of GTAs in the course allowed this participant to perceive GTAs as unintimidating, approachable and interested in student needs. Jessica said, *"I think that a lot a times you see a PhD student doing the bulk work."*

Qualities of a Professor

Over all the participants were very avid about the fact that professors seem too busy to spend time talking with undergraduate students. The participants felt that a professor was busy because of their increased workload. In turn, this workload would cause them to miss class, which one participant noted as an additional negative aspect of having a professor as the lead instructor. However, one participant noted that they enjoyed having professors and that their teaching has been beneficial. Finally, it was noted by one participant that a professor has little to learn and this can cause them to seem distanced from the material that they are teaching. Jason said: *"With a professor they have a lot on their plate. Ahh they could possibly teach multiple different lectures and classes, and with umm TA's from our standpoint as an undergrad, they have their classes as well but they also only teach a minimal amount of lecturing and lessons and so I would say that they have less responsibilities than a professor … , I believe that a professor has already hit their point [in regards to learning] of what they are going to be teaching."*

Jessica stated: *"Our professors are very busy people and they do very very important things. They won't be there because they are out of town for something. Umm so that has sometimes been a hindrance because you want your professor you like your professor, you love the way that they teach."*

While this does seem to show a tendency that participants have less enjoyment from professor led courses, it can be seen in the quotations that students do respect their professors and appreciate their involvement in the educational process.

Discussion

Based on the domains and sub-domains established through the interviews, the participants were interested in having GTAs as instructors of courses. Participants in this study felt it was critical for GTAs to have prior teaching experience and that prior teaching experience made the GTAs more knowledgeable and credible. This study concurred with the importance of GTAs having prior teaching experience (Prieto and Altmajer, 1994).

Training to help GTAs become effective teachers is something that the participants in this study suggested for GTAs that did not have prior teaching experience (Shoulders et al., 2013). According to Luft et al. (2004), GTAs often feel that university led trainings are not effective. In order to extend university led training sessions and to further develop the teaching skills of GTAs, the participants indicated that GTAs should enroll in a teaching methods course, which could be a viable option for many GTAs. This could assist GTAs outside of education to gain a better understanding of how students learn and how they are engaged in coursework. The teaching methods course should allow the GTAs to gain knowledge of commonly used teaching methods. The teaching methods presented should include, but are not limited to demonstration, inquiry based learning, cooperative learning, discussion and lecture with questioning. The GTAs should also be given the opportunity to conduct microteachings in order to

practice using the various teaching methods. The GTAs should also be introduced to the experiential learning process and to be shown different ways of incorporating the experiential learning process into the classroom. Additionally, a teaching methods course could serve as a refresher course for GTAs that had previous teaching experience. Furthermore, professors overseeing courses should provide more guidance for GTAs, which could aid in increasing the teaching effectiveness of GTAs and provide continuity between semesters. Professors should spend more time supervising and evaluating the GTAs teaching. Professors should help GTAs set goals in order to help improve their teaching skills. It is also recommended that GTAs observer both professors and other GTAs that have been deemed effective teachers.

Additionally, the experience that GTAs possess is of large benefit to students. The participants of this study found that the experience that the GTAs have is relevant to them. However, depending on the field the GTA is in, it is not always possible for them to enter the university setting with prior teaching experience at the secondary level. It is important to mention that preservice agricultural education teachers from this study recognized additional forms of teaching experience that included current and previous coursework, including the GTAs degree program and teaching workshops or trainings that are available through the university or outside agencies. In order to assist preservice agricultural education teachers in gaining knowledge and skills from their classroom interactions with GTAs, it is important for faculty members to encourage GTAs to share their prior experiences with their students when it aligns with the curriculum. The awareness of experiential learning techniques will help encourage GTAs to link current experiences to prior experiences. Professors should set the example by sharing their past experiences with the GTAs when the experiences are educative. This may be done through formal and non-formal meetings and conversations.

This study differed from Lumsden's (1993) study of Biology GTAs and found that the majority of GTAs, described in this study, had prior teaching experience at the secondary level. According to the National Research Council (2009), one's teaching style is influenced by how the individual has been taught in the past. Due to the GTAs prior pedagogical training and their teaching experience at the secondary level, the preservice teachers should be positively influenced by the GTAs instructional capabilities.

The importance of positive relationships between GTAs and their students was a major contributing factor on a preservice agricultural education teacher's perceived educational value of a PhD GTA instructed course. The willingness of a GTA to talk with undergraduate students and take time out of their schedules was a major reason the participants thought highly of the education they received. It is recommended that GTAs focus on building relationships with students to help preservice agricultural education teachers to feel comfortable communicating with the GTA. The participants preferred GTAs who were closer to their age and were willing to talk with them about class content and assignments, as well as life outside of the classroom. Through the GTAs effort to build positive relationships with students, it was evident that GTAs were effective at communicating with others and counseling or advising students (Roberts and Dyer, 2004). The participants in this study felt that they received a quality education from GTAs. However, it is critical for a GTA to have prior teaching experience in the classroom or through workshops and to focus on building positive relationships with their students.

Research Recommendations

Future research should be conducted to further explore preservice agricultural education teachers' perceptions of GTAs. This study should be replicated at multiple institutions to evaluate similarities and differences between different regions and an increased sample size should be used. Additionally, survey research methods should be used as a part of a national study.

Literature Cited

Austin, A. E. 2002. Preparing the next generation of faculty: Graduate school as socialization to the academic career. The Jour. of Higher Education 73(1), 94−122.

Bandura, A. 1986. Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. 1989. Human agency in social cognitive theory. American Psychologist 44(9), 1175-1184.

Bettinger, E. and B.T. Long. 2004. Do college instructors matter? The effects of adjuncts and graduate assistants on students' interests and success (Working Paper No. 10370). Retrieved from National Bureau of Economic Research website: http://www.immagic.com/eLibrary/ARCHIVES/GENERAL/NBER_US/N040303B.pdf

Crotty, M. 1998. The foundations of social research: Meaning and perspective in the research process. Thousand Oaks, CA: Sage Publications.

Doerfert, D.L. (Ed.) 2011. National research agenda: American Association for Agricultural Education's research priority areas for 2011-2015. Lubbock, TX: Texas Tech University, Department of Agr. Education and Communications.

Dooley, K. E. 2007. Viewing agr. education research through a qualitative lens. Jour. of Agr. Education 48(4), 32-42. DOI: 10.5032/jae.2007.04032

Erlandson, D. A., E.L. Harris, B.L. Skipper and S.D. Allen. 1993. Doing naturalistic inquiry: A guide to methods. Newbury Park, CA: Sage Publications.

Flick, U. 2006. An introduction to qualitative research. London, UK: SAGE Publications.

Glesne, C. 1999. Becoming qualitative researchers: An introduction. New York:Longman.

Koro-Ljungberg, M., D. Yendol-Hoppey, J.J. Smith and S.B. Hayes. 2009. Epistemological awareness, instantiation of methods and uniformed methodological ambiguity in qualitative research projects. Educational Researcher 38(9), p 687-699. DOI: 10.31021/0013189X09351980

Lincoln, Y. S. and E.G. Guba. 1985. Naturalistic inquiry. Newbury Park, CA: Sage Publications.

Luft, J. A., J.P. Kurdziel, G.H. Roehrig and J. Turner. 2004. Growing a garden without water: Graduate teaching assistants in introductory science laboratories at a doctoral/research univ. Jour. of Research in Science Teaching 41(3), 211−233.

Lumsden, A.S. 1993. Training graduate students to teach. The American Biology Teacher 55, 233–236.

Merriam, S.B. 1998. Qualitative research and case study applications in education. San Francisco, CA: Jossey-Bass.

National Research Council. 1996. From analysis to action: Undergraduate education in science, mathematics, engineering and technology. Washington, DC: National Academy Press.

National Research Council. 2009. Transforming agricultural education for a changing world. Washington, DC: The National Academies Press.

Ormrod, J.E. 2008. Human learning. Upper Saddle River, NJ: Pearson Prentice Hall.

Park, C. 2004. The graduate teaching assistant (GTA): Lessons from North American experience. Teaching in Higher Education 9(3), 349−361.

Pillar, G.D., K.J. Karnok and S.J. Thein. 2008. Perceptions, utilization and training of graduate student teaching assistants in introductory soil science courses: Survey results. NACTA Jour. 52(3), 25-32.

Prieto, L.R. and E.M. Altmaier. 1994. The relationship of prior training and previous teaching experience to self−efficacy among graduate teaching assistants. Research in Higher Education 35(4), 481−497.

Roberts, T.G. and J.E. Dyer. 2004. Characteristics of effective agriculture teachers. Jour. of Agr Education 45(4), 82–95.

Schuckman, H. 1990. Students' perceptions of faculty and graduate students as classroom teachers. Teaching of Psychology 17(3), p 162-165. DOI: 10.1207/s15328023top1703_5

Shannon, D.M., D.J. Twale and M.S. Moore. 1998. TA teaching effectiveness: The impact of training and teaching experience. The Jour. of Higher Education 69, 440-466.

Shoulders, C.W., C.T. Stripling and C.M. Estepp. 2012. Preservice teachers' perceptions of teaching assistants: Implications for teacher education. Jour. of Agr Education 54(2), 85-98.

Spradley, J.P. 1980. Participants observations. New York, NY: Rinehart and Winston.

United States Department of Education, National Center for Education Statistics. 2011. Graduate and first-professional students: 2007-08 (NECES 2001-174). US Department of Education; Washington D. C.

United States Department of Labor, Bureau of Labor Statistics. 2011. Occupational outlook handbook, 2010-11 edition. Retrieved on 20 November 2011 from http://www.bls.gov/oco/ocos066.htm

Characteristics of Student Success in a Graduate Physiology Course

F. C. Gwazdauskas[1] and M. L. McGilliard
Virginia Polytechnic Institute and State University
Blacksburg, VA

Abstract

Data were obtained from 309 students enrolled over a 23-year period in Advanced Physiology and Anatomy of Domestic Animals, including a 30-question pretest. There were 184 (59.6%) female and 125 (40.4%) male students. Pretest averaged 60.6 ± 0.76 (± SE) and final score averaged 86.1 ± 0.26. Analyses of variance for pretest score showed that degree sought ($P < 0.02$), department of study ($P < 0.05$), BS institution ($P < 0.001$) and background courses in physiology ($P < 0.02$) and biochemistry ($P < 0.001$) affected pretest scores. The pretest score was 59.5 ± 1.8 for incoming MS students, which was lower than scores for incoming PhD students (64.4 ± 2.0). Students from US Land Grant institutions, US non-Land Grant institutions and Virginia Tech scored higher on pretests than students from Chinese institutions. Final score was affected by gender ($P < 0.02$), previous degree ($P < 0.001$), pretest score ($P < 0.001$) and completion of background courses in anatomy ($P < 0.05$), organic chemistry ($P < 0.02$), biochemistry ($P < 0.001$) and statistics ($P < 0.02$). Pretest score and courses in biochemistry and anatomy were positively related to final score. Final score was 86.2 ± 0.97 for females compared to 84.9 ± 0.97 for males. The MS students had a final score of 85.3 ± 0.63 which was lower than that obtained by PhD students (87.9 ± 0.72). Although cause is not always apparent, multiple factors affect performance in graduate physiology and anatomy.

Introduction

The background of international students attending graduate school in the United States is often of concern because preparation of students often differs from educational systems in the United States. Transition to graduate study for international students can be difficult. Because of a number of factors, many international students arrived only a few days before classes begin. Adjustments to changes in culture may be severe. Factors that affect the final grade of graduate students were assessed by Gwazdauskas et al. (1986) under the quarter system. At that time, the course was part of a three-quarter graduate sequence in physiology. Then, international students had lower pretest and final grade scores than students who graduated from major colleges or universities in the U.S. There has been a change in source of international student populations taking graduate physiology and anatomy in this institution with more students now representing cultures of eastern Asia than in Gwazdauskas et al. (1986). Other factors shown to impact student success in various courses taken at a university include a negative class size effect (Becker and Powers, 2001), hands-on teaching models (Partridge, 2001), student standing in the class, undergraduate or graduate; (Wattiaux and Crump, 2006) and curriculum background and gender (Kensinger and Muller, 2006). The proportion of females enrolled as graduate students at Virginia Tech in the College of Agriculture and Life Sciences increased from 35.4% in 1990 to 55.7% in 2011 (Institutional Resources, 2013).

Pretesting has been used to evaluate and assess how background foundation influenced success in the current class (Collins et al., 1999; Bing et al., 2011; Schwartz et al., 1974; Saleh et al., 2007; Usta, 2011). Collins et al. (1999) and Schwartz et al. (1974) found that more background courses were associated with higher pretest and posttest achievement. Students with background classes in biochemistry, cell physiology and organic chemistry generally performed better in graduate physiology than students without these background classes (Gwazdauskas et al., 1986).

The objective of this study was to reassess the factors reported by Gwazdauskas et al. (1986) in light of a more intense semester course and changes in graduate student enrollment over the past 23 years to reassess characteristics affecting pretest and final grade scores in a graduate domestic animal physiology and anatomy course.

Materials and Methods

Data were collected from August 1988 to December 2011 for 309 students enrolled in Advanced Physiology and Anatomy of Domestic Animals, a 5-credit graduate

[1]Department of Dairy Science, 24061-0315; Phone: 540-231-4756; Email: guaz@vt.edu

offering with 4 h of lecture and one 3-h laboratory each week. The course is a graduate-level survey of general physiology. Major topics include cardiovascular (12 lectures), respiratory (four lectures), renal (four lectures), endocrine and reproduction (four lectures), neural (nine lectures), sensory (five lectures), motor (three lectures), digestive (nine lectures) and skeletal (three lectures) physiology. Laboratory experiments approved by the IACUC included bovine jugular catheterization with blood volume determination and changes in blood characteristics associated with dehydration and water loading; physiograph experiments which evaluated contractile properties of smooth and skeletal muscle in response to sympathetic and parasympathetic drugs and electrical stimulation and blood pressure changes in sheep in response to vagus nerve stimulation and the effects of sympathetic and parasympathetic drugs; sheep brain dissection; stereotaxic surgery to acquaint the student with the use of stereotaxic instruments placing a cannula into the lateral cerebral ventricle of a chicken; and digestion experiments that determined the selective absorption of compounds from the gut and evaluated isotope collection techniques for comparing rates of metabolism of compounds to understand how metabolic procedures can be used.

Student background information obtained on the first day of class included: name, department of study, degree(s) and institution(s) and courses taken as undergraduate or graduate students in histology, anatomy, embryology, physiology, cell physiology, organic chemistry, biochemistry, cytology, genetics and statistics. Following discussion of the syllabus and class expectations, a 30-question pretest was administered. Students were assured the pretest would not affect their final grade. The pretest included 15 multiple choice questions on general physiology and 15 short answer or definition questions of basic terminology and units of measure. Approximately 10 minutes were allowed for the pretest. Final score in the course ranged from 68.3 to 97.0 and was based on a weighted combination of grades for the highest nine of 10 quizzes, four hourly exams, five laboratory reports, two lecture presentations and an oral final examination.

Students originated from 10 departments. These included Animal and Poultry Sciences (APSC; n = 167), Dairy Science (DASC; n = 95), Human Foods, Nutrition and Exercise (HNFE; n = 33), Biological Sciences (BIOL; n = 5), Agricultural Education (n = 1), Crop and Soils Environmental Sciences (CSES; n = 1), Education (n = 1), Food Science and Technology (FST; n = 1), Fisheries and Wildlife (FWL; n = 2) and Veterinary Science (VetSci; n = 3). For the final statistical analyses Agricultural Education, CSES, Education, FST, FWL and VetSci were combined into one department called 'other.'

Because over 50 colleges were represented, baccalaureate schools were combined to represent six subgroups: They were grouped into six different university designation as: 1) Virginia Tech, 2) Land Grant Universities, 3) non-Land Grant U.S. Universities and Colleges, 4) schools in India, Sri Lanka and Pakistan, 5) schools in China and 6) 'other' included baccalaureate schools in Africa and the Middle East, schools in Central and South America, European Institutions, Australian and New Zealand institutions and schools in Korea and Taiwan.

Least squares analyses of variance (Glimmix procedure of SAS 9.2) of pretest scores and final numerical grade, one score per student, were used to evaluate the effects of gender, degree (undergraduate, MS or PhD), department of study, BS institution, year the class was taken and background courses. Several interactions were tested as well. When variables were not significant, models were reduced. The final reduced model for pretest score included gender, degree, gender by degree interaction, department of study, BS institution group and a yes/no response to background classes in physiology and biochemistry. Removal of non-significant effects lead to the final reduced model for final score that included gender, degree, department of study, BS institution as describe above and a yes/no response to background courses in anatomy, physiology, organic chemistry, biochemistry and statistics. Pretest scores were included as a covariate in models to evaluate final score.

Results and Discussion

There were 184 (59.6%) female students and 125 (40.4%) male students. This proportion generally matches that of Kensinger and Muller (2006) who found females comprise 54% of students enrolled in dairy production classes. The percentage of female students in this class had increased from 10 years earlier, which reflected the 20% change in the graduate student population in our college over the past 20 years (Institutional Resources, 2013). The pretest average was 60.6 ± 0.76 (mean ± SE) and the final score was 86.1 ± 0.26. There were no significant year effects for pretest score or final score.

Table 1 shows the analysis of pretest scores. The degree attained by the student prior taking the class ($P < 0.02$), department in which the student was enrolled ($P < 0.05$), college/university where the student obtained their BA or BS degree ($P < 0.001$) and previous courses in physiology ($P < 0.02$) and biochemistry ($P < 0.001$) affected pretest score. The effects of background courses in physiology and biochemistry were positive (regression coefficients were 4.71 ± 1.89 and 6.78 ± 1.77, respectively). This result indicates that the pretest score was 4.7 points higher when physiology was previously taken and 6.8 points higher when biochemistry was previously taken. These results indirectly support Gwazdauskas et al. (1986) who found that organic chemistry increased pretest scores, because organic chemistry is usually a prerequisite to biochemistry. The importance of background knowledge leading to greater success has also been reported by Collins et al. (1999); Wattiaux and Crump (2006); and Schwartz et al. (1974).

Table 1. Analysis of variance of pretest scores in a graduate physiology class.

Effect	df	Pr > F
Gender	1	0.8237
Prior Degreey	2	0.0145
Gender*Degree	2	0.0709
Department of Origin	4	0.0302
BS Institutionz	5	0.0002
Prior Physiology	1	0.0134
Prior Biochemistry	1	0.0002
Residual	277	

[y]Prior degree refers to students currently working on a BS degree, MS degree or PhD degree.

[z]Baccalaureate schools were combined to represent six subgroups: Initially, they were grouped into 10 different university designation as: 1) Virginia Tech, 2) US Land Grant Universities, 3) non-Land Grant US Universities and Colleges, 4) Africa and the Middle East, 5) India, Sri Lanka, and Pakistan, 6) Central and South America, 7) European Institutions, 8) Australia and New Zealand, 9) China, and 10) Korea and Taiwan. In the final analyses Middle East and African Institutions were combined with those in Central and South America, Europe, Australia and New Zealand, and Korea and Taiwan into one BS Institution called 'other'.

There were no differences due to gender for pretest score with the females averaging 64.4 ± 3.4 and the males averaging 63.5 ± 3.4. These pretest scores were approximately 10 points lower than those previously reported (Gwazdauskas et al., 1986) a reflection of less time given for the pretest (10 vs. 15 minutes) or possibly due to changes in demographics of the student population.

The pretest scores were 68.0 ± 6.5 for undergraduates and not different from graduate students. The 59.5 ± 1.8 for incoming MS students, who were lower (P < 0.02) than incoming PhD students (64.4 ± 2.0) is consistent with differences reported by Gwazdauskas et al. (1986) suggesting more retention of basic materials or greater academic experience of PhD students as supported by Schwartz et al. (1974) and Collins et al. (1999). Undergraduates in this course were superior students as their advisors suggested they enroll in courses at the graduate level and consent was given prior to enrollment.

Department of study had a significant impact on pretest scores (Table 2). Students from HNFE had higher pretest scores than students from APSC. Most students in HNFE were in the exercise physiology option of study and may have had a better background in physiology than students in APSC.

Students' BS institution had a significant effect on pretest score (Table 3). Students from schools designated as U.S. Land Grant institutions, U.S. non-Land Grant institutions and Virginia Tech had higher pretest scores than students from Chinese institutions. Apparently, incoming graduate students from institutions of higher education in China had the most difficulty with the pretest and this may likely be due to lack of familiarity with English (Gwazdauskas et al., 1986). Many Chinese students had arrived in the U.S. just before classes began. Scores for students from different types of U.S. institutions did not differ; suggesting that the background education tested here is comparable across the country.

Table 2. Least squares means for pretest scores by department of origin of the students.

Department	Mean	SE
Animal and Poultry Sciences	60.5[a]	2.28
Biology	62.9[ab]	5.99
Dairy Science	60.6[ab]	2.54
Human Nutrition, Foods and Exercise	67.3[b]	3.16
Other[z]	68.6[ab]	4.89

[ab] Means with different superscripts differ at P < 0.05 by Tukey-Kramer Adjustment for differences.

[z] Departments Agricultural Education; Crop and Soils Environmental Sciences; Education; Food Science and Technology; Fisheries and Wildlife; and Veterinary Science were combined into one department called 'Other'.

Table 3. Least squares means of pretest scores for baccalaureate institutions attended by graduate students taking graduate physiology.

College/University	Mean	SE
U.S. Land Grant	69.3[a]	2.90
U.S. non-Land Grant	65.9[a]	3.03
Virginia Tech	69.1[a]	2.65
Indian, Sri Lankan, and Pakistani	62.1[ab]	4.15
Chinese	56.6[b]	3.69
Schools in the Mideast, Africa, Central and South America, Europe, Australia, New Zealand, Korea and Taiwan	60.8[ab]	3.88

[ab] Means with different superscripts differ at P < 0.05 by Tukey-Kramer Adjustment for differences.

Table 4. Percentage of 308 students completing background courses during their undergraduate or previous graduate degree program.

Background course	Mean (%)
Genetics	88.3
Organic Chemistry	85.1
Statistics	82.2
Anatomy	81.5
Biochemistry	76.6
Cell Physiology	29.2
Embryology	20.1
Histology	20.1
Cytology	9.7

The percentage of students with various background courses is presented in Table 4. Less than 30% of students had previously taken histology, embryology, cell physiology, or cytology.

The statistical analysis of final score is in Table 5. Analysis of variance for final score showed that gender (P < 0.02), previous degree (P < 0.001), pretest score (P < 0.001) and background courses in anatomy (P < 0.05), organic chemistry (P < 0.02), biochemistry (P < 0.001) and statistics (P < 0.02) impacted student performance. The regressions on pretest score (0.07 ± 0.02), biochemistry (2.32 ± 0.69) and anatomy (1.44 ± 0.66) were positively related, while previous courses in organic chemistry (-1.95 ± 0.79) and statistics (-1.71 ± 0.71) were negatively related to final score. Note that with pretest in the model, significant differences were adjusted to average pretest scores, although the adjustment was not great (0.07 for each point difference in pretest score). The significance of pretest score and background courses in biochemistry support a previous report (Gwazdauskas et al., 1986) and the addition of the positive relationship with anatomy indicate that these background courses enhance understanding the mechanisms of physiological function. It is difficult to explain the detriment of organic chemistry and statistics on final score. Typically, organic

chemistry is a prerequisite for biochemistry. An analysis without anatomy and biochemistry background in the model resulted in the same direction for the regression coefficients for organic chemistry and statistics, but no significance on final score. In further data assessment there were 17.2% of the students with no statistics or organic chemistry background courses and 12.3% of students with statistic, but without organic chemistry, suggesting students more mathematically inclined do not do as well as students with a more biologically related background.

The differences in gender were associated with final score of 86.2 ± 0.97 for females compared to 84.9 ± 0.97 for males, supportive of Gwazdauskas et al. (1986) and more recently Bing et al. (2011). Females apparently were better prepared or more motivated to perform in graduate physiology even as their proportion increased from 43.6% female for this class during 1988 to 1990 to 69.2% female during the 2009 to 2011 fall semesters.

Table 5. Analysis of variance of factors that affect final scores in a graduate physiology class.

Effect	df	Pr > F
Gender	1	0.0139
Degree	2	0.0002
Department	4	0.4118
BS Institutions[z]	5	0.7849
PreTest Score	1	0.0005
Anatomy	1	0.0304
Physiology	1	0.1543
Organic Chemistry	1	0.0145
Biochemistry	1	0.0008
Statistics	1	0.0162
Residual	271	

[z]Baccalaureate schools were combined to represent six subgroups: Initially, they were grouped into 10 different university designation as: 1) Virginia Tech, 2) US Land Grant Universities, 3) US non-Land Grant Universities and Colleges, 4) Africa and the Middle East, 5) India, Sri Lanka, and Pakistan, 6) Central and South America, 7) Europe, 8) Australia and New Zealand, 9) China, and 10) Korea and Taiwan. In the final analyses Middle East and African Institutions were combined with those in Central and South America, Europe, Australia and New Zealand, and Korea and Taiwan into one BS Institution called 'other'.

Table 6. Least squares means of final scores based on department of study of students enrolled in graduate physiology. There was no statistical difference.

Department	Mean	SE
Animal and Poultry Sciences	85.6	0.78
Biology	83.9	2.05
Dairy Science	85.1	0.89
Human Nutrition, Foods and Exercise	85.3	1.11
Other[z]	88.0	1.81

[z] Departments Agricultural Education; Crop and Soil Environmental Sciences; Education; Food Science and Technology; Fisheries and Wildlife; and Veterinary Science were combined into one department called 'Other'.

Table 7. Least squares means of final scores based on baccalaureate college of students enrolled in graduate physiology. There was no statistical difference.

College/University	Mean	SE
U.S. Land Grant Universities	85.9	1.02
U.S. non-Land Grant Universities & Colleges	86.1	1.05
Virginia Tech	85.8	0.95
Institutions in India, Sri Lanka, & Pakistan	85.6	1.46
Institutions in China	84.5	1.27
Other[z]	85.5	1.37

[z] Baccalaureate schools were combined: Middle East and African Institutions, Central and South America, Europe, Australia and New Zealand, and Korea and Taiwan into one BS Institution called 'Other'.

Significant differences were found in final score based on degree being pursued by the student. The current BS students had a final score of 83.5 ± 2.25, while MS students had 85.3 ± 0.63 which was lower than that of PhD students (87.9 ± 0.72). The differences suggest that accumulated knowledge is beneficial for having success in graduate physiology (Collins et al., 1999; Lambert, 1976; Bing et al., 2011; Saleh et al., 2007) or students who pursue additional degrees are better students and self- selection plays a role in academic success.

While BS institution and department of study were important to pretest scores, they did not impact final score in the class (Tables 6 and 7). Final scores ranged from 83.9 ± 2.05 for Biology students to 88.0 ± 1.81 for students from 'other' departments. The range in final scores by area of baccalaureate study was 84.5 ±1.27 for students from China to 86.1 ± 1.05 for students from U.S. non-Land Grant colleges and universities. It appears that students from China are able to overcome language deficits throughout the semester and score as well as the rest of the student population, unlike the earlier findings of Gwazdauskas et al. (1986).

Summary

Higher pretest scores were associated with greater academic knowledge (PhD students), especially with taking courses in physiology and biochemistry, as also was demonstrated by HNFE majors contrasted with APSC, the home of this course. Students from China were least prepared for the pretest, probably due to language and cultural difficulties. For final score, higher pretest performance, PhD status and background courses in anatomy and biochemistry continued to define success. Females outperformed males in the course. Distinctive changes through the past two decades have been the influx of high-performing females and Chinese students who quickly adapt to English.

This study provides an example of the potential of improving performance in a course by identifying which students are doing well and not, why and pro-actively remedying potential background deficiencies in future students. It also illustrates how student populations and preparedness in this basic courses change over time, creating the need for teachers to identify the changes and react to them.

Literature Cited

Becker, W.E. and J.R. Powers. 2001. Student performance, attrition and class size given missing student data. Economics of Education Review 20: 377–388.

Bing, J., S. Pratt-Phillips, L.-A. Gillen and C. E. Farin. 2011. Undergraduate performance in a domestic animal laboratory taught via distance education. Jour. of Animal Science 89:297-301.

Collins, J., J.D. Riebe, M. A. Albanese, N. Dobos, K. Heiserman, S. L. Primack and E. A. Kazerooni. 1999. Medical students and radiology residents: Can

they learn as effectively with the same educational materials? Academic Radiology 6:691-695.

Gwazdauskas, F.C., M.L. McGilliard and W.E. Vinson. 1986. External factors that affects grades in graduate physiology. Jour. of Dairy Science 69: 2728-2733.

Institutional Resources. 2013. Virginia Polytechnic Institute and State University. IRINFO Report Generator. www.ir.vt.edu Accessed April 19, 2013.

Kensinger, R.S. and L.D. Muller. 2006. Major advances in teaching dairy production. Jour. of Dairy Science 89:1155–1162.

Lambert, N.M. 1976. Methodological considerations in the evaluation of differential components of supplementary education programs. Jour. of School Psychology. 14:171-185.

Partridge, J.A. 2001. Successful teaching techniques in dairy foods courses. Jour. of Dairy Science 84(E. Suppl.):E189-E190.

Saleh, M., A.W. Lazonder and T. de Jong. 2007. Structuring collaboration in mixed-ability groups to promote verbal interaction, learning and motivation of average-ability students. Contemporary Educational Psychology 32: 314–331.

Schwartz, G.F., J.S. Gonnella and H. Menduke. 1974. The value of pretesting in the surgical curriculum. Jour. of Surgical Research 16: 131-133.

Usta, E. 2011. The effect of web-based learning environments on attitudes of students regarding computer and internet. Procedia - Social and Behavioral Sciences 28: 262 – 269.

Wattiaux, M.A. and P. Crump. 2006. Students' perception of a discussion-driven classroom environment in an upper-level ruminant nutrition course with small enrollment. Jour. of Dairy Science 89:343–352.

The Role of Socialization in College of Agriculture Master's Students Persistence in College[1]

Danielle E. Hammond[2], Candice Shoemaker[3]
Kansas State University
Manhattan, KS

Abstract

To investigate factors relating to academic and social integration as predictors of intention to persist for graduate students, College of Agriculture Master's students in U.S. campus and online degree programs were surveyed. Data were gathered using an online questionnaire. In addition to demographics, the questionnaire included three scales, academic integration, social integration and intention to persist. Academic integration was measured with the subscales of advisor relationship and academic interaction. Social integration was measured with the subscales of peer group support, faculty interactions and involvement in social interactions. The subscales for each scale were combined to create academic integration, social integration and socialization scores. Mean scores were formulated from descriptive statistics. Polychoric correlation was used to identify relationships followed by regression analysis with academic and social integration as predictor variables and intention to persist as the criteria variable. A significant positive relationship between academic integration and social integration was identified. A significant positive relationship was also identified between academic integration and social integration and intention to persist. Demographic variables were examined in relationship to the scales. Overall this study indicates that socialization as explained through academic and social integration is an important factor of persistence in College of Agriculture Masters Students.

Introduction

There are numerous studies on student persistence at the undergraduate level (e.g., Spady, 1971; Tinto, 1975; 1987; Bean, 1980; Bean and Metzer, 1985; Astin, 1993, 1973; Pascarella et al., 1993; Milem and Berger, 1997; Sadler, 1997) and doctoral level (e.g., Girves and Wemmerus, 1988; Carlson, 1995; Bauer, 1997; Bair and Haworth, 1999; Mastekaasa, 2006; Most, 2008). Through these studies many of the variables that affect whether a student persists or drops out have been used to develop and test persistence models. However, master's level students have not received much attention. Is it because retention is not a problem at the master's level?

Cohen (2012) states, "Currently, the national six-year graduation rate for undergraduate students is 55.9% while doctoral student's ten-year graduation rate is 47-64%, depending on the field of study (U.S. Department of Education). While no national databases track the actual degree completion rate for master's degree students, the few studies of master's student persistence have found that degree completion rates for master's students range from 63% to 78% , depending on the number of years of study and the type of academic program" (Girves and Wemmerus, 1988; Luan, 1992; Xiao, 1998, p.3). Thus, although master's degree students finish their degrees at slightly higher rates than doctoral and undergraduate students, a third to a quarter of students will not complete their degree.

This study tested one student retention model - socialization – with master's degree students. Socialization is the process through which students learn how to behave and what it means to succeed or fail (Gardner, 2008). Socialization can be divided into two different constructs, academic integration and social integration. Social integration involves interpersonal relationships, support, interactions with others and a sense of belonging at a university (Spady, 1970; Tinto, 1975). Social integration stems from extracurricular activities, informal dealings with peer groups and interactions with faculty and staff (Tinto, 1975). When these activities are successful, they will help a student develop friendships, support, affiliation and channels of communication (Tinto, 1975). Eaton and Bean (1993) theorized that, "Social and academic integration can be considered to be primary indicators of adjustment to the college environment" (p. 9).

[1]Thanks to Drs. Shoemaker and Bremer, Talab and Williams for their support of this research. Contribution no. 13-323-J from the Kansas Agricultural Experimental Station.

[2]Graduate Assistant, Department of Horticulture, Forestry and Recreation Resources, 66506

[3]Professor, Department of Horticulture, Forestry and Recreation Resources, 66506

Academic integration is described through grade performance and intellectual development. Grade performance reflects an ability to meet the standards of the academic system; intellectual development involves a student valuing their education as a process of development in which they gain knowledge and ideas (Tinto, 1975). Academic integration is key because it involves students becoming integrated into the academic system that will allow them to achieve their goal of becoming professionals in their disciplines (Lovitts, 1996).

The above models provide a basis for which to examine graduate student persistence. However, there are differences that need to be considered when examining graduate education versus undergraduate education.

First, persistence is likely to be influenced by the characteristics of a field of study (Tinto, 1993). Therefore, the pattern of persistence will be more similar among the same field of study across institutions than among different fields at the same university (Zwick, 1991). Also, social integration is much more closely tied to academic integration at the graduate level (Tinto, 1993). Students' social interactions with peers and faculty are closely linked with students' intellectual development. Social membership becomes part of a student's academic membership and, ultimately, membership in the student's field (Tinto, 1993)

Additionally, the goal of the process of socialization is different. According to Baird (1992) and Rosen and Bates (1967), the goal of graduate school is to take a raw scholar and turn him into an academic professional. This is achieved through instilling within him a large amount of specialized knowledge, while at the same time socializing him to the norms, values, ways of thinking and modes of discourse (Lovitts, 1996). Finally, the effect of the community changes over time (Tinto, 1993). For example, Tinto (1993) describes that for a doctoral student, persistence in the later part of the degree, which involves mostly research, is likely to be influenced by a single faculty member or a small group of faculty members. This is not so much the case in the beginning stages of a doctoral student's degree.

Academic and social integration have been linked to graduate student retention and success (Church, 2008; Gardner, 2008, 2010; Tinto, 1993; Valero, 2001). However, none of these studies has truly explored factors relating to socialization or social integration and graduate student retention within colleges that focus on Agriculture. Therefore the objectives of this study were to explore factors relating to academic and social integration of graduate students: specifically, do these constructs that are shown to explain persistence in undergraduate and Ph. D. students also explain persistence in College of Agriculture Masters Students?

Materials and Methods

For this study a survey method was used to collect data using a questionnaire type instrument. The questionnaire was given to Master's students from various U.S universities. Students were surveyed using an online format of the questionnaire in Axio Survey (Axio Learning, Manhattan, KS). The Kansas State University Institutional Review Board approved the study protocol and all participants gave informed consent prior to participation in the study.

Instrumentation

Overall measurement of integration

The first subscale contained questions relating to student's academic integration. Lovitts (1996) identified that academic integration was influenced by participation in academic events and activities. Also having an advisor as well as the quality of a student's relationship with their advisor is critical in completing graduate school (Baird 1992; Lovitts, 1996; Rosen and Bates 1967). Therefore the two variables included in measuring academic integration were advisor relationship and academic participation. A mean score of the two variables was calculated to create an academic integration score.

The advisor relationship variable consisted of eight questions. The first, do you have an advisor consisted of a yes or no response. The remainder of the questions measured the quality of the relationship between the student and their advisor. These included questions such as: "my advisor advises me effectively" and "my relationship with my advisor has had a positive influence on my intellectual growth." They were adapted from Sorokosh (2004) and Little (2009) and had reported Cronbach's alpha reliability ranging from .81 to .96. Cronbach's alpha is a measure of internal consistency for a set of related items. A reliability coefficient of .70 or higher is considered acceptable in most social science research situations. The responses were based on a six point Likert type scale measuring extent of agreement with each statement.

The participation in academic interactions variable contained seven questions designed to measure the frequency students participated in academically focused interactions with others. The questions were adapted from Cardenas' (2005) questionnaire designed to measure doctoral student involvement. Some of the interactions asked about were "attended professional conferences or meetings" and "attended research seminars in yours or others disciplines." The reported overall Cronbach's alpha reliability of the instrument was .93. The responses were based on a six point scale, asking how often they have done various interactions. The responses ranged from "never" to "twice a week or more."

The second subscale of the instrument contained questions relating to social integration. The three variables included in measuring social integration were peer group support, faculty interactions and involvement in social interactions. A mean score of the three variables was calculated to create a social integration score.

The peer group support variable contained 11 questions designed to measure the strength and

usefulness of student's support from their peers. Some of these questions were adapted from Sorokosh (2004) and Little (2009) and were found to predict intention to persist and to have a reported Cronbach's alpha reliability ranging from .81 to .96. The remainder was adapted from Donatellis' (2010) institutional integration scale with a reported Cronbach's alpha reliability ranging from .88 to .92. The variable included questions like "since starting this program I have developed close personal relationships with other students" and "few of the students I know would be willing to listen to me and help me if I had a personal problem." The responses were based on a six point Likert type scale measuring extent of agreement with each statement.

The faculty interactions variable contained 11 questions designed to measure the opportunities and ease students had interacting with faculty members as well as the impacts these interactions had on students. Some of these questions were adapted from Sorokosh (2004) and Little (2009), which were found to have a Cronbach's alpha reliability ranging from .81 to .96. The remainder were adapted from Donatelli (2010) and were found to have a Cronbach's alpha reliability ranging from .88 to .92. Students were asked to rate, on a six point Likert type scale, the extent to which they agreed with statements. Some statements were "I am satisfied with the opportunities to meet and interact informally with faculty members" and "faculty are very accessible."

The final variable was involvement in social interactions. This variable contained six questions designed to measure student's involvement in informal social interactions. Some interactions asked about were "attended informal dinners and get-togethers with other fellow students" and "met with students to talk about course work, plans of work and faculty." The questions were adapted from Cardenas' (2005) questionnaire designed to measure doctoral student involvement. The reported overall reliability of the instrument was .93. The responses were based on a six point scale, asking how often they have done various interactions. Finally, to measure a student's overall socialization, which includes academic integration and social integration, scores from the integration scales were combined into one overall mean score.

Intention to Persist Instrument

Several studies have found a link between intention to persist and student's actual persistence (Bean 1982, 1990; Faghihi and Ethington, 1996). Therefore a scale measuring intent to persist was included in the questionnaire. The scale consisted of five questions and responses were based on a six point Likert type scale measuring extent of agreement. Some questions included were "I am confident I made the right decision to enroll in this program" and "I am sure that I will complete this degree program."

Sample

The sample was drawn from students in College of Agriculture programs where there are equivalent campus based and online pathways of earning similar degrees. At the universities, these online and campus based programs have similar requirements, professors and structure. This project was part of a larger study on retention in similar campus-based and online programs. The programs were identified using online university and departmental websites. Seven universities containing relevant programs were identified, University of Nebraska, Texas Tech, Virginia Tech, Iowa State, North Carolina State, Texas A and M and Washington State. The programs included horticulture, agriculture, crop science, agriculture education, soil science, plant breeding, plant science and pest management focuses. A total of fourteen programs at six universities (Texas A and M declined to participate) were identified as fitting the criteria for participation in the study.

Data Collection

The instrument was pilot tested using Axio Survey. M.S. students in the Kansas State University Horticulture department received an e-mail asking for their participation. The e-mail included a link that took them to the questionnaire. Once they clicked on the link in the email they were taken to the beginning of the questionnaire. There they saw a statement with privacy information and were asked if they consented to be included in the pilot test for the study. They were then taken to the remainder of the questionnaire. After the data were collected Cronbach's reliability coefficients were calculated and a correlational matrix was constructed. Because the Cronbach's alpha's were all above 0.70 no questions were removed. Also, no patterns indicating that the scales were measuring different constructs were identified.

The national survey was, like the pilot study, offered online through Axio Survey. Once programs were identified, e-mails were sent out to the graduate directors of the programs (n=14). In some cases the same person was the director of both the online and campus program at the university; otherwise the e-mail was sent to both the campus and online graduate director. The e-mail included some information about the study and a request to forward a message and survey link to all the master's degree graduate students that were currently enrolled in their program(s). The e-mail also included a request for the graduate directors to respond as to whether or not they forwarded the message to their students and an e-mail address to contact if they had any questions. The message for the students and the link to the online survey was included in the bottom of the e-mail to the graduate directors. The message to the students also included some information about the study, a request for their participation, an incentive, which was a $5 Starbucks gift card and a link to the online questionnaire.

One follow up e-mail was sent to the graduate directors with the same information and request for them to forward a message to all the students enrolled in their program. The message to the students included a reminder request, information about the incentive and a link to the online survey. Both the original and follow up e-mail were sent in the same semester. This process resulted in nine out of ten graduate directors forwarding the email request to their M.S. students.

As mentioned above, students received the invitation to participate in the survey through our email that was forwarded to them from their graduate director. Included in the email was a link to the online survey. Once students clicked on the link in the email they were taken to the beginning of the questionnaire. There they saw a statement with privacy information and were asked if they consented to be included in the study. Students were then taken to the remainder of the questionnaire. The questionnaire was completely anonymous. After the end of the questionnaire students were given the option to provide an e-mail address which would be used to send them their incentive. One reminder was sent. The total number of student responses was 54 and of these 42 surveys were complete and therefore usable. The total number of students receiving our email request was solicited from the program directors. Unfortunately, we were not successful in getting that from all program directors, thus we cannot determine response rate. In addition to not knowing the extent of the population we were drawing from, non-respondent bias is acknowledged.

Data Analysis

Data was downloaded from Axio Survey to Excel (Microsoft, 2010, Redmond, Washington) and then analyzed using Minitab® (Minitab, Inc, 16, State College, PA). Responses were coded such that a response of strongly disagree was given 1 point and a response of strongly agree, 6 points. A few statements were reverse coded with strongly disagree as 6 points and strongly agree as 1 point due to how the statement was written.

Descriptive statistics were used to formulate percentages as well as mean scores for the overall scales of socialization, academic integration, social integration, intention to persist and also on the subscales, advisor relationship, academic interactions, peer group support, faculty interactions and social interactions. Polychoric correlation was used to identify relationships between socialization, academic integration, social integration and intention to persist scales. Polychoric correlation was used because the ordinal variables were obtained by assigning categories to an underlying variable (agreement) that can be thought of as continuous. Coote (1998) stated that information gathered from Likert scales should be analyzed using polychoric correlations.

Because of the ordinal nature of the data, binary logistic regression was used (Elliot and Woodward, 2007) with the scales of academic integration, social integration and socialization as the independent variables and student's intention to persist as the dependent variable to identify if any variables predicted student's intention to persist. For this analysis, intention to persist was coded into a binary format. Because responses ranged from 3 to 6, a response of 3 or 4 was coded 0 for low and a response of 5 or 6 was coded 1 for high (Table 1).

Finally frequencies, analysis of variance and chi-square tests were run to determine if respondents program type, number of semesters enrolled, enrollment status, possession of an assistantship, total number of hours working for pay, gender or expected time needed to graduate, had any effect on the respondents' scores on the research variables.

Results

Thirty-seven percent of the respondents were thesis-option students and 62% were non-thesis. Campus based respondents made up 48.8% of the sample, online 34.1% and mixed campus/online 17.1%. On average, 72.5% indicated they had been enrolled between two and five semesters. Sixty-two percent indicated they were full time, 37.5% were part time and 55% were on an assistantship. Including the work they

Table 1 College of Agriculture Master's Students Responses[z,y] to Statements from the Intention to Persist Instrument.

				Scale of Agreement											
				Strongly Agree		Somewhat Agree		Slightly Agree		Slightly Disagree		Somewhat Disagree		Strongly Disagree	
#	Statements	Mean	SD	# of 6's	% of 6's	# of 5's	% of 5's	# of 4's	% of 4's	# of 3's	% of 3's	# of 2's	% of 2's	# of 1's	% of 1's
1	I question whether I made the right decision to engage in graduate study	4.33	1.73	16	38	9	21	2	5	5	12	8	19	2	5
2	I am confident I made the right decision to enroll in this program	4.57	1.47	16	38	8	19	8	19	5	12	4	10	1	2
3	I intend to earn my graduate degree either here or at another university	5.60	0.86	33	79	3	7	5	12	2	5	0	0	0	0
4	I doubt that I can successfully complete requirements for this program	5.50	0.89	29	69	7	17	5	12	0	0	1	2	0	0
5	I am sure that I will complete this degree program	5.64	0.62	30	71	9	21	3	7	0	0	0	0	0	0

[z] n = 42

[y] Scores for all scales and subscales had a possible range of 1-6

may do for their assistantship, 20% of students worked between 1-20 hours a week, 25% between 20 and 40 hours a week and 47.5% indicated they worked more than 40 hours a week. Fifty-four percent of the students also indicated the time needed for them to graduate was about what they expected, while 41.5% indicated it was more than they expected. Finally, out of the sample most (80%) answered they were White/Caucasian, 61% were female and 39% were male.

Out of a usable n of 42, the mean overall socialization score was 3.57. The mean scores for academic integration and social integration were similar at 3.5 (Table 2). The mean scores for the subscales varied. The academic integration subscales varied from 2.3 to 4.7. The social integration subscales varied from 2.3 to 4.4 (Table 2). The mean score for intention to persist was high, at 5.13 (Table 2). The range for all these scales was 1 to 6.

From the Polychoric analysis (Olsson, 1979) moderate to strong, positive correlations between academic integration and intention to persist ($r = 0.68$, $n = 42$, $p = 0.05$), between social integration and intention to persist ($r = 0.41$, $n = 42$, $p = 0.05$) and between academic integration and social integration ($r = 0.53$, $n = 42$, $p = 0.05$) were found.

From the logistic regression analysis several statistically significant relationships were found. There was a significant positive relationship between socialization and intention to persist (Table 3). This revealed that for every unit increase in the socialization score (from 1 to 6), it is 5.89 times more likely that there was a high intention to persist score. This model predicts 76.19% of the responses correctly and a Pseudo r^2 value of 0.28 indicates a moderate relationship between the variables. A significant positive relationship between academic integration and intention to persist was also found. The odds ratio indicates that for every unit increase in academic integration it is 3.33 times more likely that we will get a high intention to persist score. The Pseudo r^2 value of 0.22 indicates a moderate relationship with 76.19% of the responses being predicted correctly (Table 3). Finally, a significant positive relationship between social integration and intention to persist was discovered (Table 3). The odds ratio indicates that for every unit increase in social integration a high intention to persist score was 3.54 times more likely. The Pseudo r^2 of 0.16 indicated that this was a weak relationship and that the model predicts 78.57% of the responses correctly.

Socialization was affected by if students were in a thesis program or a non-thesis program and how many hours a week they worked (Table 4). Students working less than forty hours a week and in a thesis program reported higher socialization. Differences in academic integration were found on the number of semesters enrolled and average hours worked per week. Students enrolled in four or more semesters and that worked less than forty hours a week were more academically integrated (Table 4). There was a moderate, significant negative correlation ($r = -0.32$, $n = 41$, $p = 0.05$) between academic integration and age. Differences in social integration were found for students completing a thesis vs. non-thesis, receiving an assistantship and average hours worked per week (Table 4). Students completing a thesis that received assistantships and worked less than forty hours a week were more socially integrated (Table 4). A difference in intention to persist was found on the demographic variable of amount of time needed to graduate, those who indicated that the time needed to graduate was less or the same as expected indicated a higher intention to persist (Table 4). There were no significant differences in academic or social integration or intention to persist by the number of semesters a respondent had been enrolled, whether they were enrolled full or part time, or by respondent's gender (Table 4).

Upon further examination it was found that respondents who worked between 1 and 40 hours a week were more likely to have an assistantship ($X^2 = 15.89$, $n=39$, $p=0.001$), be enrolled full time ($X^2 = 17.03$, $n=39$, $p=0.001$), be a campus student ($X^2 = 20.88$, $n=31$, $p=0.001$) and were younger (Table 5). On the other hand those who worked more than forty hours a week were older (Table 5), did not have an assistantship ($X^2 = 15.89$, $n=39$, $p=0.001$), were an online student ($X^2 = 20.88$, $n=31$, $p=0.001$) and were likely enrolled part time ($X^2 = 17.03$, $n=39$, $p=0.001$).

Table 2. Mean Scores[z,y] for College of Agriculture Master's Students for Academic Integration, Social Integration, and Intention to Persist; and Advisor Relationship, Academic Interactions, Peer Group Support, Faculty Interactions, and Social Interactions.

Scale		Sub Scales		
	Mean		Mean	SD
Socialization	3.57			
Academic Integration	3.53			
		Advisor Relationship	4.70	1.63
		Academic Interactions	2.35	1.38
Social Integration	3.55			
		Peer Group Support	3.91	1.60
		Faculty Interactions	4.40	1.55
		Social Interactions	2.33	1.45
Intention to Persist	5.13			1.30

[z] n = 42
[y] Scores for all scales and subscales had a possible range of 1-6

Table 3. Regression matrix indicating the Binary Logistic Regression analysis[z] (dependent variable = High) between overall socialization scores and intention to persist scores.

	Socialization	Academic Integration	Social Integration
Intention to Persist			
Coefficient[y]	1.77	1.20	1.27
Z[x]	3.05**	3.0**	2.53**
Odds Ratio	5.89	3.33	3.54
Model Chi-square[w]	14.29***	11.64***	8.36**
McFadden's Pseudo r^2	0.28	0.22	0.16
Correctly Predicted	76.19%	76.19%	78.57%

[z] n = 42
[y] Coefficients represent the change in the logit for each unit change in the predictor
[x] Z represents the parameter significance
[w] Model Chi-square represents the significance of the overall model
*, **, ***Significant at P= 0.05, 0.01, or 0.001 respectively using Logistic Regression Analysis

Table 4 Demographic analysis of the overall sample of College of Agriculture masters students by program type, semesters enrolled, enrollment status, assistantship, number of hours working for pay, gender and amount of time expected to graduation.

Demographic Variable	n[z]	Academic Integration Mean Score[y]	Social Integration Mean Score[y]	Socialization Mean Score[y]	Intention to Persist Mean Score[y]
Program Type					
Thesis	26	3.36	3.98	3.81	5.11
Non- Thesis	15	2.99	3.36	3.30	5.19
Total	41				
P		0.27	0.03*	0.05*	0.76
Semesters Enrolled					
1 to 3	20	2.90	3.74	3.54	5.16
4 or more	20	3.53	3.76	3.69	5.07
Total	40				
P		0.05*	0.93	0.58	.072
Enrollment Status					
Full Time	25	3.31	3.97	3.77	5.08
Part Time	15	3.02	3.41	3.36	5.21
Total	40				
P		0.38	0.07	0.13	0.61
Assistantship					
Yes	22	3.34	4.04	3.83	4.99
No	18	3.14	3.41	3.37	5.28
Total	40				
P		0.53	0.03*	0.08	0.26
Average hours worked per week					
1 to 40	20	3.55	4.10	3.91	5.15
>40	20	2.85	3.46	3.34	5.13
Total	40				
P		0.03*	0.03 *	0.02*	0.94
Gender					
Male	16	3.22	3.88	3.73	5.23
Female	25	3.24	3.68	3.55	5.08
Total	41				
P		0.99	0.50	0.49	.057
Amount of time needed to graduate					
Less or same as expected	23	3.35	3.86	3.74	5.37
Greater than Expected	17	3.08	3.74	3.55	4.86
Total	40				
P		0.40	0.68	0.44	0.04*

[z] Number of respondents for each category varied due to non-responses.

[y] Range for mean scores is 1-6

*Significant at P=0.05 using ANOVA

Discussion

Students who were more academically integrated in their program and university are more likely to persist. These results support earlier research studies. Within academic integration, Tinto (1975) theorized that the decision to drop out is a "coping" response to a lack of fit between the student and the system and stems from, *"either insufficient intellectual development or insufficient congruency between the intellectual development of the individual and the normative climate of the academic systems (p. 106)."* Tinto (1993), Baird (1992) and Weiss (1981) also found that those social interactions which are academic in nature are linked with student intellectual development and persistence.

Additionally, Weiss (1981) found that out of all of a student's relationships, the student-advisor relationship has a most critical role in a student's persistence and commitment. Lovitts (1996) also theorized that an advisor is a critical resource for helping a student become socialized and integrated into their field of study and also provides valuable information about what is expected from the student and the way things work in the department and field (Lovitts 1996). Gardner (2007, 2010) also found that a student's advisor can help students figure out how much independence is good and provide support, which is often more important to students than having an advisor who was an expert in their field. Students in our study indicated a highly positive advisor relationship.

Table 5 Binary Logistic Regression analysis[z] (dependent variable = > 40 hours) between age and hours worked.

	# Hours work per week
Age	
Coefficient[y]	0.46
Z[x]	2.47**
Odds Ratio	1.59
Model Chi-square[w]	18.67**
McFadden's Pseudo r^2	0.36
Correctly Predicted	81.58%

[z] n = 31

[y] Coefficients represent the change in the logit for each unit change in the predictor

[x] Z represents the parameter significance

[w] Model Chi-square represents the significance of the overall model

**Significant at P= 0.01, using Binary Logistic Regression Analysis

Students who were more socially integrated also showed a higher intention to persist. This supports findings from Weiss (1981) who demonstrated that the more faculty members a student knows professionally, the more likely a student is to have increased productivity, involvement and commitment. Gardner (2007, 2010) also supported the importance of faculty members in helping students gain needed skills and dispositions.

Gardner (2010) theorizes that interactions with faculty members are important because they are the ones who initiate much of the development and also because students watch how faculty interact with each other in order to learn the norms of their field (Gardner, 2007). Students in our study reported positive interactions and relationships with the faculty in their programs.

Additionally, Gardner (2007) found that support is an important theme in the process of socialization of graduate students. Gardner (2007) found that support originates from two main sources, faculty and peers and that peer support was sometimes more important than faculty support and was important for students at all stages in a program. Beginning students mentioned peer support as what got them through the beginning of their program and students who were further along mentioned peer support as a way of gaining a clear picture of what is expected of you (Gardner, 2007). Students in our study reported slightly positive feelings of peer group support, however, their feelings of peer group support were lower than their relationships with advisors or other faculty members.

Overall, the data also showed that academic integration and social integration are associated with each other. When combined into an overall construct, higher socialization scores were related to an increase in intention to persist. For students in Master's Agriculture programs this model seems to support the literature that theorizes that academic integration and social integration complement each other and supports Tinto's belief (1993) that student's social and intellectual development are linked. The data also showed several demographics that may be important in a model of socialization. These demographics include whether or not a student has to complete a thesis, whether or not a student has an assistantship and the number of hours a student has to work per week. Further research needs to be conducted to investigate more in depth, the influence these variables may have on a student's socialization.

Summary

Academic and social integration have been shown to be important factors in graduate student persistence (Church, 2009; Gardner, 2008, 2010; Tinto, 1993; Valero, 2001). The findings of this study seem to support Tinto (1993) who theorized that the components of academic and social integration were related and intertwined with each other. These findings also support Lovitts (1996) who theorized that if students are separated from each other and from faculty, they cannot find the emotional support they need, they also cannot figure out how the system is supposed to work and they cannot voice their concerns (Lovitts 1996), placing everything on the students and their own resources. Overall integration, both academic and social, helps bind people to each other and their communities through an exchange of ideas, knowledge, impressions and feelings (Lovitts 1996).

Literature Cited

Astin, A.W. 1993. What matters in college: Four critical years revisited. San Francisco: Jossey-Bass.

Bair, C. R. and J.G. Haworth. 1999. Doctoral student attrition and persistence: A meta-synthesis of research. Paper presented at the Annual Meeting of the Association for the Study of Higher Education, San Antonio, Texas, November 18-21, 1999.

Baird, L.L. 1992. The stages of the doctoral career: socialization and its consequences. In: Annual Mtg. Of American Educational Research Association, San Francisco, CA, 20-24 April.

Barnett, D.L. 2008. Experiences influencing degree completion articulated by doctoral students in education administration, PhD Diss, Dept. of Leadership, Foundations and Human Resource Education, Univ. of Louisville, 580 S Preston St, Louisville, KY.

Bauer, W.C. 1997. Pursuing the Ph.D.: Importance of structure, goal-setting and advising practices in the completion of the doctoral dissertation. Unpublished Dissertation, University of California, Los Angeles, Los Angeles.

Bean, J. 1980. Dropouts and turnover: The synthesis and test of a causal model of student attrition. Research in Higher Education 12(2), 155-187.

Bean, J.P. 1982. Student attrition, intentions and confidence: Interaction effects in a path model. Research in Higher Education 17, 291-319.

Bean, J.P. 1990. Why students leave: Insights from research. In Hossler D. (Ed.), The strategic management of college enrollment. San Francisco, CA: Jossey-Bass.

Bean, J.P. and B.S. Metzner. 1985. A conceptual model of nontraditional undergraduate student attrition. Review of Educational Research 55(4), 485-540.

Cardenas, D.A. 2005. Measurement of involvement factors in leisure studies doctoral programs, PhD Diss, Dept. of Parks, Recreation and Tourism Management, Univ. of North Carolina State University, 2211 Hillsborough St, Raleigh, NC.

Carlson, S.L. 1995. An examination of the external factors that influence midlife women's behavior to persist in obtaining a graduate degree. Unpublished Dissertation, The Ohio State University, Columbus, OH.

Church, S.E. 2008. Mock orals and their effects on student's academic and social integration, cognitive maps, goals and rates of completion in the instructional leadership doctoral degree program at St. John's University, PhD Diss, Dept. of Administrative and Instructional Leadership, St. John's Univ., 8000 Utopia Pkwy, Queens, NY.

Cohen, K. 2012. What about Master's students? The Master's student persistence model. Paper presented at the annual meeting of the Association for the Study of Higher Education, Las Vegas, NV, Novemeber 15-17, 2012

Coote, L. 1998. A review and recommended approach for estimating conditional structural equation models. In:

Annual Mtg. of Australia and New Zealand Marketing Academy Conference, Dunedin, New Zealand.

Donatelli, S.N. 2010. Help-seeking attitudes and intentions among first generation college students. PhD Diss, Dept. of Educational Studies, Purdue Univ., 101 N Grant St, West Lafayette, IN.

Eaton, S. B. and J.P. Bean. 1993. An approach/avoidance behavioral model of college student retention. Research in Higher Education 36(6), 617-645.

Elliot A.C., W.A. Woodward. 2007. Statistical analysis quick reference guidebook. Thousand Oaks, CA: Sage Publications Inc.

Faghihi, F. and C.A. Ethington. 1996. The effect of doctoral students' background, involvement and perception of growth on their intention to persist. In Proc. 21st Annu. Mtg. of the Association for the Study of Higher Education, Memphis, TN, Memphis, 31 Oct - 3 Nov.

Gardner, S. 2008. Fitting the mold of graduate school: A qualitative study of socialization in doctoral education. Innovative Higher Education 33(2), 125-138.

Gardner, S. 2010. Contrasting the socialization experiences of doctoral students in high and low completing departments: A qualitative analysis of disciplinary contexts at one institution. The Journal of Higher Education 81(1), 61-81.

Girves, J. and V. Wemmerus. 1988. Developing models of graduate student degree progress. The Journal of Higher Education 59(2), 163-189.

Gravois, J. 2007. In humanities, 10 years may not be enough to get a PhD. Chronicle of Higher Education 53(47), A1.

Little, D.M. 2009. Graduate program culture and intention to persist: Working adults in cohort and non-cohort programs. EdD Diss, Dept. of Adult Education, Florida International Univ., 789 East Eisenhower Parkway, Ann Arbor, MI.

Lovitts, B.E. 1996. Leaving the ivory tower: A sociological analysis of the causes of departure from doctoral study. PhD Diss. Dept of Sociology, Univ. of Maryland, College Park, College Park, MD.

Luan, J. 1992. A lingitudian study of variables significant toward master's degree students' persistence and degree completion. Unpublished Dissertation, Arizona State University, Tempe, AZ.

Mastekaasa, A. 2006. Educational transitions at graduate level: Social origins and enrolment in Ph.D. programmes in Norway. Acta Sociologica 49(4): 437-453.

Milem, J.F. and J.B. Berger 1997. A modified model of college student's persistence: Exploring the relationship between Astin's theory of involvement and Tinto's theory of student departure. Journal of College Student Development 38(4), 387-399.

Most, D. 2008-2009. Patterns of doctoral student degree completion: A longitudinal analysis. Journal of College Student Retention 10(2): 171-190.

Olsson, U. 1979. Maximum likelihood estimation of the polychoric correlation coefficient. Psychometrika 44(4), 443-460.

Ott, M.D., T.S. Markewich and N. Ochsner. 1984. Logit analysis of graduate student retention. Research in Higher Education 21(4), 439-460.

Pascarella, E.T., L. Bohr, A. Nora, B. Zusman, P Inman and M. Deslter. 1993. Cognitive impact of living on campus versus commuting to college. Journal of College Student Development 34 216-220.

Rosen, B.C. and A.P. Bates. 1967. The structure of socialization in graduate school. Sociological Inquiry 37, 71-84.

Sadler, W.E., F.L. Cohen and L. Kockesen. 1997. Factors affecting retention behavior: A model to predict at-risk students. AIR Annual Forum Paper (Annual Forum of the Association for Institutional Research, 37th, Orlando, FL, May 18-21, 1997) 22 pages.

Smallwood, S. 2004. Doctor dropout. (http://chronicle.com/article/Doctor-Dropout/33786). The Chronicle of Higher Education. (June, 2001).

Sorokosh, A. 2004. Program factors affecting doctoral student retention and attrition: Development and initial validation of a program assessment instrument. PhD. Diss. Hofstra Univ., 1000 Fulton Ave, Hempstead, NY.

Spady, W. 1970. Dropouts from higher education: An interdisciplinary review and synthesis. Interchange 1(1), 64-85.

Spady, W.G. 1971. Dropouts from higher education: Toward an empirical model. Interchange 2(3), 38-62.

Tinto, V. 1975. Dropouts from higher education: A theoretical synthesis of the recent literature. Review of Educational Research 45, 89-125.

Tinto, V. 1987. Leaving college: Rethinking the causes and cures of student attrition. Chicago: University of Chicago Press.

Tinto, V. 1993. Leaving college: The causes and cures of student attrition, 2nd ed. Chicago: MI: University of Chicago Press.

U.S. Department of Education, National Center for Educational Statistics. 2010. Digest of Education Statistics: 2010. Washington, DC Retrieved March 31, 2012, from the World Wide Web: http://nces.ed.gov/programs/digest/d10/.

Valero, F.Y. 2001. Departmental factors affecting time-to-degree and completion rates of doctoral students at one land-grant research institution. The Journal of Higher Education 72(3) 341–367.

Weiss, C.S. 1981. The development of professional role commitment among graduate students. Human Relations 34, 13-31.

Xiao, B. 1998. Factors influencing master's degree attainment in business, engineering, health and human sciences and visual and performing arts. Paper presented at the Annual Forum of the Association for Institutional Research, Minneapolis, MN.

Zwick, R. 1991. An analysis of graduate school careers in three universities: Differences in attainment patterns across academic programs and demographic groups. Princeton: NJ: Educational Testing Service.

Engaging Undergraduate Students from Two Institutions in a Multicultural Synchronously Taught Agriculture Course[1]

Kevin D. Gibson[2] and Tamara J. Benjamin[3]
Purdue University
West Lafayette, IN

Bridgett R. K. Chapin[4]
Haskell Indian Nations University
Lawrence, KS

Christian Y. Oseto[5] and Anne M. Lucietto[6]
Purdue University
West Lafayette, IN

Abstract

While distance education courses have expanded course offerings in the agricultural sciences, programs to increase interaction among minority serving and predominately white institutions have been lacking. To address this need, we delivered a synchronously taught undergraduate course on sustainable agriculture to students at Haskell Indian Nations University and at Purdue University for three semesters from 2010 to 2012. Students participated in three main activities: lectures, reciprocal campus visits and a project in which each student interviewed two to three adults about their perspectives on the sustainability of U.S. agriculture. Quantitative and qualitative data were used to determine student engagement and program assessment. Students at both universities posted comments and questions frequently during the lectures and were generally satisfied with the technology used to deliver the lectures. As measured by the number of comments and questions posted during the lectures, Native American males were particularly engaged by course content. The interest of Native American males in working in multicultural groups also increased significantly during the semester although no differences were detected for Purdue males or for women at either institution. Students emphasized the importance of the reciprocal visits and projects for getting to know each other outside the classroom in both written and verbal comments. Our results suggest that students from culturally diverse institutions can be engaged during synchronously taught courses using distance-learning technologies.

Introduction

Although the percentage of people of color in the United States continues to increase and is projected to reach over 50% by 2050 (United States Census Bureau, 2012), relatively little progress has been made in broadening the participation of minorities in science, technology, engineering and math (STEM) disciplines (Association of Public and Land-Grant Universities, 2009; The National Academies, 2011). The widening gap between minorities and their representation in STEM disciplines may be particularly difficult to bridge in agriculture where misconceptions about current agricultural careers and their significance to a student's community can limit student interest (Association of Public and Land-Grant Universities, 2009). To maintain a viable and relevant agricultural industry, we must increase the number and diversity of students pursuing careers in agriculture (National Research Council, 2009). Predominately white institutions (PWIs) must do a better job attracting minority students – many of the most prominent agriculture programs are at PWIs

[1]This research was partially supported by USDA International Science Education Award #2009-51160-05466 and this study was deemed exempt by the Purdue University Institutional Review Board.

[2]Associate Professor, Botany and Plant Pathology, (765) 496-2161, kgibson@purdue.edu
[3]Research Scientist, Botany and Plant Pathology, tamara17@purdue.edu
[4]Professor, Environmental Sciences, bchapin@haskell.edu
[5]Professor, Entomology, osetoc@purdue.edu
[6]PhD Student, Engineering Education, aluciett@purdue.edu

– but approximately a third of all minority undergraduate students in the United States attend a Minority Serving Institution (Harmon 2012).

Minority Serving Institutions (MSIs) - which include Tribal Colleges and Universities (TCUs), Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs) and Asian-American Native American Pacific Islander Serving Institutions (AANAPSIS) – must play a major role in addressing this goal. The National Resource Council (2009) noted that "academic programs in agriculture tend to exist in isolation" (p. 3) and recommended greater interactions among institutions. More specifically, they noted that pathways from tribal colleges to careers in agriculture have not been highly successful and recommended that institutional partnerships be developed with tribal colleges. Tribal colleges enroll approximately 19% of all Native American students (Harmon 2012) and, as land grant institutions with close ties to local tribal communities, have tremendous potential to engage students in agriculture.

The National Resource Council (2009) also recommended that shared introductory courses that serve multiple populations be developed and that faculty be prepared to teach effectively within this new educational paradigm. The development of curricula shared online between universities has the potential to increase agricultural course offerings at PWIs and TCUs (Frick et al., 2004). Online courses can be delivered to students at multiple institutions synchronously through technologies such as videoconferencing, asynchronously through the use of online content and previously recorded lectures, or through a combination of synchronous and asynchronous tools. Although there appear to be no reduction in student outcomes for purely online versus purely in-person courses (Means et al., 2010), some researchers have reported less interaction among and between students and faculty and lower achievement rates in synchronously taught classrooms than in traditional classrooms (Angeli et al., 2003; Bernard et al., 2004; Mauve et al., 2001). Muilenberg and Berge (2005) reported that students perceive a lack of social interaction as the most severe barrier to online learning followed by course administration/instructor issues.

A potential approach for developing shared courses between PWIs and TCUs (which would also address the need for institutions to internationalize their curriculum) is to focus on international agriculture and global food issues (Frick et al., 2004). Enrollment in study abroad has increased substantially during the last few decades; however, minority participation in study abroad has not kept pace with this growth (Dessoff, 2006; Institute of International Education, 2012). Perdreau (2002) identified several barriers for ethnic minority students including a lack of funding, concern about their acceptance in other countries, the perception that study abroad programs do not provide culturally relevant experiences and the belief that study abroad is an unnecessary distraction from obtaining a degree. Calhoon et al. (2003) suggested that Native Americans studying at TCUs might find it particularly difficult to access study abroad programs. The authors argue that TCU faculty often carry substantial teaching loads that preclude organizing logistically challenging study abroad programs and that TCUs may lack the financial resources to support study abroad programs. Thus partnering with a PWI with the necessary resources to fully support study abroad programs might be particularly beneficial for TCUs.

Purpose

The primary goal of this study was to assess the potential use of distance learning technology to provide a synchronous classroom experience on sustainable agriculture in preparation for a two-week study abroad program in Costa Rica to students at Haskell Indian Nations University (HINU) in Lawrence, KS and at Purdue University (PU) in West Lafayette, IN. We were interested in whether student engagement would vary by institution and gender. We were also interested in determining the effect of site visits and personal reflections on sustainable agriculture on student engagement.

Institutions

HINU has an average yearly enrollment of approximately 1000 undergraduate students who are members of federally recognized tribes across the United States. PU is a PWI with an annual enrollment of approximately 30,000 undergraduate students, primarily from within Indiana. Both universities are land-grant institutions. PU has dozens of majors in disciplines related to agriculture while the only Bachelor's degree in STEM fields at HINU is a BS in Environmental Science. The primary campus for CATIE (Center for Tropical Research and Education) is located in Turrialba, Costa Rica but the institution serves member countries located throughout Latin America. CATIE offers graduate degrees to students interested in the sustainable use of natural resources and agriculture. PU and CATIE offered a two-week summer field course on biodiversity in natural and agricultural systems for several years (Gibson et al., 2012) before partnering with HINU.

At the beginning of each semester, students completed a questionnaire in which they were asked to indicate their major, estimated year of graduation and whether they primarily grew up in a rural, suburban, urban, or reservation community. Forty-six students (25 from HINU, 21 from PU) took the course from 2010 to 2012; annual enrollment ranged between 11 and 16 students (Table 1). Most students at both institutions were in their junior or senior year when they took the course and most were enrolled in a science major (Table 1). Most HINU students (84%) who took the course were enrolled in the Environmental Science major. Only two students from PU were enrolled in majors outside the College of Agriculture. Less than half of the students at

Table 1. Characteristics of Students Attending Sustainable Agriculture Course from 2010 to 2012

	Male students	Female students	All students	Students in a science major	Students from rural communities	Students from a reservation community	Juniors and seniors
				2010			
Haskell	4	5	9	8	4	3	7
Purdue	5	3	8	8	2	0	6
				2011			
Haskell	5	3	8	7	3	2	8
Purdue	2	3	5	4	3	0	5
				2012			
Haskell	1	7	8	7	0	2	6
Purdue	2	6	8	7	3	0	5
Cumulative	19	27	46	41	16	7	37

both institutions were from rural communities and less than a third of the HINU students were from reservation communities (Table 1). However, several HINU students indicated on their forms that they grew up in some combination of reservation and rural or urban/suburban communities. More female students than male students enrolled in the course at both universities (Table 1). Students were not asked to provide their age but we know from conversations with the students that PU students were 25 years old or less while the age of HINU students ranged from 20 to over 40. TCUs typically have older student populations than PWIs (Institute for Higher Education Policy, 2006).

Methods and Materials

The three-credit course entitled "Multicultural Perspectives on Sustainable Agriculture" was team-taught by four instructors (two from PU, one from HINU and one from CATIE) during spring semester in 2010, 2011 and 2012. Students received academic credit from and were graded solely by their home institution. The instructors' backgrounds included agroforestry, aquatic biology, entomology and weed science. Five main topics were covered during each semester: (1) perspectives on the sustainability of U.S. agriculture, (2) an indigenous perspective on land use and agriculture, (3) biodiversity and tropical ecosystems, (4) Costa Rica history and culture and (5) tropical crops. We specifically included indigenous perspectives on agriculture and land use to address concerns raised by Calhoon et al., (2003) that Native American students may view study abroad courses that do not include an indigenous perspective as culturally irrelevant.

The course was taught twice each week (each lecture was 75 minutes) using Adobe Connect, a web-based communication platform. Students and instructors attended a physical classroom at their respective institutions where each participant used a computer to join the online classroom. This allowed us to effectively link classrooms – students could see and interact directly with their instructor and other students at their institution - rather than just through computers. Although Adobe Connect supports the use of web cams to provide live video, faculty only used audio to deliver lectures, which typically consisted of a series of narrated slides. Video was not used due to concerns in the first year of the course about inadequate bandwidth at HINU. Participants typed questions and comments during the lectures into a "Chat" screen that was visible to all participants. Students also had microphones that could be enabled if they needed to have a more detailed discussion with the instructor about a concept or question. "Breakout rooms" were used to place students into sub-groups to discuss key topics during each lecture. At the end of these 5-minute chats, students would summarize their discussion and post it so the instructor or others could comment.

In addition to the synchronously taught classroom, students participated in two key activities: reciprocal campus visits and a project in which each student interviewed two to three adults about their perspectives on the sustainability of U.S. agriculture. Both activities were intended to increase student exposure to different backgrounds and cultures. During the reciprocal visits, which were typically three days (Friday to Sunday), students served as hosts and arranged campus tours and social activities in the evening. Visits to HINU typically included a tour of the Haskell-Baker wetlands and of the HINU Cultural Center and Museum, which contains a permanent exhibit documenting the progression of HINU from a boarding school designed to forcibly sever students from their cultures to a four-year university where Native culture is honored and incorporated into curricula. Visits to PU included a tour of PU's student farm, an overview of graduate science programs relating to agriculture and participation in the sampling of spring ephemeral plants as part of an ecology course taught by one of the instructors. Logistical problems prevented the HINU students from visiting PU in 2012. In 2010 and 2011, students presented their interviews on sustainability during the visit to PU. The students edited and presented their interviews as well as information on their own backgrounds and perspectives on sustainability to the class in 15 to 20 minute presentations. In 2012, the projects were presented during class with Adobe Connect. The students typically interviewed friends and family members, who varied substantially in age, gender, ethnicity, geographical location and profession. Thus the presentations served as both a mechanism for students to learn more about each other and to learn about multicultural perspectives on sustainability.

To assess student engagement and participation during lectures, we recorded each lecture and counted the number of responsive and non-responsive (social) comments posted by students during each lecture. We

defined responsive posts as those in which a student asked a question or posted a comment that was clearly in response to lecture material. Student engagement in online courses has been assessed both by counting postings (Blum, 1999; Ertmer and Stepich, 2004; Ryle and Cumming, 2007) and by considering the type and quality of posts (De Wever et al., 2006; McLoughlin and Mynard, 2009; Milman, 2009). We focused our analyses on the number and type of posts (responsive or non-responsive), which allowed us to objectively assess participation. We did not focus on assessing the quality or content of the posts because, although we have a record of student comments, we cannot correlate student posts to specific comments by faculty during the live lectures. Thus the content of posts cannot be evaluated within the full context of the student-faculty exchanges.

Mixed model analysis of variance was used to assess the effects of gender and institution on the number of responsive, social and total posts per students. Relatively few men enrolled in the course in 2012 (Table 1) so we combined data across years for our analyses. We were also interested in the degree to which participation by one group might affect participation by the other groups; for example, would the number of posts by HINU students be positively or negatively affected by the number of PU posts? Spearman correlation coefficients, which measure the strength of the association between two variables, were used to determine if posting by one group correlated with posting by other groups. Analyses were conducted with the SAS 9.1.1 software package (SAS Institute Inc., Cary, NC, USA). Students were asked at the beginning and end of each semester to rate their interest in a career in agriculture and their interest in learning more about agriculture on a scale from one to five where one indicated that a student had no interest and five indicated that a student was very interested. Students were also asked to anonymously provide written comments regarding their experience with the course, particularly the effectiveness of Adobe Connect for delivering content and stimulating class discussions and how they thought the course might be improved.

Results and Discussion

The average number of social and responsive posts per lecture ranged from 1.8 to 3.9 (Table 2). Gender and institution affected the number of posts. The HINU men posted more total and responsive comments than the students in the other three groups (Table 2). No differences were detected in responsive posting among the other three groups (Table 2). The PU women posted fewer social comments than the HINU men; no differences were detected among the remaining groups in social posting (Table 2). Students at both institutions posted less than one social comment per lecture (Table 2). Although 79% to 90% of all posts were in response to the lecture, this may underestimate the potential for social posting which can be distracting for students and faculty. We minimized social posting by monitoring comments during class and periodically reminding students to limit their posts to questions or comments about the lecture material. It is possible that social posting would have been more common in the absence of instructor interventions. Roschelle et al., (2000) suggested that engagement is a critical characteristic of an active learning environment. To the extent that posting reflects engagement, the class format appeared particularly effective at engaging HINU men.

Spearman correlation coefficients were positive for all comparisons (Table 3). This suggests that students responded to posted comments/questions by posting their own comments/questions, regardless of gender or institution. Most correlations were significant or highly significant (Table 3). However, the number of responsive posts by PU male students and HINU female students were not significantly correlated (Table 3). Similarly, the number of social posts by HINU male students and PU female students were not significantly correlated (Table 3). Many researchers believe that learning styles and student preference in content delivery and engagement in online discussion forums are affected by gender (Kolb et al., 2001; Kulturel-Konak et al., 2011). In our study, gender may have affected the strength but not the direction of interactions between HINU and PU students.

The course did not significantly increase student interest in a career in agriculture or in learning more about agriculture (Table 4). PU students were more interested in a career in agriculture than HINU students (Table 4); this is unsurprising since most of the PU students were enrolled in PU's College of Agriculture.

Table 2. Number of Posts Per Student, by Gender and Institution, During Lectures

	Male students		Female students	
	Haskell	Purdue	Haskell	Purdue
Responsive	3.29 (0.45)a	1.44 (0.26)b	1.89 (0.30)b	1.71 (0.29)b
Social	0.63 (0.17)a	0.31 (0.09)ab	0.49 (0.11)ab	0.19 (0.06)b
Total	3.92 (0.50)a	1.76 (0.30)b	2.38 (0.35)b	1.91 (0.32)b

[1]Data was combined across three semesters (2010, 2011, and 2012).
[2]Values are means; parentheses enclose standard error.
[3]Posts that directly relate to the lecture are characterized as responsive while posts that were not related to the lecture are characterized as social.
[4]Values followed by the same letter within a row did not differ significantly (P ≤ 0.05).

Table 3. Spearman Correlation Coefficients for Student Posts

	Haskell female	Purdue male	Purdue female
		Responsive posts	
Haskell male	0.32*	0.34*	0.45**
Haskell female		0.19	0.57**
Purdue male			0.39**
		Social posts	
Haskell male	0.58**	0.45**	0.10
Haskell female		0.47**	0.40**
Purdue male			0.41**
		Total posts	
Haskell male	0.39**	0.35*	0.42**
Haskell female		0.28	0.54**
Purdue male			0.40**

[1]Data was combined across three semesters (2010, 2011, and 2012).
[2]Larger values indicate greater correlation between variables; the sign of the Spearman correlation indicates the direction of association (positive or negative).
[3]A single asterisk indicates significance at P≤0.05; two asterisks indicate significance at P≤0.01.

Table 4. Student Interest in Agriculture and Working in Multicultural Groups Measured at the Beginning (Pre) and End (Post) of Each Semester

	Male students		Female students	
	Haskell	Purdue	Haskell	Purdue
	Interest in a career in agriculture[1]			
Pre	2.0 (0.5) a	3.6 (0.4) a	2.5 (0.3) a	3.7 (0.6) a
Post	3.0 (0.7) a	4.1 (0.5) a	2.9 (0.4) a	3.8 (0.3) a
	Interest in learning more about agriculture[1]			
Pre	3.0 (0.6) a	3.3 (0.3) a	3.1 (0.4) a	3.0 (0.5) a
Post	3.8 (0.4) a	3.7 (0.3) a	3.6 (0.3) a	3.7 (0.4) a
	Interest in working in multicultural groups[1]			
Pre	3.5 (0.5) b	3.6 (0.4) a	4.3 (0.3) a	3.8 (0.3) a
Post	4.8 (0.2) a	3.7 (0.2) a	4.1 (0.4) a	4.1 (0.3) a

[1]Data was combined across three semesters (2010, 2011, and 2012).

[2]Students were asked to rate their interest in a topic from 1 to 5 where 1 indicated that the student was not interested and 5 indicated that the student was very interested.

[3]Values are means; parentheses enclose standard errors.

[4]Within a column, means followed by the same letter were not significantly different (P≤0.05).

Students at both institutions were in their junior or senior year so it is perhaps also unsurprising that their career goals were not altered by a single course. Interest in working in multicultural groups was relatively high at the start of the semester regardless of institution (Table 4). The course did not affect the interest of PU students or HINU female students in working in multicultural groups. However, the interest of male HINU students in working in multicultural groups increased from 3.5 to 4.8 (Table 4). This provides additional support to the idea that the course particularly engaged Native American males.

Based on their written comments and personal communications with the instructors, the students were generally satisfied with the use of Adobe Connect to deliver the synchronous lectures. Students particularly liked the chat feature and the ability to work in breakout groups during class Comments included *"the chat feature was a nice way to allow us to ask questions without completely interrupting the lecture"* and *"it seemed less like a lecture and more interactive since we could type our input."* Students wrote that the *"breakout sessions were a good way to get two separate classes in two separate states to interact"* and *"probably the most effective way possible to carry on course communication between the two classes."* A common criticism, however, was that class was "delayed too often." In order to start class on time, the instructors and students needed to log into Adobe Connect five to ten minutes before the start of class which was not always possible.

Although students had opportunities to interact during the lectures, students emphasized the importance of the reciprocal visits in their written comments and in conversations with the instructors. Students wrote *"the visits to the opposite campus were essential for the course. Interacting online is not enough for students at both campuses to be able to get to know each other"* and *"it was really cool to have the students come to HINU, especially during our pow-wow."* One student even considered the visits to be "the main benefits of the course." The visits seemed particularly powerful for the PU students because many of them did not know the history of boarding schools in the U.S. The interview projects, which required students to provide background on where they grew up, were intended in part to provide students with an opportunity to learn more about each other prior to the study abroad course. However, the projects were due near the end of the semester and several students suggested that they would have been more useful near the start of the semester. For example, one student suggested that *"everyone could post a short video in the beginning of the semester just telling some facts about themselves so we could get to know each other earlier in the semester."*

The course presented a number of logistical challenges, primarily related to calendar differences between the universities. Semesters at HINU and PU start and stop on different dates; in some years, PU students started and finished a full week before HINU. Similarly, HINU and PU differ in when they offer their spring breaks. HINU is administered by the Bureau of Indian Education and observes several Federal holidays that were not observed by PU. Cumulatively, these differences resulted in several days where classes were either canceled or each institution met separately. Teaching the course with Adobe Connect required instructors to monitor the chat function as they lectured in order to respond in a timely manner. However, in some cases, the other instructors or students would address a question or comment before the lecturer could respond. Although encouraged to post their questions so that entire class could see, students would occasionally ask and have their questions answered orally by their local instructor. Thus the number of posts may underestimate student engagement.

MSIs are experts at educating underrepresented and low-income students and play a critical role in graduating students of color in the U.S. (Harmon, 2012). MSIs like HINU actively incorporate the cultural traditions of underrepresented students into their curricula and provide relatively inexpensive learning environments for students to explore and further develop their identities. For these reasons and others, minority students may prefer MSIs even if greater resources are available at PWIs (Li, 2007; Provasnik and Shafer, 2004). However, students at MSIs may have access to fewer resources and a less diverse curriculum than students at PWIs. Broadening the curriculum at MSIs, particularly with courses related to agriculture, could expose more students to opportunities in agriculture and increase the number of underrepresented students seeking agricultural degrees at the undergraduate and graduate level. This broadening of the curriculum may also motivate indigenous students to pursue STEM careers as they gain a greater understanding of the significance of certain kinds of scientific and technical knowledge to their communities. Opportunities to engage students at tribal colleges that offer two-year degrees might prove particularly beneficial since 56% of two-year tribal college graduates go on to four-year institutions (Gasman et al., 2008).

Summary

Online courses that bring together students from MSIs and PWIs have the potential to increase course offerings and provide multicultural experiences for students at both institutions. Our experience suggests that it is possible to engage students from culturally diverse institutions in a synchronously taught agricultural course using distance-learning technology.

Literature Cited

Angeli, C., N. Valanides and C.J. Bonk. 2003. Communicating in a web-based conferencing system: The quality of computer mediated interaction. British Journal of Educational Technology 34: 31-43.

Association of Public and Land-Grant Universities. 2009. Human capacity development: The road to global competitiveness and leadership in food, agriculture, natural resources and related sciences. Washington, D.C: Association of Public and Land-Grant Universities.

Bernard, R.M., P.C. Abrami, Y. Lou, E. Borokhovski, A. Wade, L. Wozney and B.Huang. 2004. How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. Review of Educational Research 74(3): 379-439.

Blum, K. D. 1999. Gender differences in asynchronous learning in higher education: Learning styles, participation barriers and communication patterns. Journal of Asynchronous Learning Networks 3(1): 46-66.

Calhoon, J.A., D. Wildcat, C. Annett, R. Pierotti and W. Griswold. 2003. Creating meaningful study abroad programs for American Indian postsecondary students. Journal of American Indian Education 42(1): 46-57.

Dessoff, A. 2006. Who's not going abroad? International Educator 15(2): 20-27.

De Wever, B., T. Schellens, M. Valcke and H. Van Keer. 2006. Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review. Computers & Education 46(1): 6-28.

Ertmer, P. and D. Stepich. 2004. Examining the relationship between higher-order learning and students' perceived sense of community in an online learning environment. In: Proc. 10th Australian World Wide Web conference, Gold Coast, Australia, 3-7 July.

Frick, M.J., D. Bambauer and T. Bruening. 2004. Institutional development in international agriculture: A collaborative approach by 1862 and 1994 land grants. NACTA Journal March 2004.

Gasman, M., B. Baez and C.S.V. Turner. 2008. Understanding minority-serving institutions: SUNY Press.

Gibson, K.D., T.J. Benjamin, C.Y. Oseto and M.M. Adams. 2012. A short-term study abroad course in Costa Rica. NACTA Journal March.

Harmon, N. 2012. The role of minority-serving institutions in national college completion goals. Institute for Higher Education Policy (IHIEP), Washington, DC.

Institute for Higher Education Policy. 2006. Championing success: A report on the progress of tribal colleges and university alumn. In American Indian Fund (Ed.).

Institute of International Education. 2012. Profile of U.S. Study abroad students, 2000/01-2010/11 Open Doors Report on International Educational Exchange: Institute of International Education.

Kolb, D.A., R.E. Boyatzis and C. Mainemelis. 2001. Experiential learning theory: Previous research and new directions. In R.J. Sternberg and L. Zhang (Eds.), Perspectives on thinking, learning and congitive styles. The educational psychology series. Mahway, NJ: Lawrence Erlbaum Associates, Inc.

Kulturel-Konak, S., M.L. D'Allegro and S. Dickinson. 2011. Review of gender differences in learning styles: Suggestions for stem education. Contemporary Issues in Education Research (CIER) 4(3): 9-18.

Li, X. 2007. Characteristics of minority-serving institutions and minority undergraduates enrolled in these institutions. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Mauve, M., N. Scheele and W. Geyer. 2001. Enhancing synchronous distance education with pervasive devices. Informatik 2: 1117-1122.

Means, B., Y. Toyama, R. Murphy, M. Bakia and K. Jones. 2010. Evaluation of evidence-based learning: A meta-analysis and review of online learning studies. U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service. Washington, DC. Retrieved June 10, 2013 from www.ed.gov/about/offices/list/opepd/ppss/reports.html.

McLoughlin, D., and J. Mynard. 2009. An analysis of higher order thinking in online discussions. Innovations in Education and Teaching International 46(2): 147-160.

Milman, N.B. 2009. Crafting the "right" online discussion questions using the revised bloom's taxonomy as a framework. Distance Learning 6(4): 61-64.

Muilenburg, L.Y. and Z.L. Berge. 2005. Student barriers to online learning: A factor analytic study. Distance Education 26(1): 29-48.

National Research Council. 2009. Transforming agricultural education for a changing world. National Academies Press, Washington, DC.

Perdreau, C. 2002. Study abroad: A 21st century perspective: Building diversity into education abroad programs. Retrieved December 2, 2010 from http://www.aifs.org/aifsfoundation/perdreau.htm

Provasnik, S. and L.L. Shafer. 2004. Historically black colleges and universities, 1976 to 2001. Washington, DC: US Department of Education, National Center for Education Statistics.

Roschelle, J.M., R.D. Pea, C.M. Hoadley, D.N. Gordin and B.M. Means. 2000. Changing how and what children learn in school with computer-based technologies. The Future of Children 10(2): 76-101.

Ryle, A. and K. Cumming. 2007. Reflections on engagement in online learning communities. International Journal of Pedagogies and Learning 3(3): 35-46.

The National Academies. 2011. Minority participation: America's science and technology talent at the crossroads. National Academies Press, Washington, DC. Retrieved from http://www.nap.edu/catalog.php?record_id=12984.

United States Census Bureau. 2012. National population projections. Retrieved from http://www.census.gov/population/projections/data/national/2012.html.

Teaching Agribusiness Export Plans via International Video Teleconference – Perceptions, Problems and Pointers[1]

S. Kumarappan[2] and K. Hostetler[3]
Ohio State ATI
Wooster, OH

S. Angles[4]
Tamil Nadu Agricultural University
Coimbatore, TN, India

Abstract

The authors offered an international agribusiness course enrolling five students in Ohio State University ATI and nine students in Tamil Nadu Agricultural University (India). The students interacted synchronously via video teleconference to create export plans for agricultural products. This paper summarizes their feedback and suggestions. The implications of using video teleconferencing to help students derive their own export plans are discussed within the Technology, Pedagogy and Content Knowledge (TPACK) framework. The students rated the video teleconference interactions better than traditional methods of lecture based instruction. Their reasons included superior interaction, the ability to create more realistic business plans in consultation with foreign peers and the opportunity to learn non-content skills such as trust and cooperation in the international context. The difficulties for students arose from establishing the value proposition in an international context, the challenges in sifting through enormous international information, recognizing the cultural differences and the technical and connectivity issues in organizing teleconferencing sessions. The article also includes suggestions from the instructors' perspectives on effective use of video teleconferencing in international agribusiness courses.

Introduction

Globalization has created new business opportunities, diversified the consumer base and improved the supply chain prospects for novel and ethnic products (Malloy et al., 2012; Radhakrishna et al., 1994). Many U.S. colleges, including community colleges, have started to teach the global business concepts (Beamish and Calof, 1989; Cardon and Marshall, 2010; Coers et al., 2012). A survey of community colleges offering international business courses found that the interest in offering international courses had tripled between 2010 and 2012 (Hult and Motz, 2012). The aim of these courses is to teach the business value propositions in an international context and help students customize those values for foreign customers. In the case of agricultural products, the focus expands to include the seasonality of farm supplies, perishability and sanitary and phyto-sanitary quarantine requirements.

Typically, the instructors design the course materials to teach international business aspects derived from textbooks, online resources and video supplementary materials (Cardon and Marshall, 2010; Coers et al., 2012; Sharon et al., 2012). The instructors often treat the student derived export plans as a classroom exercise rather than an integral activity of the course itself.

We developed an alternative approach to treating the role of student derived export plans in the course. This paper describes such a pedagogical strategy where five students from the Ohio State University ATI (ATI) interacted with nine students in Tamil Nadu Agricultural University (TNAU) via video teleconference. The students derived their plans in consultation with foreign peers and faculty giving it credibility and an opportunity to learn non-content skills such as trust, cooperation, cultural sensitivity and leadership skills. The video teleconferences played a critical role to help students consult, communicate, collaborate and create their international business content which fits well with the Technological, Pedagogical and Content Knowledge framework (TPACK, Koehler and Mishra, 2009).

[1]This study was deemed exempt by the Ohio State University Institutional Review Board. The authors thank The Ohio State University, Office of International Affairs and Ms. Ruth Sesco in OSU Libraries and Dr. Chinnadurai in Tamil Nadu Agricultural University for guidance and support.

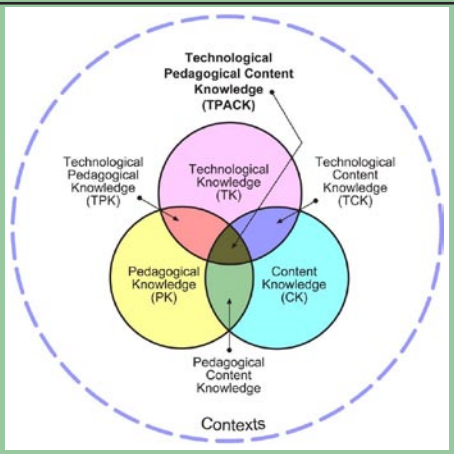
[2]Division of Arts, Sciences and Business; +1-330-287-1261; kumarappan.1@osu.edu

[3]Division of Arts, Sciences and Business; +1-330-287-1256; hostetler.78@osu.edu

[4]Department of Agricultural Economics; +91- 98949-08458; sangles@rediffmail.com

TPACK Framework and Course Design: The TPACK framework evolved from the earlier version of the same framework known as Pedagogical and Content Knowledge (PCK, Magnusson et al., 1999). The TPACK framework suggests that students' overall understanding arise from three distinct domains: technological, pedagogical and underlying content. With the widespread use of technology in today's classroom teaching, the use of TPACK framework would be more relevant in the context of our international agribusiness course.

Figure 1: Technological Pedagogical Content Knowledge Framework



Source: Koehler and Mishra (2009)

The confluence of technological, pedagogical and content domains in our course is as follow:

1. **Content domain**: We differentiated the course content into three sub-components:
   - Content delivered by the instructors: the international business concepts, lesson plans and discussions led by the instructors;
   - Content derived by the students: the export plans developed through student peer interactions in the foreign country; and
   - Non-content content: the cultural awareness, sensitivity and the level of trust that students could establish through the video teleconferencing.
2. **Pedagogical domain**: We used students' export plans to introduce key international agribusiness concepts to the students. The classroom content and discussion focused on the issues for the products selected for exporting.
3. **Technological domain**: The video teleconferencing modules and screen-share opportunities enabled students to interact with faculty and peers in the foreign country.

Objectives

The objectives of this paper are to -

- Explain the scope, roles and limitations of interactive video teleconference modules in an international agribusiness course
- Evaluate the student interest and preferences in adopting video teleconferencing to create export plans
- Develop guidelines in using video teleconferencing for agribusiness courses

Effectiveness of Video Teleconferencing

The video teleconferencing, virtual classrooms and other web-based instruction methods have become more accessible, inexpensive and integral to today's classrooms (Herrington et al., 2004; Cook and Dupras, 2004; Andone and Frydenberg, 2011; Khan, 1997; Myers and Huegler, 2011; Bostock, 1997; Meyers and Jones, 1993; Johnson and Stucke, 2011). There is a growing body of evidence that web-based conferencing has similar pedagogical effectiveness of face-to-face interaction (Garrett, 2011). Ferry et al. (2012) and Munkvold et al. (2011) recognize even larger benefits of cross-cultural video conferencing as an opportunity to create 'global graduates for a global workplace'. Gloor et al. (2011) stressed the importance of inter-cultural interaction resulting from the efforts of instructors as a key non-content outcome of video teleconference sessions.

The extant literature also recognize some common problems in using video teleconferencing such as the time zone differences that affect synchronous teleconference sessions and inability to engage student with remote log-in (Munkvold et al., 2011). The institutional differences – where the same course is treated differently by various institutions – tend to deter the offering of global courses. Other factors that impact international delivery of courses include the software platform for video teleconferencing, the amount of flexibility in learning and doing work assignments and the efforts of instructors (Arbaugh, 2000).

Research Gap: The literature shows the growing opportunities and challenges with using teleconferences to teach international concepts. But the opportunity to create and use student-derived content in international agribusiness courses has not been fully explored. We focus on the extent and possibility of using student derived content (through video teleconferences) in the delivery of an international agribusiness course.

Methods

Course Structure and Video Teleconference: The Ohio State University ATI (ATI) piloted an international agribusiness course in spring 2012 (10-week quarter). To provide a realistic learning experience, five ATI (undergraduate) students were partnered in teams with nine graduate students in Tamil Nadu Agricultural University (TNAU), India. There were three teams of students each comprising one or two ATI students and two or three TNAU students. The number of students was purposefully capped at a lower number in this pilot offering. The course blended daily classroom lectures with weekly interactive video teleconference. In the U.S., the class met four times per week to discuss introductory international business concepts and to prepare for the international collaboration session. In India, the students

met once a week in preparation for the international collaboration session. The video teleconference session was held each week, for nine continuous weeks. The teams congregated in one room in each location and both classrooms were connected using Adobe Connect software. The instructors in both locations guided the students by providing an agenda for the teleconference, support materials and research assistance for export planning and customized templates and airtime for each team to interact via video teleconference. (The Export Business Planner for Your Small Business published by the U.S. Small Business Administration was provided to the students to guide their thinking through the creation of their own import/export plan. Additional materials such as product specific market reports, U.S. and India trade statistics and video links providing real life examples from those participating in international trade were also provided.) The teleconference sessions also included invited guest speakers from the U.S. who discussed the global marketing and international business law issues.

Student-Driven-Content: The students developed export plans for three agricultural products: (i) export of soybean oil from the U.S. to India, (ii) export of mangoes from India to the U.S. and (iii) export of a natural, health supplement (moringa powder) from India to the U.S. The student teams mimicked actual international business partnerships. For soybean oil exported from the U.S., the U.S. team focused on the export regulations in the U.S. while the Indian team focused on the import aspects in India. The students contacted international agribusiness companies in India and the U.S. to understand the supply chains and value propositions for their agricultural product. The students also focused on the sanitary and phyto-sanitary requirements, food labeling rules and regulations and tariff restrictions in the context of U.S. – India trade for their product. The 'non-content' materials such as the level of trust, extent of cooperation, international networking and negotiation skills were regularly highlighted during the classroom discussions.

Data: The data for this research was collected through exit surveys. The survey focused on the student perceptions on the video teleconferencing technology and how much they learned from deriving their own export plans. The unstructured qualitative interviews of students also contributed to the results discussed below.

Results and Discussion

The results are arranged under three headings: (A) student perceptions of the course, (B) key problems that affected student learning and (C) pointers for designing similar international agribusiness courses with video teleconferencing.

A. Student Perceptions

The students expressed an increased level of interest in the international business concepts upon completing the course and video teleconference modules. The ATI undergraduate students reported that their interest in the international business concepts rose from 6.8 to 8.3, on a scale of 1 to 10 (10 being the highest, table 1). The TNAU graduate students also reported an increase from a score of 6.4 at the beginning of the term to 7.6 by the end of the term. In spite of the small number of students enrolled in the course, the students were almost unanimous in approving the effectiveness of the course as evidenced in their comments for the open ended questions.

Table 1. Student interest in the international business concepts before and after the course (10 = high interest; n=12).

	Before the Course	After the Course
Students from OSU-ATI (n=4)*	6.8	8.3
Students from TNAU, India (n=8)	6.4	7.6

*One of the student responses is not reported due to being an outlier within the dataset.

Almost the whole class (11 out of 13 students) reported high or very high interest in learning international business concepts upon completing the interactive teleconferencing modules. The students also expressed confidence in improved ability to research and establish international value proposition independently. The students gave an average score of 4.2 to 4.5 (out of 5) for the industry, product and country research reports that enabled them to collect market information in the foreign country. These scores were higher than that for traditional resources such as classroom lectures 3.9; textbook 3.7; in-class videos 3.8 (out of 5). The student responses showed higher satisfaction with the online interaction via video teleconferencing. The interactive collaboration was scored at 4.7, one of the highest scores among all the resources used in the class providing evidence that students preferred to learn through interactive collaboration.

Table 2. Student responses to video teleconferencing modules (n=12).

Question	Average Score
Challenged me to think on my own	4.0
Improved my ability to research a topic and find information on my own	4.3
Got me interested in international business issues	4.5

Among the modes for international collaboration, the Adobe Connect video teleconferencing software ranked better at 4.3 out of 5 than the other modes of communication (Skype software scored at 3.0; telephone conversation at 3.4). The stability of the software platform, continued use of the software throughout the term and the ability to share student work synchronously resulted in a higher score. Many students emphasized the clarity of audio visuals as a key factor affecting their interest in the international business course.

The students also responded positively for the technology-content-pedagogical (TPACK) aspects built into the course. The average score for these three components was 4 or more on the Likert scale (table 3). The students specifically mentioned that they were more likely to adopt such video teleconferencing technologies

Table 3. Student responses to Technology, Pedagogy, and Content Knowledge (TPACK) built into the international agribusiness course (n=12).

Question	Average Score
Technology	
Benefited from the use of video teleconferencing in the course	4.7
Will use technology in my future career	4.8
Content	
Learned international business concepts	4.5
Will be interested in creating my own international business idea and plan	4.3
Pedagogy	
Benefited from interacting with faculty and students in the other country	4.6
Will conduct research as part of my future career endeavors	4.4

in their future careers. The open-ended responses showed satisfaction with the opportunity to interact with foreign peers and create their own content (export plans).

Learning from Student Derived Content: In the process of creating the export plans, the students learned how drastically different were the value propositions and profit potential between the domestic and foreign markets. The students acknowledged the importance of conducting market research at the end of the teleconference sessions. The graduate students from TNAU were able to conduct consumer surveys in India on short notice. Such an active involvement of Indian students taught ATI undergraduate students how to collect and interpret data in the context of international agribusiness.

For the question 'did this course fulfill your expectations?' seven students responded that they gained a better insight into the international business concepts; one student felt that there was not enough interaction (especially with the retail customers). The remaining students were neutral in the beginning of the course – not knowing what to expect – but felt that they had gained a better understanding of international businesses. Some students commented on the difficulty to learn and process a lot of business information within a short period of time. All student responses affirmed that the international business courses should include an interactive component such as video teleconferencing. The student comments also suggested that they gained certain key non-content skills: ways to sort through information on various websites, ability to interact with partners in a different country and having developed an entrepreneurial mindset.

B. Problems Encountered by Students

A few students felt that the amount of work needed to develop a business plan was substantially high. The process of sifting through a lot of information online before presenting it to foreign partners was perceived to be time consuming and overwhelming at times. The students expressed a need to have a specific business model that would work for their product such as the business model canvas (Osterwalder and Pigneur, 2010). The students learning the international agribusiness concepts for the first time would be greatly benefited if the instructors helped them identify who their partners could be and what activities would have to be implemented.

The ATI undergraduate students relied largely on the secondary data collection through industry reports; but the focus of TNAU students was on conducting primary research through consumer surveys – such differences created some frustration for the students. Another problem was the English accent of the foreign students. The instructors had to repeat and rephrase sentences to ensure that all students understood the discussion. The inconvenient timing of video interaction, early mornings in the U.S. and evenings in India and the significant set up time of teleconferencing equipment seemed to bother some students.

C. Problems Encountered by Instructors

1. Unexpected Divergence in Course Instruction: The course was intended to be offered with the same focus in both U.S. and Indian locations. But as the course evolved and students took responsibility for their export plans, the focus of the courses in the two locations diverged to accommodate the local student needs. ATI instructors focused more on teaching the global opportunities, challenges and identifying the entrepreneurial opportunities behind the global supply chains. The TNAU participants focused more on researching the customers, developing and collecting primary data through survey questionnaires. These approaches also turned out to be complementary to some extent.

2. Lack of Discussion Templates: A single standard template was given to the students to record the details pertaining to their product during the teleconference sessions. Each product (soybean oil, mangoes and moringa health supplement) had its own regulations and requirements causing difficulties for the students in recording information. One possible solution could be to provide those templates in the format of Guided Notes with modifications for each team (Haydon et al., 2011; Musti-Rao et al., 2008). But creation of such customized templates for each team would require significant time commitment from the instructors.

3. Importing a Novel Product: Many students were not familiar with the chosen products. This led to some anxiety among student teams in establishing the value propositions at the global versus domestic level.

4. Technology Issues: Student comments showed that technology and equipment problems affected their ability to focus and participate during the teleconference sessions. Allowing ample time to set up the equipment before the start of class can help avoid this problem.

5. Time Commitment: The instructors (both in the U.S. and India) had to commit significant amounts of time to develop the discussion material for each video teleconference session. As the course evolved, we had to constantly revise our teaching plans and technology use to suit the student needs.

6. Assumptions vs. Actual Data: The students were forced to assume certain international transport cost data and other product characteristics. The simplification of data and the lack of actual information forced us to shift the focus from the export plans to the planning process.

7. Too Many Teams: The two hours of teleconference per week was not sufficient to discuss three different export plans. On a couple of occasions, one team used most of the airtime during the teleconference session leaving other teams frustrated. By the end of the term, we realized that just two teams would have been sufficient: one team exporting from India to the U.S. and the other team exporting from the U.S. to India.

8. Complexities and Repetition: If the materials are very different between lectures and teleconference sessions, some students dissociated lectures from teleconference sessions and treated them as independent of each other. If the materials are similar, some students complained about repetition. The instructors need to develop a judicious mix of topics and how that content is paced within the course to retain student interest.

D. Pointers for Future Video Teleconference Modules

1. Additional Interaction between Foreign Faculty and Domestic Students: The emphasis was on student interaction in our teleconference modules. All students were present during all teleconference sessions. Instead, it would have been useful to have exclusive interaction of the instructors with the students in the foreign location prior to having all students present. This would give the instructors an opportunity to build rapport with students in the foreign country.

2. Need for Leaders (faculty and students): The success of the teleconference modules heavily depend on the faculty or students who can guide the plan development and control the teleconference sessions. Given the highly intensive nature of video teleconferencing modules, faculty leaders need to lead and motivate the student teams. The number of students in each team has to be carefully decided upon; in the pilot offering of this course, we had limited the enrollment to a smaller number to ensure that sufficient attention for each student. Even though, the results discussed here come from a single class of students, the authors strongly believe that similar positive responses can be repeated in larger classes as well. The larger classes can provide the students with more opportunities to interact, lead and learn from each other.

3. Active Guidance for Student Teams: The faculty members need to take an active role in helping students establish the value propositions at domestic vs. global level. Students needed clear instructions on what pieces of business information to record and share via video teleconference. The lecture sessions proved vital to the planning and preparation for teleconference sessions. The resources such as Export Business Plans (supplied by U.S. Small Business Administration) can be useful for export planning purposes.

4. Meeting the Expectations: Since we had placed significant emphasis on student derived content (export plans), it became necessary to provide detailed and concrete steps on what components need to be included in a valid export plan. For instance, we required the students to prepare a cost-benefit analysis of sourcing the product locally vs. internationally and the opportunities to market it to the consumers in the other country. Some activities were easier for the teams to adhere to while some were considered to be difficult due to the lack of reliable information or information overload. Having an alternative plan would help to guide students through the planning process.

5. Synchronous Collaboration: We found that the students learned more when they were able to share, discuss and edit MS-Word, MS-Excel documents and view websites simultaneously. The cloud or internet based resources (for example, Google Docs) or a learning management system that is accessible for all students (for example, Moodle) can be useful for such collaborative interaction. It would be beneficial to provide a summary (by the instructor) or view a short video at the start of each teleconference session to ensure that all students have the necessary background information.

6. Data Sources: Whenever the data derived from student peers was more realistic, the teams' interest and participation improved due to the additional confidence that they are dealing with real world information. Hence, reliable secondary databases or primary survey research can be added to improve the student interest.

7. Pre- and Post-teleconference Activity: Some students expressed their desire to finish the sessions with a summary quiz to review and summarize the teleconference discussion. The problem with quizzes after teleconference sessions is that much of the content derived during the teleconference does not exist prior to the student interaction. In such cases, the instructors have to be creative with some open-ended summary questions to help students summarize their learning from the teleconference sessions.

Summary

There is a growing need for agribusiness students to learn the emerging global opportunities in agriculture and obtain practice in international business planning using a hands-on approach. To meet this objective, the authors used video teleconference modules in an international agribusiness course. The students in the U.S. (Ohio State ATI) and India (TNAU) interacted via video teleconference to develop export plans for three products: mangoes, moringa health supplement and soybean oil. At the conclusion of the course, student feedback was gathered through exit surveys. The course and exit surveys were designed according to the Technological, Pedagogical and Content Knowledge (TPACK) framework. The primary focus of this study is to focus on the student derived content (export plans).

Perceptions: The students showed increased interest in international agribusiness concepts with the use of video teleconferencing technology. The student ranked video teleconferencing technologies highly among all the resources, followed by market research databases. The student comments suggested that collaborative export plans enabled them to appreciate the differences and difficulties in the context of a foreign market. The interactivity of video teleconferencing was preferred to watching videos about international business planning. The students frequently mentioned that they recognized the importance of non-content aspects (cultural, language and trust issues) in the international business context.

Problems: Some issues stemmed from the institutional differences in terms of focus and scope of the course. In our case, the U.S. students were interested in entrepreneurial aspects while the Indian students were more interested in primary data collection to validate the business opportunity. Establishing value propositions for a foreign consumer market and identifying reliable information sources proved to be challenging for almost all student teams. In our course, much of the course content was derived by the students through video teleconferencing. It was harder to anticipate and control the quality of student output and interaction; this eventually led to a shift in pedagogical focus from the export 'plans' to the 'planning process.' Even though the class size was small, it was difficult at times to cover all import-export aspects for three different products. The smaller class size hindered us to draw much broader conclusions about the use of video teleconferencing.

Pointers: Some suggestions to incorporate video teleconference modules include: (i) promoting active interaction of foreign faculty and domestic students before enabling student team interactions, (ii) identifying student leaders to lead teleconference discussions, (iii) guiding student teams actively by helping them differentiate domestic vs. foreign value propositions, (iv) promoting interaction among student teams through cloud based resources, (v) providing reliable secondary data sources to create valid export plans and (vi) ensuring student learning with assessments before and after each teleconference session. Overall, we feel that the use of video teleconference was rewarding for both the students and instructors in discussing the international agribusiness concepts.

Literature Cited:

Andone, D. and M. Frydenberg. 2011. Across Continents: Using Web Based Collaboration Tools for Learning. 11th IEEE International Conference on Advanced Learning Technologies, IEEE pp. 100-102.

Arbaugh, J.B. 2000. Virtual classroom characteristics and student satisfaction with internet-based MBA courses. Jour. of Management Education 24(1):32-54.

Beamish, P. and J. Calof. 1989. International business education: A corporate view. Jour. of International Business Studies 20(3):553-564.

Bostock, S.J. 1997. Designing Web-based instruction for active learning. In: Khan. B.H. (eds). Web-based instruction. Englewood Cliffs, NJ: Educational Technology Pub. Inc.

Cardon, P.W. and B. Marshall. 2010. International opportunities for business students. National Business Education Yearbook. http://bryanmarshall.com/research/2010_Cardon_Marshall_International_Opportunities_NBEA.pdf

Coers, N., M.T. Rodriguez, T.G. Roberts, H.C. Emerson and R.K. Barrick. 2012. Examining the student impacts of three international capstone experiences. NACTA Jour. 56(2):55-62.

Cook, D.A. and D.M. Dupras. 2004. A practical guide to developing effective web-based learning. Jour. of General Internal Medicine 19(6):698-707.

Ferry, D.L., C.T. Kydd and C. Boyles. 2012. Creating the global graduate: A cross-cultural videoconferencing case study. Decision Sciences Jour. of Innovative Education 10(2):139-164.

Garrett, N.A. 2011. A preliminary comparison of synchronous venues for distance learning: traditional videoconferencing vs. web-based conferencing. International Jour. of Mobile Learning and Organisation 5(2):159-174.

Gloor, P., M. Paasivaara, C. Lassenius, D. Schoder, K. Fischbach and C. Miller. 2011. Teaching a global project course: experiences and lessons learned. In: Proceedings of the 2011 Community Building Workshop on Collaborative Teaching of Globally Distributed Software Development. Honolulu, HI. 23 May.

Haydon, T., G.R. Mancil, S.D. Kroeger, J. McLeskey and W.J. Lin. 2011. A review of the effectiveness of guided notes for students who struggle learning academic content. Preventing School Failure: Alternative Education for Children and Youth 55(4):226-231.

Herrington, J., T.C. Reeves, R. Oliver and Y. Woo. 2004. Designing authentic activities in web-based courses. Jour. of Computing in Higher Education 16(1):3-29.

Hult, T. and W. Motz. 2012. Benchmarking Study on International Business Education at Community Colleges. MSU Broad School of Business - International Business Center (CIBER): http://global.broad.msu.edu/ibc/publications/research/pdfs/ibex2012.pdf

Johnson, R.D. and C.H. Stucke. 2011. Developing And Delivering The Virtual MBA Course. International Business & Economics Research Jour. 4(3):63-68.

Khan, B.H.(ed.). 1997. Web-based instruction. Englewood Cliffs, NJ: Educational Technology Pub. Inc.

Koehler, M. and P. Mishra. 2009. What is technological pedagogical content knowledge (TPACK)? Contemporary Issues in Technology and Teacher Education. 9(1):60-70.

Magnusson, S., J. Krajcik and H. Borko. 1999. Nature, sources and development of pedagogical content knowledge for science teaching. In: Gess-New-

some, J. and N.G. Lederman (eds.). Examining pedagogical content knowledge: The construct and its implications for science education. Dordrecht, The Netherlands: Kluwe Academic Pub.

Malloy, M.N. and A.J. Davis. 2012. The University of Georgia Avian Biology Study Abroad Program in Costa Rica. NACTA Jour. 56(3):24-29.

Meyers, C. and T.B. Jones. 1993. Promoting Active Learning. Strategies for the College Classroom. San Francisco, CA: Jossey-Bass Inc. Pub.

Munkvold, B.E., D. Khazanchi and I. Zigurs. 2011. Augmenting Online Learning with Real-Time Conferencing: Experiences from an International Course. In: NOKOBIT 2011. Universitetet i Tromso, Norway: 21-23 Nov.

Musti-Rao, S., S.D. Kroeger and K. Schumacher-Dyke. 2008. Using guided notes and response cards at the postsecondary level. Teacher Education and Special Education: The Jour. of the Teacher Education Division of the Council for Exceptional Children 31(3):149-163.

Myers, C.J. and P.A. Huegler. 2011. The Effects of Virtual Groups on Learning Outcomes in an ITV Delivered International Business Course. In: Van den Bossche, P., W.H. Gijselaers, R.G. Milter (eds.). Building learning experiences in a changing world. 3(1):165-193.

Osterwalder, A. and Y. Pigneur. 2010. Business model generation–a handbook for visionaires, game changers and challengers. Hoboken, NJ: John Wiley & Sons Inc.

Radhakrishna, R.B. and T.H. Bruening. 1994. Pennsylvania study: Employee and student perceptions of skills and experiences needed for careers in agribusiness. NACTA Jour. 38(1):15-18.

Sharon, W. and P. Susan, 2012, Open Doors 2012: International Student Enrollment Increased by 6 Percent. Institute of International Education. http://www.iie.org/Who-We-Are/News-and-Events/Press-Center/Press-Releases/2012/11-13-2012-Open-Doors-International-Students.

Resistance to Integrating Management and Economics Courses Across the Natural Resources and Agricultural Curricula

James M. Simons[1], Thomas J. Straka[2], Lawrence R. Gering[3] and Robert F. Polomski[4]
Clemson University
Clemson, SC

Abstract

Many natural resource, forestry, environmental and agricultural curricula at U.S. universities and colleges include a sequence of courses in economic, managerial and policy, foundations. These curricula share a commonality in the development of a microeconomic/managerial economic foundation for decision making, with a natural resources emphasis. Many of the courses in these curricula are presented in a linear or sequential format and are only partially integrated, while a few university programs have integrated much of the coursework, with economic, managerial and policy foundations being included throughout many courses. We investigated successful forest management curricula used in accredited programs in terms of courses used as the economic foundation, level and methods of integration of management/economics/policy into all course work in the major, specific non-integrated management/economics courses required in the junior/senior years and logistical tools used to accomplish the integration. A comparison to the curricula currently used by programs in forestry, environmental and natural resources, horticulture and other majors at Clemson University, a typical land-grant university, was conducted. Our goal was to develop a set of economics-based integrated courses, with the intention of increasing curricula efficiency by reducing credit hours in curriculum and duplication in courses. Clemson's forestry program was specifically addressed. We describe integration opportunities within the forestry curriculum and a process to actually implement varying levels of integration until the faculty feels comfortable with the new curriculum.

Introduction

Forestry, natural resources and agricultural education have undergone major changes over the last few decades. Curricula in these areas share a common need for a foundation in economics, management and policy. We will use the forestry curriculum to address this common need for an efficient integrative management/economics foundation in the typical land-grant agricultural college curricula. Forestry, along with other natural resource management disciplines, is often an integral part of a College of Agriculture and this discussion of economics issues applies across the typical College of Agriculture.

While forestry has always stressed sustained production of forest outputs and more recently sustained multiple-use outputs, the concept of sustainable forest management is relatively new. The professional judgment of foresters was rarely challenged until public perceptions of forestry evolved into broader definitions of sustainability, changing expectations of what constitutes stalwart forest stewardship and developing methodologies to enhance decision making (Sample et al., 1999). One of the founders of the field of forestry economics, William A. Duerr, suggested restructuring the subject as early as 1990. He observed revolutionary changes in the forest products markets, globalization of forestry, changes in forest products themselves and most importantly, a changing culture where the public and not foresters, dictated forest management goals and objectives (Duerr, 1990).

Forest economics is mostly taught at public land-grant universities in forestry schools or departments. Generally the same few textbooks are used across the United States. Much of forest economics is applied microeconomics or macroeconomics with forestry applications. There seems to be flexibility in how the course is taught, even how it might be taught in combination with other economics courses (Flick And Dunn, 1998). There

[1]Graduate Research Assistant, Division of Natural Resources, jamesmsimons@gmail.com
[2]Professor, Division of Natural Resources, (864) 656-4827, tstraka@clemson.edu
[3]Associate Professor, Division of Natural Resources, (864) 656-4853, lgering@clemson.edu
[4]Extension Associate, Division of Agriculture, (864) 656-2604, bplmsk@clemson.edu

is a general flexibility that forestry economics faculty provides to forestry and natural resources programs. Flick and Dunn (1998) point out: *"Forestry economics faculty offer forestry schools one important attribute that is often overlooked and that bears on the time a forest economist has for research. Forest economists can be used flexibly, for a variety of things, because most are trained in both forestry and social science. They can help out in statistics, biometrics, management, policy, capstone courses, research methods, recreation, industrial forestry, courses in consulting and others. This is generally not true of other forestry professors. Forest biologists, for example, are less often asked to teach outside their specialties, while forest economists seem to bear such requests routinely."* This same flexibility allows forest management/economics faculty to be the primary instructors in the areas of forest management, forest economics, forest valuation, forest policy, forest management plans and the forestry capstone course.

While our focus is heavily on natural resources and forestry programs, the discussion and results apply equally to agriculture programs. Natural resources and forestry programs are often located within agricultural colleges and the background economics courses discussed apply to fundamental curriculum requirements across these colleges. Basic agricultural or natural resources economics and management course are common prerequisite courses within agricultural colleges. Thus, our suggestions on course integration and curricula efficiencies should be applied broadly across all curricula in the agricultural colleges.

What is the forest economics/management core curriculum area? Natural resources management and forestry programs (and most agricultural college majors) have some sort of required skill set in economics. The trend is to integrate these skills into a set of major courses that will enhance competency, literacy and fluency. Depending upon program direction, this might mean courses in basic economics or ecological, environmental, natural resources, or forest economics. Each of these disciplines, while highly correlated, offers specialization for the managerial processes each type of professional might need in real world practice (Manning, 2008). Outside pressures from legislators who want to reduce program costs, employers who want to hire new graduates with relevant skill sets, as well as inside pressure to maintain academic quality combine to foster an environment for integrated course work in areas like forest economics and management (Sample et al., 1999).

The changing demands of forestry and natural resources curricula are much broader than the sequence of management and economics courses. Integration across the curriculum involves many issues that impact management and economics components, but also impact the relationship of all courses. There are simple issues like integrating tools within the curricula (Andreasen, 2004). Spatial information technologies are now a foundation of forestry and natural resources management programs (Drape et al., 2013; Hess and Cheshire, 2002). How are tools like these best integrated into curricula? The active involvement required in cooperative learning in natural resources education has been shown to improve academic achievement (Etchberger, 2011). The integration of problem-based learning and web-based multimedia can also enhance academic achievement (Strivelli et al., 2011). Some curricula embrace an international (Pellek, 1989), ethical (Lewis et al., 1999), or multi-objective (Lakshminarayan et al., 1995) focus. These types of innovation are valuable modifications to curricula that produce a broader based education. They do impact curricula and certainly combine with other integration efforts to affect the academic experience. Our focus will be limited to integrated forest and natural resources education, specifically within its managerial, economics and policy areas.

There is no question that an expanding set of managerial and economic skills are necessary to meet the changing demands of foresters and natural resource professionals (Boland et al., 2001; Tombaugh, 1998; Sample et al., 1999). In particular, today's curricula are required to "provide the breadth in natural resources to meet complex management issues and is representative of the major changes in forestry education in recent decades" (Erven, 1987; O'Hara and Redelsheimer, 2012). Forestry and natural resources curricula tend to be have weak requirements in social sciences in general (Vonhof, 2010). This is not just an American problem; the importance of a broad set of managerial and economic skills is recognized internationally (Leslie et al., 2006; Vanclay, 2007). That forestry educational standards keep up with the changing social and political requirements is critical and integration of skill sets will be necessary (Radhakrishna and Bruening, 1994; Tombaugh, 2001). The economics and management foundation we propose meets these broad-based integrative curriculum needs for not just forestry (Beck, 1990; Larson, 1996), but most of the curricula in a typical agriculture college (Franklin, 1986; Heiman et al., 2002).

What is the Integrated Curriculum Approach?

An integrated curriculum approach is nothing new and has been applied across many disciplines (Ward and Waller, 1988). Rather than discuss the approach in general, we will concentrate on forestry and natural resources management curricula and how integration might be applied there. Vaux (1975) discussed the topic almost forty years ago, starting with the definition of integration as "combining to form a more complete, harmonious, or coordinated entity." Using his definition, the thing being integrated is the program of study with a goal of providing the professional educational framework to produce a forester or natural resources manager. He recognized that one form of integration was incorporating

new knowledge into the curriculum. That is, keeping the subject matter "current."

A second kind of integration is the one that is relevant here. It is based on identifying commonalities between and within the curriculum disciplines. An example might be silvicultural practices, forest management and forest economics. Each is a separate discipline. The curriculum might recognize that silviculture and forest management must interact to form management alternatives and forest economics might provide the criteria that allows for selection of the optimum alternative. Vaux (1975) notes that integration of areas that are biological, soils, growth and ecosystem based are not that difficult. However, integration of those that are social science based is difficult to accomplish. The social science areas are people-based. Culture, personal preferences and values come into play.

Vaux was clearly correct. Since he wrote that article, forestry and natural resources management issues have become of great concern to the general public (clearcutting, endangered species and loss of forest land). Today's forest managers need grounding in ecosystem management, interdisciplinary thinking and planning, landscape ecology and adaptive management (Gilbert et al., 1993). When forestry leaders were asked in 1991 to identify the critical elements of a forestry curriculum the results were integrative, not discipline-focused and stressed basic competencies (rather than traditional courses), education (rather than training), a balanced natural resource perspective (rather than a timber focus), global awareness, social responsibility, knowledge of the political process and ability to navigate in it, theory and practice, increased program flexibility to allow for minors and other options, current issues focus and the ability to work in teams (Gilbert et al., 1993). To develop the broad skills and capabilities necessary to meet those critical elements, an integrative approach is almost mandatory (Schneider et al., 2005). Our focus is on integrating a portion of a curriculum. Thus, our discussion on integrated programs will be brief. Obviously, integrating a discipline area or two closely allied discipline areas is not as challenging as integrating an entire program. However, the same types of problems arise and the same advantages can be accomplished, just at a more modest level. To provide insight into integration of curricula a few examples will be briefly discussed.

Washington State University developed a new integrated curriculum in 1990. Traditional fields of forestry, wildlife management, range management and wildland recreation management were merged into a department that offered a B.S. degree in natural resource management (with majors in forest management, range management, wildlife management, or wildland recreation management) or natural resource sciences majors in plant or wildlife sciences). All students start out taking the same educational foundation courses. They also take a set of natural resources core courses, including Introduction to Natural Resources Management I, II, III and IV. These are broad integrative courses, so a student could easily switch majors at this early stage. Next, the forestry students move to a set of forestry core courses, but at the same time also complete other natural resource core courses. These natural resource core courses often cover topics that were traditional forestry courses, but from a broad landscape management viewpoint. Finally, there are courses that offer forestry options in business, wildlife, management and directed study (Gilbert et al., 1993).

The best example of an integrated forestry curriculum is likely Northern Arizona University. It first adopted this approach in 1972. Their professional program is divided into three integrated 16-credit courses, referred to as Semesters A, B and C. In 1996 the program was entirely revamped with an emphasis on adaptive curriculum management where the three semesters are continually reviewed (for issues like delivery methods, prerequisites, academic content and emphasis of subdisciplines). Courses use a strong team teaching approach (Fox et al., 1996; Sample et al., 1999; Covington et al., 2000).

The University of Vermont's School of Natural Resources provides a program where goals are met through interdisciplinary exchange. No courses were added to its existing curricula; instead, the School developed an integrated core curriculum for use by all six of its B.S. programs (including its then Society of American Foresters accredited forestry program). Their approach was retrospective: first, by setting goals for student achievement and then, second, by developing a core curriculum that met those goals. The key was use of a process that encouraged interdisciplinary exchange and avoided departmental fragmentation (Ginger et al., 1999; Sample et al., 1999).

Auburn University adopted a new forestry curriculum about 20 years ago (Flick et al., 1995). They identified four types of forestry programs: (1) "forestry in a larger whole" where forestry becomes part of a larger comprehensive environmental, ecological, or natural resources identity, (2) "many forestries" with multiple curricula in timber management, wildlife, recreation and such, (3) "integrated forestry" where traditional forestry's subdivisions and disciplines are abandoned for a holistic approach and (4) "bulging forestry" where more and more courses are added to the traditional forestry curriculum. They claim all four approaches are unsatisfactory as the first abandons forestry, the second defines forestry as timber management, the third breaks "with historical continuity concerning subjects and academic disciplines, making it difficult to understand what is happening,' and the fourth is undisciplined. The Auburn University approach was one that focused on core principles and placed forestry at the center—"not subjugated to natural resource management, environmental management, or another concentration."

The Auburn University faculty recognized that "the theory of forestry involves primarily three disciplines:

biology, economics and measurements. Biology includes soils, ecology, silviculture and protection. Economics includes policy and managerial sciences. Measurement includes land and forest measurements as well as sampling and growth and yield (Flick et al., 1995). Integration does occur in their curriculum, but between courses, to make up the traditional whole of forestry. Their definition of economics would include the traditional forestry courses of forestry economics, forest management, forest valuation, forest policy, forest management plans and planning, forest operations and procurement and business. While the key question is how to integrate within and across the three disciplines, we will focus our discussion on how best to integrate solely within the economics discipline, while recognizing that the other two disciplines have the same integration problems (Kobziar et al., 2009; Temesgen et al., 2011).

Integrating the Economics Discipline into the Forestry/Natural Resources Curriculum

Integration within or across disciplines can be viewed in terms of both breadth and depth (Ginger et al., 1999). There is a perceived tradeoff between producing graduates with skill sets needed to perform professional work (depth) and those with broad foundations able to solve complex social and technical problems (breadth), but this does not have to be the case (Hoch and Dougher, 2011; Hosner, 1993; Perry et al., 1994). Integration can help develop both breadth and depth across "cross-discipline and cross-value natural resource management" (Jensen et al., 1998; Torres and Cano, 1995). Our discussion on integrating the economics discipline into forestry and natural resources management courses will focus on both depth and breadth in recognizing that single disciplines are now expected to have some level of integration within and across other disciplines. Forest valuation is no longer totally concerned with wood value and forest management; it is now impacted by social and political pressures that did not exist a few decades ago (Fisher, 1996).

The management/economics discipline in forest and natural resource management programs usually consists of introductory economics courses (either an economics concepts course, principles of microeconomics, principles of macroeconomics, or an applied economics foundation course). Using the Clemson University Catalog as representative of a land-grant university, these courses would be ECON 200 – Economics Concepts, a general course that introduces both microeconomics and macroeconomics, not intended for economics majors; ECON 211 – Principles of Microeconomics, a foundation course for economics majors; ECON 212 - Principles of Macroeconomics, a foundation course for economics majors; and AP EC 202 – Agricultural Economics, an applied microeconomics course similar to ECON 201, but with agricultural applications (Clemson University, 2012). Two other general natural resource economics courses are offered at Clemson University: AP EC 257 – Natural Resources, Environment and Economics and AP EC 357 – Natural Resources Economics. These two courses could relate to any environmental, natural resources, or forestry curriculum. In addition, there are many applied economics courses that relate to specific agricultural situations.

Many of the majors in Clemson University's School of Agricultural, Forest and Environmental Sciences use these foundation courses in the economics/business components of their curricula. Agricultural Mechanization and Business requires ECON 211 or APEC 202; Environmental and Natural Resources requires AP EC 257 or ECON 211; Forest Resource Management requires AP EC 257 or ECON 200 or ECON 211 or ECON 212; Soils and Sustainable Crop Systems requires either AP EC 202 or ECON 211; and Wildlife and Fisheries Biology requires AP EC 257.

This would be typical for a land-grant university: many of the curricula have business or economic components and most of them require either principles of microeconomics/macroeconomics or applied principles of microeconomics/macroeconomics course as the foundation for additional economics work. That applied microeconomics course is usually applied agricultural economics for the general agricultural fields and usually applied natural resources economics for the natural resources fields. An upper level general natural resources course is also common for the natural resources fields.

The Sequential Model

Though some variation is bound to exist within the forestry programs of each university, those that share a more sequential commonality tend to have a similar trend in class progression. In order for a school's curriculum to be grouped in the sequential category, a clear succession of courses must be present.

The general flow of courses begins with a fundamental economics course which is usually taken in the sophomore year. The economics requirement is typically microeconomics, macroeconomics, or an introductory applied economics course. Other combinations exist within different curricula. Most universities only require that one foundational economics course be taken, but other programs require a more intensive study of economics with two courses. Juniors will then take a forest economics course which applies economic principles to forestry related dealings such as investment theory, resource supply, economics of conservation and taxation principles. The function and structure of forest product markets are also examined. The purpose of forest economics is to narrow the broad field of microeconomics into material that is more related to forest activities. The typical sequential program will then require seniors to take a forest management course as well as a natural resource/forest policy class. As stated before, each university presents different sequences of courses, but for the most part they each

follow a similar trend. Refer to Figure 1 for a diagram of a typical management/economics series of classes for the sequential model.

Classifying the Curricula of Society of American Foresters (SAF) Accredited Programs

After examining the curricula of the 46 SAF accredited universities, five different sequence models were constructed; sequential, quasi sequential, combination, quasi integrated and fully integrated. Because there was no existing formula for deciphering which curriculum series belonged to each model, personal judgment had to be used to decide what category each fit into. Because the same person investigated and placed each of the schools into the different models, there was no bias and results remained consistent. Examples of a sequential and fully integrated model are presented in Figures 1 and 2, but there are many programs that did not necessarily fit into either category. The curriculum pattern that falls within the quasi sequential model most often follows the sequential pattern closely, but may contain a class which combines two subjects such as forest economics and valuation. For a curriculum to be classified as quasi integrated, it typically exhibits a pattern that does not have the natural flow of succession such as a sequential approach or may contain some sort of capstone class which integrates multiple disciplines. It was necessary to create a combination model for those programs that did not fit the criteria of either sequential or integrated platforms. While it is easier to classify programs which fall into one extreme or the other, the grey area in between is often harder to categorize. Refer to Figure 3 for an illustration of how many schools fell into each of the five categories.

Figure 2 illustrates the structure of a fully integrated forestry curriculum. Just as with the sequential model, the students gain a basic understanding of economic principles by taking an introductory microeconomics course in their second year of study. During the spring term of their junior year, the students experience the integrated approach to learning forest management. The management sequence draws from prerequisites such as ecology and silviculture and also has corequisites that must be taken in concurrence with other integrated classes. In addition to the 13 units of integrated forest management, the students have the option to take an additional 3 units of liberal studies, diversity elective, or a certificate course.

Of all the SAF accredited universities, most require some form of basic economics class. The majority of forestry programs allow the students to choose which economics course they wish to take. Nineteen schools (41%) had the option to take microeconomics/ macroeconomics/ or a basic agricultural economics course that is micro/macro based. Though microeconomic principles and theories are more relevant to the field of forestry, there must be an underlying reason why different universities allow other economics courses to be taken. One explanation for the variance might be that incoming transfer students may have already taken an outside economics course and the flexible requirements allow their coursework to be accepted. Thirty percent of the schools do require that students take microeconomics.

Figure 1. Example of Sequential Model

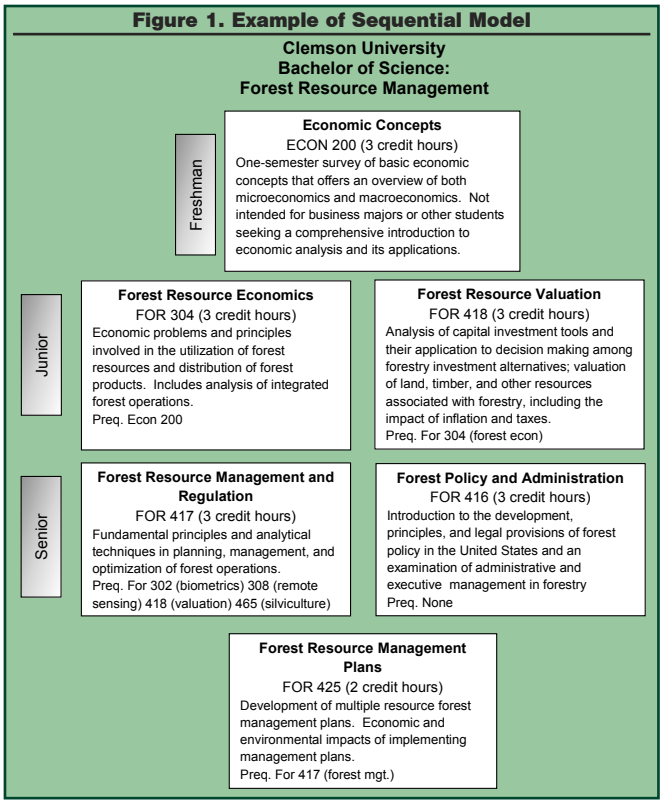


Figure 2. Example of Fully Integrated Model

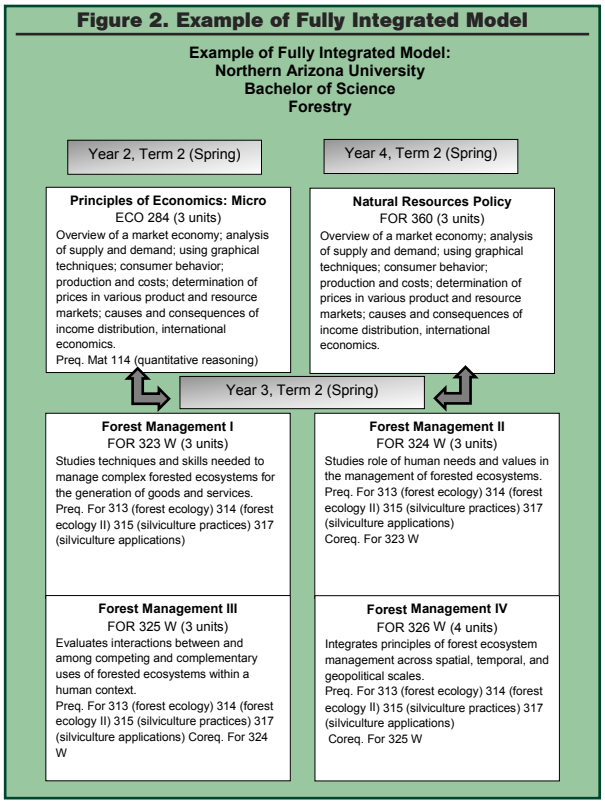
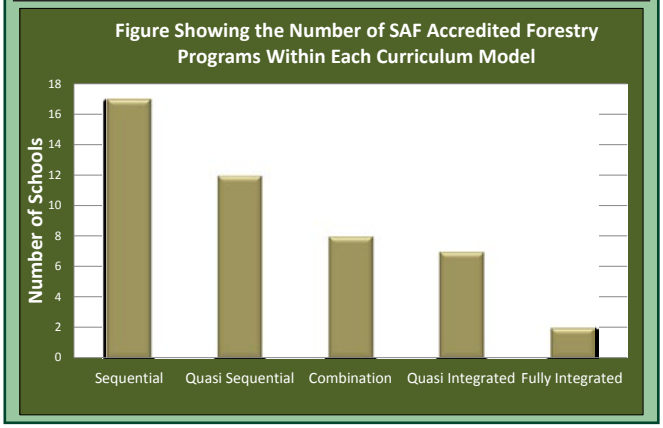


Figure 3. Graph Representing the Number of Schools Whose Curriculum Fall Into Each of the Five Models



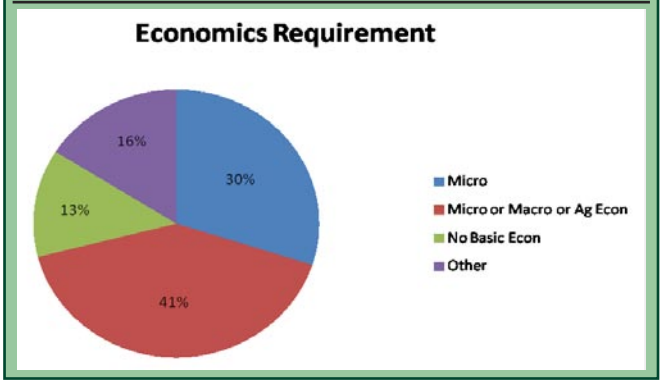
At 13%, there were a surprising number of programs that did not require any basic economics classes. Of the eight remaining programs, different combinations of requirements existed; two schools required their students to take macroeconomics, three required both microeconomics and macroeconomics and three schools required a basic agricultural economics course. This is shown in Figure 4.

Conclusion

The changing perception of the forestry profession demands that a broader view be taken rather than just the input and output of forest products (Gering et al., 2012). While the foundational scientific courses of forestry practices such as dendrology, ecology and silviculture will always be fundamental in any forestry program, so too will social sciences such as economics and policy. The fact that the overwhelming majority of SAF accredited forestry programs require some form of foundational economics course proves this notion. Another avenue that universities take to present the "big picture" to students is by requiring a forest policy class. Coursework in this field provides a background from both a current and historical standpoint on how many resource related policies came to be. Finally, there must be an adequate managerial approach to any natural resource program. Many universities are able to adopt subject matter from a broad range of topics such as planning and optimization of forest operations into their management class in order to bring multiple subject matters together. The management class will also often include financial matters that are pertinent for the professional forester to use in the decision making process.

The integrated approach to curriculum has gained popularity in recent times. Though it has been illustrated that the majority of universities are tending towards a sequential approach, the integrated curriculum is here to stay and many programs have adopted a partially integrated platform in some of their coursework. The capstone course that many universities offer is a prime

Figure 4. Graph Illustrating the Economics Requirement of the 46 SAF Accredited Programs



example of bringing together multiple disciplines into one class to bridge the gap between subject matter.

The slow adoption of the integration may be due to internal issues within the particular university. When each course is individualized within the sequential model, the professor teaching each is typically specialized in that particular field. In order to integrate various material into one class, the course must be team taught or be led by an instructor with a vast and varied knowledge in an array of different fields.

Another challenge to converting to an integrated curriculum is the slow adoption of faculty members to a new way of presenting information. The classic sequential approach is a condensed, "cut and dry" process of teaching. Often, professors will not have to stray too far out of the breadth of each course's particular subject. If an integrated model were to be adopted, the entire structure of each course would have to be altered. If the course is to be team taught, a deal of synergy would have to exist amongst the faculty. Varied opinions on how to present topics, what content is important and countless other issues could become a point of friction between instructors.

The sequential approach is the time-tested, most popular way of presenting different subjects. Each course can be taught by someone who has a particular specialty in that area without having to be versed on many different subject matters. This is an advantage to the students because they can learn from someone who is an expert on that focus. The students learn about one particular topic and then move on to the next in the series laid out before them based on what courses constitute as prerequisites for the next course. Though each different class within a forestry curriculum stresses different topics, there is often an overlap of material in certain courses. Often, content within courses such as forest economics, management and valuation can be markedly similar, if not the same. Because the different instructors have similar programs to teach and stress what they deem important, the student may see a redundancy in content. While it is not necessarily bad to be refreshed on past topics, taking a more integrated approach may be more conducive to the student's learning.

Literature Cited

Andreasen, R.J. 2004. Integrating experimental learning into College of Agriculture capstone courses: Implications and applications for practitioners. NACTA Jour. 48(1): 52-57.

Beck, R.L. 1990. Agricultural business curricula. NACTA Jour. 34(3): 12.

Boland, M., E. Lehman and J. Stroade. 2001. A comparison of curriculum in baccalaureate degree programs in agribusiness management. International Food and Agribusiness Management Review 4(3): 225-235.

Clemson University. 2012. Clemson University undergraduate announcements 2012-2013. Clemson, SC: Clemson University.

Covington, W.W., P.Z. Fulé, T. M. Alcoze and R.K. Vance. 2000. Learning by doing: Education in ecological restoration at Northern Arizona University. Jour. of Forestry 98(10):30-34.

Drape, T.A., D. Westfall-Rudd, S. Doak, J. Guthrie and P. Mykerezi. 2013. Technology integration in an agriculture associate's degree program: A case study guided by Rogers' diffusion of innovation. NACTA Jour. 57(1): 24-35.

Duerr, W.A. 1990. Restructuring the economics of forestry to cope with changing times. In: Proc. 1990 Annu. Mtg. of Southern Forest Economics Workers, Monroe, LA, 29-30 Mar.

Erven, B. L. 1987. Reforming curricula: Challenge and change for agricultural economists. American Jour. of Agricultural Economics 69(5): 1037-1042.

Etchberger, R.C. 2011. Assessment of cooperative learning in natural resources education. Jour. of Forestry 109(7):397-401.

Flick, W.A. and M.A. Dunn. 1998. At the margin: The economics of teaching forest economics. In: Proc. 1998 Annu. Mtg. of Southern Forest Economics Workers, Williamsburg, VA, 25-27, Mar.

Flick, W.A., G. Somers, B. Jones, D. Brinker and D. Gjerstad. 1995. Yet all will be foresters: Curriculum reform at Auburn University. Jour. of Forestry 93(10):20-24.

Fisher, R.F. 1996. Broader and deeper: The challenge of forestry education in the late 20th century. Jour. of Forestry 94(3):4-8.

Fox. B.E., T.E. Kolb and E.A.Kurmes. 1996. An integrated forestry curriculum: The Northern Arizona University experience. Jour. of Forestry 94(3):16-22.

Franklin, D. R. 1986. Four curriculum options within agricultural economics. NACTA Jour. 30(2): 15-17.

Gering, L., J. Simons, T. Straka and R. Polomski. 2012. Integrating management and economics courses across the forest resources curricula. Jour. of Forestry 110(8):532.

Gilbert, F.F., K.A. Blatner, M.S. Carroll, R.L. Richmond and B.A. Zamora.1993. Integrated forest resource education: One response to the challenge. Jour. of Forestry 91(3):17-22.

Ginger, C., D. Wang and L. Tritton. 1999. Integrating disciplines in an undergraduate curriculum. Jour. of Forestry 97(1):17-21.

Heiman, A., J. Miranowski, D. Zilberman and J. Alix. 2002. The increasing role of agribusiness in agricultural economics. Jour. of Agribusiness 20(1): 1-30.

Hess, G.R. and H.M. Cheshire. 2002. Spatial information technologies: Integrating the tools with the curricula. Jour. of Forestry 100(1):29-34.

Hoch, W.A. and T.A.O. Dougher. 2011. Student perceptions of hybrid versus traditional courses: A case study in plant identification. NACTA Jour. 58(4): 8-13.

Hosner, J.F. 1993. Meeting demands for breadth and depth: A two-tiered approach. Jour. of Forestry 91(3):15-16.

Jensen, E.C., P.S. Doescher and B. Shelby. 1998. A new natural resources for a new century. Jour. of Forestry 96(2):15-17.

Kobziar, L.N., M.E. Rocca, C.A. Dicus, C. Hoffman, N. Sugihara, A.E. Thode, J.M. Varner and P. Morgan. 2009. Challenges to educating the next generation of wildland fire professionals in the United States. Jour. of Forestry 107(7):339-345.

Lakshminarayan, P.G., S.R. Johnson and A. Bouzaher. 1995. A multi-objective approach to integrating agricultural economic and environmental policies. Jour. of Environmental Management 45(4): 365-378.

Larson. R. B. 1996. Agricultural business management curricula. Jour. Agribusiness 14(2): 143-155.

Leslie, A.D., E.R. Wilson and C.B. Starr. 2006. The current state of professional forestry education in the United Kingdom. International Forestry Review 8(3):339-349.

Lewis, D.K., T. Kuzmic and E.L. Miller. 1999. Integration of ethics into a forestry curriculum. NACTA Journal 43(2), 33-36.

Manning, R.E. 2008. Integration in natural resources education: Designing a core curriculum. Society and Natural Resources 11(2):179-190.

O'Hara, K.L. and C.L. Redelsheimer. 2012. Divergent trends in accredited forestry programs in the States: Implications for research and education. Jour. of Forestry 110(4):201-206.

Pellek, R. 1989. My chance: On an international curriculum. Jour. of Forestry 87(7):64.

Perry, J.A., E. Vanderklein and A.R. Ek. 1994. Education: Breadth versus depth. Jour. of Forestry 92(2):60.

Radhakrishna, R. B. and T.H. Bruening. 1994. Pennsylvania study: Employee and student perceptions of skills and experiences needed for careers in agribusiness. NACTA Jour. 38(1): 15-18.

Sample, V.A., P.C. Ringgold, N.E. Block and J.W. Giltmier. 1999. Forestry education: Adapting to the changing demands on professionals. Jour. of Forestry 97(9):4-10.

Schneider, M., A. Colglazier, R. Beutler, C. Pollard and C. Francis. 2005. Student, advisor and employer

opinions on interdisciplinary education in agriculture. Jour. Natural Resources and Life Sciences Education. 34(1): 101-106.

Strivelli, R.A., M. Krzic, C. Crowley, S. Syanatkar, A.A. Bomke, S.W. Simard and A. Jakoy. 2011. Integration of problem-based learning and web-based multimedia to enhance a soil management course. Jour. of Natural Resources and Life Sciences Education 40(1):215-223.

Temesgen, H., B.J.I. Eskelson, T.C. Maness, D.M. Adams and H.E. Burkhart. 2011. Teaching in contemporary forest resources curricula: Applications to courses in forest measurements and biometrics. Jour. of Forestry 109(7):371-377.

Tombaugh, L.W. 1998. The forces of change driving forestry education. Jour. of Forestry 96(2):4-7.

Tombaugh, L.W. 2001. Changing standards for a dynamic profession: forestry education accreditation. Jour. of Forestry 99(9):4-9.

Vanclay, J.K. 2007. Educating Australian foresters for the 21st century. International Forestry Review 9(4):884-891.

Torres, R.M. and J. Cano. 1995. Examining cognition levels of students enrolled in a College of Agriculture. Jour. of Agricultural Education 36(1): 46-54.

Vaux, H.J. 1975. The 'integrated curriculum" in contemporary forestry education. Jour. of Forestry 73(2):80-83.

Vonhof, S. 2010. Deficiencies of undergraduate forestry curricula in their social sciences and humanities requirements. Jour. of Forestry 108(8):413-418.

Ward, J. and S. Waller. 1988. Strategies for integrated teaching. NACTA Jour. 52(2): 24-28.

Effectiveness of Primary School Agriculture Teachers in Swaziland

Daniel Sibanda[1]
Gwane Teacher Training College
Nhlangano, Swaziland

Barnabas M Dlamini[2] and Jethro M Simelane
University of Swaziland
Luyengo, Swaziland

Abstract

Teaching effectiveness is the extent to which teaching leads to increased learning. The purpose of this study was to determine factors related to the effectiveness of primary school agriculture teachers in Swaziland. The pupils' performance in the Grade 7 examinations in Swaziland Primary Agriculture Examinations was used as a measure for teachers' performance. The design of the study was a descriptive correlational survey. A self-administered questionnaire was used for data collection. The target population was 384 primary school agriculture teachers that offered agriculture as a subject during 2011. A stratified random representative sample of 186 agriculture teachers was used in the study. A response rate of 72% was achieved after134 respondents provided usable data. Descriptive statistics of frequencies, means, percentages and standard deviations were used to describe data and correlations were used to describe relationships between variables. Regression analysis was used to determine explanatory and predictor variables for teaching effectiveness. The findings revealed that the explanatory and predictor variables for teacher effectiveness were the number of agriculture in-service workshops attended by the teacher and school type (religious or government). The research hypothesis that teachers' perception regarding their college preparation program should explain the greatest variance in teacher effectiveness was rejected. The conclusion from the study was that primary school agriculture teachers were not effective. The major recommendation was that effective, relevant and regular workshops have to be conducted to enhance effective teaching of agriculture in primary schools.

Key words: Correlational survey, teaching effectiveness, primary school agriculture teacher, academic performance, external examination.

Introduction

Teaching effectiveness can be defined as the process of eliciting desired outcomes in learners. The performance of agriculture teachers could be judged by pupils' attainment in public examinations and practical activities. The academic performance of pupils is linked to the ability, commitment and job satisfaction of teachers. Satisfaction from teaching is the best predictor for teaching effectiveness (Dlamini, 1989).

Teaching effectiveness can be influenced by a teacher's background. This includes pre-service and in-service training. This training provides opportunities for teachers to master subject matter and to enhance overall teaching effectiveness. Strong in-service programs, ideally, are designed to maintain a pool of beginning and experienced teachers who are competent and capable.

Support from the school and community also enhances teacher effectiveness. The school must have the necessary resources and the community should provide facilities which make life pleasant to the teacher. Job satisfaction and personal commitment to the profession help make a teacher effective. Appalling conditions of service work against the success of education reforms that would promote quality and relevant education. These result in teachers having negative attitudes towards government, which may lead to ineffectiveness.

Kunene (1996) reported that the standard and quality of agriculture offered in schools was continually deteriorating despite lots of inputs made toward uplifting the standards of the school's agriculture program. Kunene further stated that coordinators (supervisors) reported that some schools did not take heed of the recommendations for improvement that are suggested by the area or district coordinators or supervisors.

Nzalo (1997) reported that countries where agricultural education had failed were those that had

[1]Department of Agriculture, PO Box 474
[2]Department of Agricultural Education and Extension, Faculty of Agriculture; E-mail: dean@uniswa.sz

poor supervision of the program. Duncan et al. (2006) stressed that agriculture involves skills and mastery in agricultural content, pedagogical processes and other competences that are associated with managing the overall program of agricultural education. In agreement with Duncan et al., Dlamini (1989) indicated that for effective teaching to take place, agriculture teachers require mastery of the subject matter, teaching skills and student management. Mazibuko (2004) observed that the quality of education offered in schools was not good enough, attributing this to the fact that there was little effective teaching in schools. Magagula (1994) pointed out that some of the ingredients to quality education are the optimum and efficient ways in which teachers are trained in what to teach (content) and how to teach (pedagogy). Roques (1986) alluded to the fact that teaching a practical subject like agriculture is more demanding than teaching other subjects because agriculture teachers have to care for crops and livestock even on weekends and holidays. Magagula (2008), however, reported that coordinators had observed that teachers who had no training in education experienced difficulties in teaching modern agriculture. It was argued that the issue of inadequately trained teachers was insignificant in Swaziland, as it only accounted for 1 to 2%. Given the challenges and concerns that affect the smooth running of the school's agriculture program (agriculture program taught in schools), there is a strong need to carry out a study to determine the level of effectiveness of agriculture teachers, especially, in primary schools.

Purpose and Objectives of the Study

The purpose of the study was to determine the teaching effectiveness of primary school agriculture teachers in Swaziland. The specific objectives of this study were to:

1. Describe the effectiveness of agriculture teachers in terms of academic performance of their pupils in external examinations.
2. Describe the perceptions of the primary school agriculture teachers regarding their college preparation.
3. Describe the level of support agriculture teachers receive from the school leadership for the smooth running of the Schools Agriculture Program in primary schools in Swaziland.
4. Identify in-service training needs of agriculture teachers
5. Describe relationships between variables.
6. Identify independent variables that explain and predict effectiveness of primary agriculture teachers in Swaziland.

Major Hypothesis

The research was based on the hypothesis that Swaziland's primary school agriculture teachers' perceptions on their college preparation should explain the greatest variance on their effectiveness. The hypothesis was supported by Harper et al. (1990) who conducted a study in the United States of America to determine factors associated with Western Region agriculture teachers' perceptions of teaching effectiveness. They found that teachers' perception of their teacher training program accounted for the largest proportion (22.4%) of variance in the variable scores and identified five significant factors that were related to teaching effectiveness in agriculture. These factors were: teachers, training, community environment, school environment, student characteristics and background of the teacher.

Methodology

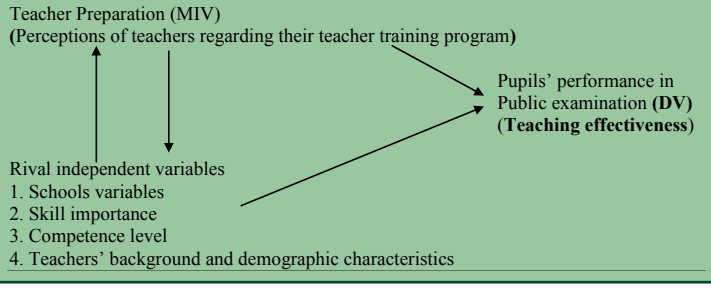
The study was a descriptive correlational survey study. The conceptual framework for the study is as shown in Figure1.

The target population was all agriculture teachers (N= 348) teaching agriculture in the primary schools in Swaziland during the calendar year 2011.There was only one agriculture teacher assigned to teach agriculture in a primary school. An up- to- date list of teachers was obtained from the Ministry of Education and Training to control frame error.

A stratified random sampling procedure by region was followed to determine sample size. A random representative sample size of 186 teachers was obtained for the study. This number was based on Krejcie and Morgan (1970) table for determining sample size for research activities. A stratified random sampling ensured proportionate representation for each of the four regions of Swaziland and ensured that each individual was chosen entirely by chance and each member had an equal chance of being included in the sample. The procedure included categorizing the 348 teachers from the same number of schools into the four regions. The names of all the 348 teachers were written on pieces of paper. The papers were then put into four bags, one bag for each region. The bags were shaken for evenly distribution of the papers in the bags. From the four bags, a total of 186 teachers were chosen.

A questionnaire was designed to collect data from the sample of 186 primary school agriculture teachers. The questions were developed from related literature. The questionnaire was divided into five sections. The first section was college preparation and had 12

Figure1. Conceptual framework of the study.



statements that required respondents to indicate their level of adequacy in college teacher preparation. A six point Likert scale was used to rate the items. The rating scale ranged from very inadequate (1) to very adequate (6). The second section, school related factors, contained 12 questions with nine of the statements requiring respondents to indicate their level of satisfaction regarding support received from school management. Respondents were required to indicate their level of satisfaction using a six point Likert scale ranging from very unsatisfactory (1) to very satisfactory (6). Three questions required respondents to provide informational responses. The third section was skill importance. Respondents were asked to indicate the level of importance regarding 24 agricultural skills. Rating scales ranged from unimportant (1) to very important (6). The fourth section was skill competence level, which included the same 24 agricultural skills as in third section. Respondents were asked to indicate their level of competence in performing each skill. The rating scale ranged from very incompetent (1) to very competent (6). The fifth section, background and demographic variables, included 14 variables and 10 informational questions. Questionnaires were mailed to the teachers in accordance with procedures suggested by Dillman (1978).

The dependent variable was teaching effectiveness of primary school agriculture teachers in terms of the academic performance of their pupils in the Grade Seven National Agriculture examinations of 2011. Examination results were obtained from the Examinations Council of Swaziland. Student grade symbols were as follows: A ≥ 70%, B = 63% - 69%, C = 56% - 62%, D = 50 % - 55%, E = 40% - 49 % and F = 0% - 39%. For analysis purpose, mean scores were calculated for each grade symbol as follows: A = 85%, B = 66%, C = 59%, D = 52.5%, E = 44.5% and F = 19.5%.

The number of candidates per school that attained each of the symbols was multiplied by the mean scores for the symbols and the overall product was divided by the total number of candidates. The calculated final score (percentage) per school was attributed to the agriculture teacher. Thus, only one score was used per teacher.

A panel of experts consisting of the regional coordinator from the Shiselweni district, two Ngwane College Heads of Department: Professional Studies and Agriculture Departments and a lecturer from the Department of Primary Education at the University of Swaziland attested to the representativeness of the items making up the survey instrument. To insure reliability, a pilot test was conducted with 30 primary school agriculture teachers that were not participating in the study. Cronbach's alpha was conducted to determine the reliability coefficients for the domains of the instrument. The reliability coefficients were found to be .85, .70 and .94, for the college preparation, school variables, skill importance and competence levels domains, respectively.

A total of 134 questionnaires with usable data were returned, yielding a 72% response rate. Non response error was controlled by comparing early respondents to late respondents and no significant differences were observed between early respondents to late respondents (as surrogates for non-respondents). Hence, results are true for the target population (Miller and Smith, 1983). The Statistical Package for Social Sciences (SPSS) Version 19.0 was used. Percentages, means and standard deviations were used to describe data. Weighted discrepancy scores using Borich's (1980) model of assessing needs were used to determine the agriculture teachers' in-service needs for the acquisition of various skills. Analysis of Variance (ANOVA) and t-test were used to determine statistical significant differences. Post hoc analysis using Scheffe's HSD test was used to determine significant group differences. Correlations were used to describe relationships between variables. Regression analysis was used to identify explanatory and predictor variables for teaching effectiveness. To determine the level of statistical significance, an a priori probability alpha level of P = .05 was set.

Findings

Description of the Study Sample

The majority (82 or 61%) of the primary school agriculture teachers from the four regions of the country were males. Most (116 or 88%)of the primary school agriculture teachers came from rural areas and their ages ranged from 23 to 59 years with a mean age of 37.80 and standard deviation of 9.30. The majority (64 or 47.76%) of the agriculture teachers were trained at Ngwane Teachers' College. The majority (71 or 52.99%) of the agriculture teachers graduated between the year 2000 and 2011.Few of the teachers (n = 25) improved themselves by enrolling with Emlalatini in-service training center and obtained an in-service certificate in Agricultural Education. Most (78 or 58.21%) of the teachers did not take agriculture as their major course in their final year of study. The majority (93 or 69.40%) of the teachers held a diploma (Associate degree) qualification having credit passes (C grade) from their different institutions of training. Most (95 or 70.90%) of the teachers have been in the teaching profession for ten years and teaching agriculture for about eight years. Most (85 or 63.43%) of the schools where the teachers were teaching had been offering agriculture for more than 20 years. The majority (80 or 59.70%) of the teachers reported non-existence of in-service workshop opportunities and (113 or 86.90%) agriculture teachers reported to have not attended in-service workshops since employment.

Mean scores of pupils' performance in the grade seven Agriculture Examination in the year 2011 by region as an indicator for effectiveness of primary school agriculture teachers in Swaziland

Table 1 displays mean scores for the academic performance of the 2011 Grade Seven candidates as a measure of teaching effectiveness of the primary school

agriculture teachers. The results show that the overall mean score for all the schools in the four regions of Swaziland was 48.04%. Schools from the Lubombo region had the highest mean scores (M = 49.32%), followed by schools from the Manzini region (M = 48.16%). Schools from Hhohho came third (M = 47.80%) and schools from the Shiselweni region had the lowest mean score (M =46.96%). There was no significance difference (P=.05) in academic performance between the four regions. Based on the overall mean score (48.04%), of the 2011 Agriculture National Examinations, which fell below 50% mark, primary school agriculture teachers in Swaziland were not considered effective in their teaching.

Respondents' Perceptions Regarding College Preparation

Table 2 contains information regarding adequacy of teacher preparation by colleges in providing training to primary school agriculture teachers in Swaziland. Findings indicated that primary school agriculture teachers perceived their college preparation as slightly adequate (M = 4.33). Preparation in assessment records had the highest mean (4.77) rating. On the other hand, the least mean rating (inadequate preparation) was reported to have been in managing layers (M = 3.03). Again, this trend was noticed in respondents from all the four regions of the country. This scenario could be attributed to the fact that the agriculture syllabus for primary schools puts less practical emphasis on layers (hens) than broiler chickens. Hence, teacher educators might have read the primary school syllabus and decided to put less emphasis on layers. The findings of this study are in line with those of Maseko (1987) who noted that students (pre- service teachers) did no acquire adequate skills and knowledge from the courses offered by the agriculture departments at Ngwane and Nazarene Teacher Training colleges to become effective teachers. Magagula (2008) raised a concern on the declining standards in teacher training institutions.

Table 1. Mean scores of pupils' performance in the grade 7 Agriculture Examination (2011) by region

Region	N	Mean score (%)	SD	F	Probability
Lubombo	24	49.32	7.86		
Manzini	40	48.16	8.14		
Hhohho	39	47.72	8.79		
Shiselweni	31	46.96	8.12		
Overall	134	48.04	8.23	.40	.75

Probability = .05

Primary School Agriculture Teachers' Perceptions Regarding the Support Received

Table 3 contains information on agriculture teachers' perceptions regarding the support received from school management. The findings from this study revealed that primary school agriculture teachers were slightly unsatisfied with the support they received from their schools leadership. The mean rating for "the support received from school management" domain was 3.84, indicating a slightly unsatisfactory rating. However, the respondents reported satisfaction with the items "land availability" and "head teacher's support" with a mean rating of 5.06 and 5.05, respectively. On the other hand, the availability of audio-visual aids had the least mean rating (M = 1.88). Access to computers also received a low (unsatisfactory) mean rating of (M= 2.31). The researchers observe that access to educational technology may be a key factor that agriculture teachers are concerned with in Swaziland.

Table 2. Respondents' perceptions regarding college teacher preparation

	Name of District									
Independent Variables	Lubombo		Manzini		Hhohho		Shiselweni		Overall	
	M	SD	M	SD	M	SD	M	SD	M	SD
	(n = 24)		(n = 40)		(n = 39)		(n = 31)		N =134	
Content of education courses	4.62	1.14	4.15	1.44	4.49	1.14	4.77	0.92	4.51	1.21
Writing objectives	4.29	1.60	4.50	1.34	4.38	1.31	4.68	1.19	4.46	1.34
Teaching Practice	4.67	1.24	4.47	1.38	4.64	1.22	4.55	1.31	4.58	1.20
Content of agriculture courses	4.42	1.47	4.22	1.25	4.56	1.29	4.45	1.80	4.41	1.28
Managing school gardens	4.83	1.05	4.45	1.22	4.41	1.23	4.61	1.25	4.58	1.20
Managing vegetables	5.00	0.83	4.58	0.96	4.77	0.90	4.39	1.28	4.69	1.02
Managing field crops	4.46	0.93	4.42	1.15	4.51	1.12	4.48	1.26	4.47	1.12
Managing broilers	4.79	1.22	4.25	1.52	4.23	1.65	4.55	1.57	4.45	1.52
Managing layers	3.00	1.50	2.65	1.81	3.08	1.90	3.39	1.63	3.03	1.75
Managing finances	3.42	1.61	3.58	1.55	3.49	1.62	3.94	1.24	3.61	1.51
Keeping production records	4.58	1.06	4.35	1.37	4.26	1.50	4.42	1.23	4.40	1.32
Assessment records	5.29	0.96	4.47	1.45	4.64	1.27	4.68	1.30	4.77	1.32
Overall	4.45	1.22	4.19	1.37	4.29	1.35	4.41	1.33	4.33	1.32

Rating Scale: 1= Very inadequate, 2= inadequate, 3 = slightly inadequate, 4 = slightly adequate, 5 = adequate, 6 = very adequate; M = Mean or Average; SD = Standard Deviation; n = sample size.

Table 3. Respondents' perceptions regarding support from school management

	Name of District									
Independent Variables	Lubombo		Manzini		Hhohho		Shiselweni		Overall	
	M	SD	M	SD	M	SD	M	SD	M	SD
	(n = 24)		(n = 40)		(n = 39)		(n = 31)		N =134	
Head teachers' support	5.21	1.22	5.15	0.98	4.95	1.17	4.90	1.11	5.05	1.12
Access to finances	3.92	1.69	4.18	1.55	3.72	1.61	3.32	1.60	3.79	1.62
Availability of garden tools	4.87	1.12	3.38	1.65	4.26	1.35	4.52	1.48	4.26	1.47
Availability of poultry Equipment	4.75	1.11	4.05	1.48	3.56	1.55	4.26	1.37	4.16	1.46
Availability of land	5.50	0.66	5.02	1.29	4.95	1.17	4.77	1.45	5.06	1.22
Availability of water	3.62	2.04	3.95	1.92	3.82	1.70	3.35	1.74	3.69	1.83
Relations with other teachers	4.92	1.02	3.95	1.66	4.36	1.51	4.39	1.43	4.41	1.49
Access to computer at school	3.33	2.06	3.95	1.47	2.13	1.59	1.84	1.64	2.31	1.72
Availability of audio- visual aids	1.75	1.15	1.78	1.14	1.95	1.19	2.03	0.40	1.88	1.21
Domain	4.21	1.34	3.71	1.46	3.74	1.43	3.71	1.47	3.84	1.43

Rating scale: 1 = Very unsatisfactory, 2 = unsatisfactory, 3 = slightly unsatisfactory, 4 = slightly satisfactory, 5 = satisfactory, 6 = very satisfactory teaching; M = Mean or Average; SD = Standard Deviation; n = sample size.

Discrepancy Scores, Weighted Mean Scores and Ranks

Table 4 reports discrepancy scores, weighted mean scores and ranks of 24 agriculture education skills. Weighted mean scores are

Table 4. Weighted mean scores and rankings for determining in-service needs of agriculture teachers

Skill area	Importance		Competence		[a]Discrepancy Score	[b]Weighted Mean score	Rank
	M	SD	M	SD	**DS**	M	Rank
	N = 134		N = 134		N = 134		
Soil sampling	4.91	1.48	3.28	1.47	1.63	8.00	1
Identification of diseases	5.38	0.97	4.05	1.01	1.33	7.15	2
Keeping financial records	5.44	1.01	4.14	1.11	1.30	7.07	3
Making contour lines	4.71	1.43	3.25	1.48	1.46	6.88	4
Identification of pests	5.43	0.88	4.17	0.92	1.26	6.84	5
Keeping broiler production records	5.15	0.92	4.33	0.96	1.18	6.51	6
Keeping diary records	5.57	0.83	4.42	0.85	1.15	6.40	7
Making compost	5.45	0.94	4.31	0.71	1.13	6.17	8
Keeping crop production records	5.04	0.98	4.29	0.94	1.13	6.00	9
Laying out plots	5.60	0.81	4.81	0.87	1.05	5.86	10
Ability to use sprayers	5.21	1.17	4.07	1.14	1.12	5.83	11
Keeping vegetable production records	5.46	0.98	4.44	0.96	0.97	5.28	12
Identifying soil profile	5.18	1.09	4.19	1.12	0.99	5.13	13
Testing for crop maturity	5.26	0.99	4.29	0.93	0.97	5.10	14
Controlling soil erosion	5.48	0.94	4.74	0.14	0.74	4.10	15
Vegetative propagation	4.46	1.45	3.73	1.45	0.73	3.29	16
Keeping tool inventory	5.65	0.75	5.06	1.03	0.58	3.29	16
Making seedbeds	5.69	0.76	5.04	1.17	0.56	3.10	18
Plotting growth curve	4.71	1.43	4.05	1.46	0.66	3.09	19
Identifying soil texture	5.27	1.03	4.73	1.10	0.54	2.85	20
Weighing live chickens	5.10	1.21	4.57	1.26	0.53	2.70	21
Handling chickens	5.34	0.94	4.88	1.15	0.46	2.43	22
Identifying cattle breeds	5.19	1.19	1.35	4.75	0.44	2.30	23
Transplanting	5.66	0.64	5.26	0.99	0.40	2.27	24

Note. [a]Discrepancy score = Mean score importance – Mean score competence,
[b] Weighted mean score = Discrepancy score x Mean score importance;
M = Mean or Average; SD = Standard Deviation; n = sample size.

normally used to rank skills according to their competence in relation to in-service needs (Borich, 1980). Findings from this study revealed that the five top skill areas the primary school agriculture teachers needed in servicing were in soil sampling, identifying diseases, keeping financial records, making contour lines and identification of pests.

Relationships between Variables

Table 5 displays intercorrelations between variables. Davis' (1971) scale of descriptors was used to describe the relationship between performance (Dependent variable) and selected background and demographic characteristics of respondents (Independent variables). The findings showed that correlation coefficients for all the 14 independent variables ranged from negligible association to moderate association. Variables with the highest negative correlations with teaching performance were sex (rpb = -.21), type of school (rpb = -.24) and in-service attended (r =-0.22).

Independent Variables of Effectiveness

Multiple regression analysis was used to estimate the relationships between the independent variables and teaching effectiveness of primary school agriculture teachers. Stepwise regression was used to determine which of the independent variables explained and predicted variance on the dependent variable, teaching effectiveness of primary school agriculture teachers. Fourteen independent variables were included in the analysis. The number of cases included met the requirements set forth by Warmbrod (1992), who indicated that 8-10 cases are needed for each independent variable to run linear multiple regression. Initially, the findings of this study showed collinearity between the independent variables "age" and "teaching experience" (r = .82). To eliminate collinearity, age and teaching experience were combined.

The number of agriculture in-service workshops contributed 6.1% of the variance in the dependent variable, as measured by academic performance of pupils in an external examination (Table 6). A negative beta coefficient (-0.25) reveals a negative correlation between numbers of in service workshops attended and teaching performance, as measured by decreased performance of pupils. A beta value is a measure of how strongly each predictor variable influences the dependent variable (pupils' performance). It is measured in units of standard deviations. High beta values indicate the great impact of the independent variable on the dependent variable and negative beta values indicate negative impact of the independent variable on the dependent variable. This result creates a concern with the teaching effectiveness of the in-service workshops.

Table 5. Relationships between variables

	Y	X^1	X^2	X^3	X^4	X^5	X^6	X^7	X^8	X^9	X^{10}	X^{11}	X^{12}	X^{13}	X^{14}
Y	1.00														
X^1	-.14	1.00													
X^2	-.12	.11	1.00												
X^3	-.07	-.05	-.11	1.00											
X^4	-.24	-.08	-.06	-.07	1.00										
X^5	-.14	-.02	.00	-.11	.28	1.00									
X^6	-.01	.01	.11	-.10	-.09	-.26	1.00								
X^7	-.16	.02	-.06	-.14	.19	.73	-19	1.00							
X^8	-.06	.13	.05	.03	-.19	-.14	.05	-.03	1.00						
X^9	-.22	.05	-.03	.07	-.10	.35	-.26	.30	.32	1.00					
X^{10}	.07	-.06	.07	-.18	-.03	-.19	.04	-.12	.09	-.07	1.00				
X^{11}	.08	-.21	.03	-.15	-.15	-.39	.28	-.24	.01	-.24	.27	1.00			
X^{12}	.15	.16	.22	-.16	-.22	-.31	.19	-.16	.38	.60	.00	.09	1.00		
X^{13}	-.21	-.11	-.16	.06	.07	-.03	-.10	.03	.03	.21	.09	.08	-.26	1.00	
X^{14}	.13	-.05	-.02	.05	-.03	-.04	.20	.04	.04	.08	-.01	.03	.07	.10	1.00

Dependent variable: Y= performance of primary school agriculture teachers (Interval). X^1= College preparation (Interval), X^2= school variables (Interval), (interval, X^3=school location (nominal: 0 = rural,1= urban), X^4=school type (nominal,0 = mission, 1 = government), X^5= Experienc$_e$(age and teaching experience) Ratio, X^6=college performance (Ratio), X^7= experience in teaching agriculture (ratio),X^8= in-service opportunity X^9= agriculture in-service attended(ratio), X^{10}= Access to computers (Nominal, 0 =no, 1 = yes), X^{11}= academic qualification (ratio), X12= was agriculture your major? (Nominal, 0= no, 1= yes), x^{13} $_{= sex}$ (Nominal 0 = female, 1= male), X^{14}=teaching practice grade / symbol (ratio).

Table 6. Variables perceived to explain and predict teaching effectiveness of teachers

Independent variable	R	R^2	R^2_{change}	β	Beta	t-value	probability
School type (religious or government)	.24	.058	.058	-.4.31	-.26	-.3.21	00
Number of in-service workshops attended	34	.119	.061	-.5.73	-.25	-.3.00	.00
Constant = 50.15							

Adjusted R^2 = .105; Standard error = .768; Probability = .05.

Table 7. Regression analysis of the major independent variable with rival variables

Rival Independent variable	R	R^2	R^2_{change}	â	Beta	t-value	probability
Skill competence	.10	.10	.10	.36	.30	3.78	.00
Academic qualification	.37	.14	.04	.28	-.20	-2.44	.02
Agriculture as a major	.41	.17	.03	.32	.19	2.36	.02
Constant = 2.74							

Adjusted R^2 = .151; Standard error = .758; Probability = .05.

Table 7 shows regression analysis of the major independent variable (College teacher preparation) by rival independent variables. Skill competence and agriculture as a major were found to be the largest predictors of positive teacher preparation. Academic qualification had a negative impact on teacher preparation.

The research hypothesis was that teacher preparation should explain the greatest variance on pupils' performance'. The findings showed that teacher preparation did not explain the greatest variance on pupils' performance, instead the number of workshops attended did, but in a negative fashion. The findings showed that although the primary school agriculture teachers rated themselves to be effective, the academic performance of their pupils in the 2011 external examination was low and contrary to their self-ratings. Thus the hypothesis for this study was rejected. Instead school type and number of in-service workshops attended explained about twelve percent of the variance on student performance.

Conclusions and Recommendations

The purpose of the study was to determine factors that influence teaching effectiveness of primary school agriculture teachers. Primary school agriculture teachers perceived themselves to have been adequately trained. There was a negative correlation between college teacher preparation and performance of pupils in the national examinations. Teacher educators in teacher training colleges have to ensure pre-service teachers acquire adequate knowledge and skills that would enable pre-service teachers to teach effectively when employed or beginning teaching. The findings indicated that teachers were slightly satisfied with support from their schools. There was also negative correlation between school related factors and pupils' performance.

The conclusion was that head teachers strive to offer the necessary support in terms of facilities to primary school agriculture teachers to be effective. The primary school agriculture teachers reported to be deficient in some agricultural skills. Teacher educators have a mammoth task of teaching in such a way that pre-service teachers acquire adequate skills from the different courses offered in colleges. In conclusion, colleges have to equip teachers with the necessary skills for effective teaching to take place in schools. The findings revealed that there were low correlations (low to negligible association) between performance (dependent variable) and 14 demographic and background characteristics (independent variables) considered in the study. Since the teachers perceived to have received slightly adequate preparation from colleges, the performance should have been slightly above average (50%).

The school type and number of agriculture in-service workshops attended by the primary school agriculture teachers were found to be the factors that explained and predicted the academic performance of pupils in national examinations. However, this study found that both factors had a negative impact on academic performance. This is contrary to previous research findings which alluded to the fact that in-service workshops make teachers perform their tasks better. From this study and related literature, mission schools perform better than government schools in external examinations.

Based on the findings and conclusion drawn from this study, the following recommendation is made: The Ministry of Education and Training should avail funds for regular and relevant training in technical skills (content) for agriculture teachers. Assessment of in-service training needs indicated that primary school agriculture teachers needed in service in technical skills, such as, soil sampling, identification of crop diseases, keeping financial records, making contour lines and identification of crop pests. The majority of the teachers denied the existence of in-service opportunities. On the basis of the fact that the study could not come up with many factors that influence teaching effectiveness of agriculture teachers in primary schools: A case study should be conducted on agriculture teachers from schools that consistently produce good results to determine factors that enhance their good performance. This recommendation is based on the fact that the teachers perceived themselves to be effective yet the academic performance of their pupils was low. A study to determine job satisfaction among primary school agriculture teachers in Swaziland might be helpful

Literature Cited

Borich, G.D. 1980. A needs assessment model for conducting follow-up studies. Journal of Teacher Education 31 (3): 39 – 49.

Davis, J.A. 1971. Elementary survey analysis. New Jersey: Prentice Hall

Dillman, D.A. 1978. Mail and telephone surveys. The total design method. New York: John Wiley and Sons.

Dlamini, S.S. 1989. If motivation is the answer, what is the problem? Modern Agriculture Circular 4 (2):1- 3.

Duncan, D.W., J.C. Ricketts and J Uesseler. 2006. Teacher preparation and in-service needs of Georgia Agriculture Teachers. Journal of Agricultural Education 47 (2): 24 – 33.

Harper, J.G., R.G.Weiser and R.F. Armstrong. 1990. Factors associated with western region agriculture teachers' perceptions of teaching effectiveness, University of Nevada-Reno, Retrieved May 24, 2012 From: Http://Pubs.Aged.Tamu.Edu/Jae/Pdf/Vol31/31-04-22.Pdf.

Krejcie, R.V. and D.W. Morgan. 1970. Determining sample size for research activities. Educational and Psychological Measurement 30: 607-610.

Magagula, C. 1994. Factors influencing teacher commitment to work. The case of Swazi teachers. UNISWA Journal of Agriculture (3): 63 – 75.

Magagula, S.D.M. 2008.The modern agriculture programme at primary, junior secondary and senior secondary school levels. Mbabane, Swaziland.

Maseko, J.S. 1987. The evaluation of the agriculture programme at Ngwane College. Unpublished B.Sc. Dissertation, University of Swaziland, Luyengo.

Mazibuko, E.D. 2004. Students' perspectives of effective teachers in selected high schools in Swaziland. UNISWA Research Journal 8 (18), 37 – 44.

Miller, L.E. and Smith, K.L. 1983. Handling response issues. Journal of Extension 2 (22): 45 – 49.

Nzalo, N. 1997. Developing a working philosophy of agricultural education in Swaziland. Unpublished M.Sc. Thesis. University of Swaziland. Luyengo, Swaziland.

Roques, J.G.W. 1986. Motivation. Modern Agriculture Circular 2(10): 9 - 10.

Warmbrod, R. 1992. Agricultural Education 995 - Course notes on multivariate data analysis. The Ohio State University, Autumn, 1992.

An Examination of the Use of Reusable Learning Objects to Alter Agricultural Students' Attitudes and Opinions Regarding International Settings[1]

M'Randa R. Sandlin[2], Theresa Pesl Murphrey[3], James R. Lindner[4] and Kim E. Dooley[5]
Texas A&M University
College Station, TX

Abstract

Understanding students' attitudes, opinions and perceptions is a critical component of the educational process. This understanding becomes even more critical when one considers the need to encourage global awareness as instructors strive to identify ways to positively impact student perceptions related to international settings. The purpose of this study was to measure the impact of reusable learning objects (RLOs) that were created related to the culture of Trinidad and Tobago on undergraduate agricultural students' attitudes about the country. There were three phases to the study: creation of the Thurstone scale, administration of the pre-assessment and administration of the post-assessment. The population of the study consisted of four classes containing a total of 103 students in a College of Agriculture. Findings revealed that engaging in the RLO process had an impact on students' attitudes toward the culture of Trinidad and Tobago. Implications exist for the creation and delivery of vicarious learning tools such as RLOs and for the globalization of students.

Introduction

Understanding students' attitudes, opinions and perceptions is a critical component of the educational process. This understanding becomes even more critical when one considers the need to encourage global awareness as instructors strive to identify ways to positively impact student perceptions related to international settings.

Attitudes can be defined as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein and Ajzen, 1975, p. 6). In accordance with this definition, attitudes can directly impact a student's willingness to learn and be open to new information. One goal of undergraduate education is to create "thoughtful professionals and better informed citizens" (Walter and Reisner, 1992, p. 20) who can participate in educated conversations about agricultural related topics. Hobbs and Chernotsky (2007) stated "[t]o be productive citizens in the 21st century, students need to understand the challenges facing the world today" (p. 2). Regardless of the setting, negative attitudes toward international locations indirectly impact a student's global perspective. Wingenbach et al. (2003) reported that agricultural education students had less than desirable knowledge of global issues and that there was a need to provide opportunities to increase this knowledge.

As shared by Knight (1994), "Curriculum is the backbone of the internationalization process" (p. 6). Colleges of Agriculture strive to provide a global perspective in the classroom. In fact, study abroad and international internships are excellent ways to impact attitude – but these are not always possible or even pursed by agriculture students. In the 2009/2010 academic year, 1.3% of students from the United States (approximately 3,500) that studied abroad were from the field of agriculture (Institute of International Education, 2011).

Studies have been conducted that have confirmed the benefit of direct exposure to international settings through travel such as study abroad, organized international tours and international internships. Bruening et al. (2002) wrote that students who participated in an extended field trip to Puerto Rico "indicated that the experience was important, valuable and meaningful

[1]This project was supported by Higher Education Challenge Grant no. FLAE–2009–00865 from the USDA National Institute of Food and Agriculture.
[2]Agricultural Leadership, Education and Communications Department, 979-458-2304, mranda.sandlin@agnet.tamu.edu, Ph.D.
[3]Agricultural Leadership, Education and Communications Department, 979-458-2749, t-murphrey@tamu.edu, Assistant Professor
[4]Agricultural Leadership, Education and Communications Department, 979-458-2701, j-lindner@tamu.edu, Professor
[5]Agricultural Leadership, Education and Communications Department, 979-847-6180, k-dooley@tamu.edu, Professor and Associate Dean for Academic Operations

to them and their professional and personal lives" (p. 73). Stephens and Little (2008) found that student teachers "enhanced their self-confidence, leadership abilities and global awareness by participating in an international experience" (p. 54). Boyd et al. (2001) reported that participation in an international youth exchange generated interest in global issues and influenced participants to be more culturally sensitive. However, while these activities might be the most impactful methods of exposure to international settings, there are many limitations. Expense and access are very real limitations for undergraduate students enrolled in Colleges of Agriculture. Wingenbach et al. (2006) reported that students indicated barriers to participation in international experiences as including "personal safety, language and financial barriers and missing their family" (p. 79) while Irani et al. (2006) confirmed these barriers and noted them as "concern about financial costs and overall time involved" (p. 27).

While interest in participating in international experiences has been documented (Briers et al., 2010), the reality of actual participation is another matter. Briers et al. reported that greater than 70% of students "felt that participating in a study abroad program would improve their competitiveness in the global marketplace" (p. 17) while at the same time a 2008/2009 report of participation in study abroad at Texas A&M University was only 2.69% of the approximately 6,200 students in the College of Agriculture (Study Abroad Programs Office, 2009).

One potential means of exposing students to international topics without leaving the classroom is through vicarious learning which has been defined as knowledge acquisition through the observation of behaviors of individuals or forms of media (Bandura, 1977; Schunk, 2004). In the context of training, *"[p]reliminary research seems to indicate that vicarious learning has significant advantages over more traditional methods"* (Manz and Sims, 1981, p. 112). Schunk (2004) also indicated that vicarious learning may be a more efficient method of learning because the individual is not required to perform all of the behaviors to learn a task.

Boyd et al. (2004) found that *"it is feasible to provide agricultural students with a realistic international experience using an asynchronous simulation"* (p. 67); the students were able to learn international agricultural concepts, such as small-farmer decision consequences, via media observations. The advantages of vicarious learning as it relates to international experience also include the convenience of not having to travel and also the potential for substantial cost savings – addressing the limitations shared by previous researchers regarding barriers to student participation in study abroad opportunities. These advantages extend to safety issues and an expanded reach as we consider international experiences for students.

Creating methods to address the need for global awareness is important. Agricultural educators have continuously sought new and better ways to provide education for students in ways that can have a positive impact. Use of the Internet in the broad sense (Molnar and Fields, 2004), the use of audio/video technology (Miller and Honeyman, 1993; Siciliano et al., 2011), online lessons (Mamo et al., 2004) and online course platforms and technologies (Murphrey et al., 2012; Strong et al., 2012) are just a few examples of ways that agricultural instructors have sought to improve instruction in the classroom. In fact, Boyd et al. (2004) reported that an online international simulation was found to increase undergraduate student understanding of international development. Creative ways to expose students to international settings are needed and these methods should be tested for impact on altering student attitudes because attitude ultimately begets action.

Reusable Learning Objects (RLOs) are an emerging method for both online and classroom application that could meet this need. The use of the term "learning object" (Farha, 2009; Hodgins, 2004; IEEE, 2002) can be seen in publications that relate to the use of educational technology, while the concept of "reusability" has been addressed in the context of distance learning (Sicilia and Garcia, 2003) and digital information (Polsani, 2003). "RLOs are units of content and educational structure divided into reusable objects and modules" (Tate and Hoshek, 2009, p. 51). Reusable Learning Objects are further described as "digital, self-contained, reusable entit[ies] with a clear learning aim that contains at least three internal changing components: content, instructional activities and context elements" (Laverde et al., 2007, p. 675). Reusable Learning Objects created by faculty who have visited a foreign country have the potential to provide students an in-classroom experience that would otherwise require international travel to obtain. In addition, RLOs can allow an expanded reach of faculty beyond the faculty who had the opportunity to travel abroad. The creation of RLOs by faculty has been implemented as a means of enhancing classroom experiences in relation to international experience. However, it was not known whether or not this method was an effective tool in altering student attitudes and opinions about the international location.

Theoretical Framework

The theoretical framework of this study was based on Bandura's (1977) social learning theory. Social learning theory was originally developed as a behavioral modeling theory but has evolved to also include attitudes and emotional reactions and is now a model that describes observation, imitation and modeling as a means of learning (see Figure 1); it is also known as social cognitive learning (Bandura, 1977). The social learning theory indicates that the combination of personal, behavioral and environmental determinates leads to learning.

Bandura (1977) described personal determinates as events in an individual's life that have molded their thinking, feeling and physical traits. These

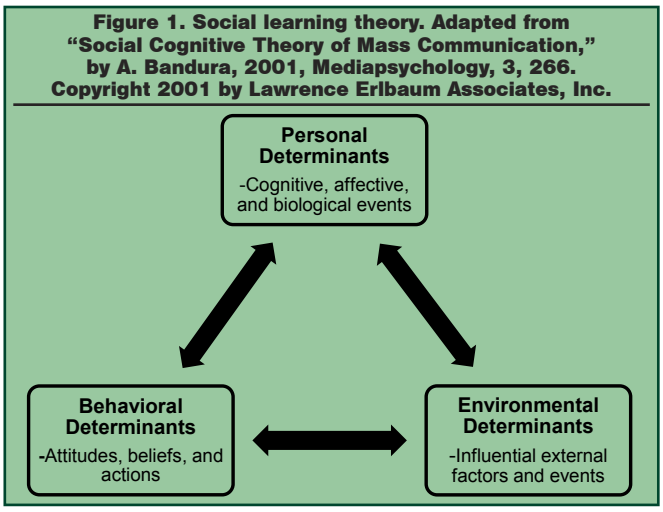


Figure 1. Social learning theory. Adapted from "Social Cognitive Theory of Mass Communication," by A. Bandura, 2001, Mediapsychology, 3, 266. Copyright 2001 by Lawrence Erlbaum Associates, Inc.

characteristics are indicated to be innate, or internal, to an individual. Behavioral determinants represent the patterns of an individual's actions, attitudes and beliefs (Bandura, 1977). These determinants are a combination of the values, ethics and morals that an individual holds and the outward expression of these factors. Environmental determinants are a compilation of external factors that influence the holistic individual (Bandura, 1977).

Study Context

Providing students with an opportunity to gain an understanding of global issues and international settings is critical. The researchers believe that achieving this goal could be accomplished through the use of RLOs to create opportunities for vicarious learning which could, in turn, impact attitudes and opinions regarding international settings. Each faculty member that participated in the Trinidad and Tobago Faculty Abroad experience with the Department of Agricultural Leadership, Education and Communications at Texas A&M University in 2011 created a reusable learning object (RLO) that addressed a topic in their field of expertise in relation to the culture of Trinidad and Tobago. Each RLO was a digital file that included a learning objective, a lesson and an assessment. The lesson content and presentation was unique to each RLO; some used video recorded interviews, others used photographs, etc. The RLOs may be accessed at www.globaleducationlab.org. In this study, students experienced one of the created RLOs as a cognitive event in an effort to change their attitudes toward the culture of Trinidad and Tobago. Due to the reciprocal causation nature of Bandura's (1977) social learning theory, if there is an impact on students' attitudes, there will also be an effect on their affective characteristics, beliefs and attitudes and their willingness to experience other environmental experiences, such as a study abroad or international travel.

Purpose and Objectives

The purpose of this study was to measure the impact of reusable learning objects (RLOs) that were created related to the culture of Trinidad and Tobago on undergraduate agricultural students' attitudes about the country. It is important to note the individual RLOs and their content were not being assessed, rather the impact of the RLOs on student attitudes of an international location. The following objectives guided the study: (1) create a Thurstone scale to measure student attitude change based on exposure to RLOs focused on the culture of Trinidad and Tobago, (2) identify students' attitudes of the culture of Trinidad and Tobago before and after the use of an RLO during class and (3) compare pre and post student attitudes and identify changes. Institutional Review Board approval was received for this study.

Methods

Instrument Development

Objective one of the study was to create a Thurstone scale to measure student attitude change regarding the culture of Trinidad and Tobago. The Thurstone scale is designed to measure a participant's "attitude as expressed by the acceptance or rejection of opinions" (Thurstone, 1928, p. 533). Thurstone (1928) also noted that a participant's attitude may change *"due to unknown causes or to the presence of some known persuasive factor such as the reading of a discourse on the issue in question"* (p. 533). For this study, the persuasive factor was the RLO. In accordance with Trochim and Donnelly (2007), the researchers developed a Thurstone scale by: developing the focus, generating potential scale items, rating the scale items, computing scale score values for each item, selecting the final scale items and administering the scale. Ultimately, a Thurstone scale results in a single score from multiple items that represents participants' attitude toward a given topic; it is a single summated score.

An instrument should be developed with a well-defined focus for the scale and the description of the focus and what the researcher is measuring should be clear for the respondents (Trochim and Donnelly, 2007). The researchers in this study defined the focus for the scale by creating the following focus command for participants to respond to: Generate statements that describe specific attitudes that people might have about the culture of Trinidad and Tobago. The students were not given additional information about the country; the goal of this prompt was to gain general statements about the culture of Trinidad and Tobago from the perspective of individuals who had similar experiences and education with the topic.

The researchers generated potential scale items by obtaining a large set of statements (Trochim and Donnelly, 2007). Two classes of approximately 60 students each were given note cards, asked to write one statement per note card and to generate as many statements as possible in response to the focus command. These students were not members of the population who engaged in the RLOs; they were used to

obtain general statements about the culture of Trinidad and Tobago as representatives of the larger student peer group. A total of 320 statements were generated. The researchers sorted the cards into themes so that representative statements could be easily chosen; 17 themes were identified and a total of 32 representative statements were selected.

To rate the scale items, the 32 statements were placed on an instrument with an 11-point scale, with one being least favorable to the concept and 11 being most favorable to the concept (Trochim and Donnelly, 2007). The same two classes of students were asked to indicate how favorable, on a scale of 1-11, each statement was about the culture of Trinidad and Tobago (i.e., "Trinidad and Tobago has beautiful beaches." is a favorable statement and "Trinidad and Tobago is a dangerous place." is not a favorable statement).

The scale score values for each item were computed using SPSS to determine the median and the interquartile range. Two statements were initially chosen from each of the 11 median values. The two statements within each median value were chosen because they had the smallest interquartile range values and, therefore, the least amount of variability across the responses (Trochim and Donnelly, 2007).

Each statement was then assessed by the researchers to ensure clarity and one from each median value was chosen to represent the final scale (Trochim and Donnelly, 2007). The median value (1-11) became the scale value for the corresponding statement. A final, pre and post instrument was created with the 11 statements; the response options were agree and disagree for each statement. Agree was assigned the scale score (i.e., 1-11), disagree was assigned a value of zero (Trochim and Donnelly, 2007). The same 11 statements were included on both the pre and post assessments; Table 1 shows these items and their corresponding scale score.

Study Population and Instrument Administration

The population of the study consisted of four classes containing a total of 103 students. The students were enrolled in a course in a College of Agriculture that was under the instruction of a faculty member who created an RLO related to their specific content area and culture in Trinidad and Tobago. Each RLO contained a learning objective, media-rich content and a learning assessment. The students engaged in the RLO components that were created by their instructor. Data were collected during the 2012 Spring and Summer semesters. Prior to RLO use, students were asked to complete the pre-assessment. The faculty members conducted class using the components of their RLO and then the students were asked to complete the post-assessment. There were 100 usable instruments collected; three were not included because they were not fully completed.

The instruments were scored by the researchers. To calculate a student's total scale score, the researchers averaged the scale scores of the items that the student agreed with; responses of "disagree," a zero value, were not calculated into the average (Trochim and Donnelly, 2007). This process determined the student's location on the scale; the same was done for the post responses. If a student's response location on the scale increased in value from the pre to the post assessment, their attitude toward the culture of Trinidad and Tobago was considered to have moved in a favorable direction. If a student's response location on the scale decreased in value from the pre to the post assessment, their attitude toward the culture of Trinidad and Tobago was considered to have moved in an unfavorable direction (Trochim and Donnelly, 2007). This study was deemed exempt by the Texas A&M University Institutional Review Board.

Findings

Objective two of the study was to identify students' attitudes of the culture of Trinidad and Tobago before and after an RLO presentation. Descriptive statistics of both the pre and post data were calculated to determine the response frequencies for each survey item. Table 1 shows the statement, the corresponding scale score (favorability rating) and the frequencies of response for both Agee and Disagree on the pre-test and the post-test. The mean scores of the population's attitude toward the culture of Trinidad and Tobago for both the pre-test and post-test data sets (see Table 2) were calculated by multiplying the number of Agree responses by the favorability score for each statement. The resulting numbers were averaged by adding them together and

Table 1. Pre and Post-test Response Frequency for Each of the Eleven Statements (N=100)

Statement	Favorability Score	*f* Pre-test		*f* Post-test	
		Agree	Disagree	Agree	Disagree
Trinidad and Tobago is a dangerous place.	2	41	59	12	88
Trinidad and Tobago is considered a low income country.	2	83	17	68	32
Hurricanes cause a lot of damage in Trinidad and Tobago.	3	72	28	54	46
The people of Trinidad and Tobago do not speak English.	4	22	78	19	81
The country of Trinidad and Tobago is densely populated.	5	52	48	43	57
The people of Trinidad and Tobago live in small communities.	6	85	15	85	15
The people of Trinidad and Tobago eat a lot of seafood.	7	79	21	83	17
The people of Trinidad and Tobago are skilled in producing crafts.	8	95	5	84	16
The culture of Trinidad and Tobago is friendly.	9	93	7	99	1
Trinidad and Tobago has unique celebrations that attract tourists.	9	87	13	85	15
Trinidad and Tobago has beautiful beaches.	10	92	8	97	3

Note. Items are listed in ascending order of favorableness.

Table 2. Means With Standard Deviations of Students' Attitudes Toward Trinidad and Tobago Pre and Post Reusable Learning Object Presentation (N=100)

Assessment	M	*SD*
Pre-test	6.46	0.63
Post-test	6.97	0.69

Note: The Mean (*M*) was calculated by multiplying the number of Agree responses by the favorability score for each statement and then the resulting numbers were averaged by adding them together and dividing by the total Agree frequency count. Scale: 1=least favorable, 11=most favorable

dividing by the total Agree frequency count. The overall pre (M=6.49, SD=0.63) and post (M=6.97, SD=0.69) RLO attitudes of the students toward the culture of Trinidad and Tobago were identified.

Objective three of the study was to compare student attitudes toward the culture of the international setting based on the pre and post assessments and identify any changes that may have resulted. The attitudes of the population, in relation to the scale scores (1=least favorable, 11=most favorable), were found to be positive in both assessments. The means were entered into a paired samples t-test to compare the difference between the mean of the students' attitudes toward the culture of Trinidad and Tobago before engagement in the RLO process (M=6.49, SD=0.63) and after the RLO process (M=6.97, SD=0.69); the difference was found to be significant ($t=5.27$, $df=99$, $p<0.01$).

Conclusions and Discussion

Objective one was a methodological objective. The objective was achieved through the creation of an instrument following guidelines articulated by Trochim and Donnelly (2007). It was concluded that the creation of the instrument using the Thurstone scale was an effective method of measuring change in attitude.

Objective two identified students' attitudes of the culture of Trinidad and Tobago before and after an RLO was used to present content and assess learning in a classroom. Based on findings, it was concluded that students' attitudes toward the culture of Trinidad and Tobago were changed as a result of being exposed to the contents of the RLO. It was further concluded that after viewing the media-rich content and completing the assessment of the RLO, many students chose to agree with more positive statements and disagree with more negative statements on the post assessment (see Table 1). These findings are consistent with social learning theory (Bandura, 1977) in that the students personal determinates had an effect on their behavioral determinates (see Figure 1).

Objective three measured the change in students' pre-assessment to post-assessment attitudes of the culture of Trinidad and Tobago. Given the finding that students' attitude score was significantly different between the pretest and the posttest, it was concluded that the RLO impacted students' attitudes. Because the mean moved in a positive direction on the Thurstone scale (see Table 2), the students' attitudes toward the culture of Trinidad and Tobago were found to have become more favorable after viewing the contents of the RLO. In accordance with the social learning theory (Bandura, 1977), students in this study were exposed to a cognitive event in a learning environment and were able to learn vicariously. Similar to the findings of Boyd et al. (2004) that indicated asynchronous simulation as a viable means of providing agricultural students an international experience, agricultural students in this study learned cultural lessons through the use of reusable learning objects and, as a result, changed their attitudes toward the culture of Trinidad and Tobago.

This study provided evidence that RLOs have the potential to impact change in student attitude toward international settings. It is recognized that limitations to the study do exist. As with any educational activity, characteristics of the RLO such as length, media use, content and structure along with the way the RLO is developed and delivered can directly impact the results of that activity. However, this study provides a first-step in documenting impact. Documentation of impact is critical in order to garner support to further the development and promotion of RLO use. Additional study is required to document best practices and also factors that determine success and impact. Further research is also needed to determine if the use of RLOs is more or less effective than other teaching methods within college of agriculture classrooms.

Implications and Recommendations

Technology continues to provide opportunities to enable faculty to impact students with new and creative methods. The conclusion that the use of RLOs in the classroom significantly impacted students' attitudes implies that the use of RLOs in the classroom has potential in regard to influencing students' attitudes toward international settings. This impact could, in turn, influence a student's decision to participate in activities such as study abroad programs. This impact is in accordance with Bandura's (1977) social learning theory in that the altering of attitudes can lead to changes in environmental determinates; students may become more comfortable with the idea of participating in study abroad programs, international internships, international field trips and societal participation, as a whole. The documentation of the significant impact of RLO use in the classroom implies that resources spent on the development of these RLOs would be well spent, especially given that the process can enable one faculty member to reach many students. The implications for broader reach are notable as the reusable nature of the learning objects allow for open-access to the materials by educators at all levels if appropriate. In this case, it allows for access to content specific, culturally rich information about agricultural topics.

The intent of this study was not to identify ways to replace international activities such as study abroad, international internships, or international field trips, but rather to identify a means to engage

students and encourage these students to participate in additional activities through the altering of attitudes toward international settings. As shared earlier, only a small percentage of students actually participate in international activities that require travel outside of the United States.

Based on the findings and conclusions of this study, it is recommended that faculty members use vicarious learning methods, as described by Bandura (1977) and Schunk (2004), to incorporate context-specific, international concepts into their curriculum. The nature of vicarious learning suggests that learners may not experience many of the usual steps and nuances that a learner may experience while learning in a traditional method (Schunk, 2004). Considering this, it is imperative that the creators of vicarious learning materials take extra care in accurately representing content and context in their RLOs.

Further study is recommended to document the value and impact of RLO use in regard to their effect on attitude toward international settings. In fact, it is recommended that follow-up studies be conducted with students who participated in the original study to see if these students have a higher likelihood of deciding to participate in an international activity that requires travel outside the United States. In addition, further study could determine if the impact of the RLO is diminished if a faculty member other than the one who created it actually administers it in the classroom. If it can be documented that the impact of RLO use maintains significance regardless of who administers the RLO, the potential for impact is great and the potential for expanded reach is notable.

Perceptions hold the key to reality in regard to student interest and engagement in international program participation. Scholars have noted the importance of engaging undergraduate students in international issues and thus, creating "thoughtful professionals and better informed citizens" (Walter and Reisner, 1992, p. 20). This study documented one method of working toward that goal.

Literature Cited

Bandura, A. 1977. Social learning theory. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. 2001. Social cognitive theory of mass communication. Mediapsychology, 3, 265-299. DOI: 10.1207/S1532785XMEP0303_03

Boyd, B.L., S.R. Felton and K.E. Dooley. 2004. Providing virtual experiences for undergraduates. Jour. of International Agr. and Extension Education 11(3), 63-68. DOI: 10.5191/jiaee.2004.11307

Boyd, B.L., C. Giebler, M. Hince, Y. Liu, N. Mehta, R. Rash and Y. Yanta. 2001. Does study abroad make a difference? An impact assessment of the International 4-H Youth Exchange program. Jour. of Extension, 39(5). Retrieved from http://www.joe.org/joe /2001october/rb8.php

Briers, G.E., G.C. Shinn and A.N. Nguyen. 2010. Through students' eyes: Perceptions and aspirations of college of agriculture and life science students regarding international educational experiences. Jour. of International Agr. and Extension Education 17(2), 5-20.

Bruening, T.H., J. Lopez, D.F. McCormick and D.R. Dominguez. 2002. Active learning: The impact on students participating in an extended field trip to Puerto Rico. Jour. of Agr. Education, 43(4), 67-75.DOI: 10.5032/jae.2002.04067

Farha, N.W. 2009. An exploratory study into the efficacy of learning objects. The Jour. of Educators Online 6(2), 1-31. Retrieved from http://www.thejeo.com/Archives /Volume6Number2/FarhaPaper.pdf

Fishbein, M. and I. Ajzen. 1975. Belief, attitude, intention and behavior: An introduction to theory and research. Reading, MA: Addison-Wesley.

Hobbs, H.H. and H.I. Chernotsky. 2007. Preparing students for global citizenship. In: Proc. American Political Science Association Teaching and Learning Conference, Charlotte, NC, 9-11 Feb. Retrieved from http://www.apsanet.org/tlc2007/TLC07HobbsChernotsky.pdf

Hodgins, W.H. 2002. The future of learning objects. In: Proc. of 2002 eTEE Conference: e-Technologies in Engineering Education - Learning Outcomes Providing Future Possibilities, Davos, Switzerland, 11-16 Aug.

IEEE. 2002. Draft standard for learning object metadata. New York: The Institute of Electrical and Electronics Engineers, Inc.

Institute of International Education. 2011. U.S. study abroad: Fields of study. Open Doors Report on International Educational Exchange. Retrieved from http://www.iie.org/Research-and-Publications/Open-Doors/Data/US-Study-Abroad/Fields-of-Study/2000-10

Irani, T., N.T. Place and C. Friedel. 2006. Beliefs, attitudes, perceptions and barriers toward international involvement among college of agriculture and life science students. Jour. of International Agr. and Extension Education 13(2), 27-37.DOI: 10.5191/jiaee.2006.13203.

Knight, J. 1994. Internationalization: Elements and checkpoints (CBIE Research No. 7). Retrieved from Canadian Bureau for International Education website: http://quic.queensu .ca/resources/training/files/CBIE_Internationalization_Elements_and_Checkpoints.pdf

Laverde, A.C., Y.S. Cifuentes and H.Y.R. Rodrigues. 2007. Toward an instructional design model based on learning objects. Educational Technology, Research and Development 55(6), 671-681.DOI: 10.1077/s11423-007-9059-0

Mamo, M., T. Kettler, D. Husmann and D. McCallister. 2004. Assessment of an on-line erosion lesson as a teaching tool in introductory soil science. NACTA Jour. 48(3), 47-52.

Manz, C.C. and H.P. Sims Jr. 1981. Vicarious learning: The influence of modeling on organizational behavior. The Academy of Management Review 6(1), 105-113.

Miller, G. and M. Honeyman. 1993. Attributes and attitudes of students enrolled in agriculture off-campus videotaped courses. Jour. of Agr. Education 34(4), 85-92.DOI: 10.5032/jae.1993.04085

Molnar, J.J. and D. Fields 2004. Using the Internet for instruction: Experiences, possibilities and considerations. NACTA Jour. 48(4), 12-19.

Murphrey, T.P., S. Arnold, B. Foster and S.H. Degenhart. 2012. Verbal immediacy and audio/video technology use in online course delivery: What do university agricultural education students think? Jour. of Agr. Education 53(3), 14-27.DOI: 10.5032/jae.2012.03014

Polsani, P.R. 2003. Use and abuse of reusable learning objects. Jour. of Digital Information, 3(4). Retrieved from http://journals.tdl.org/jodi/index.php/jodi/article/view/89/88

Sicilia, M. and E. Garcia. 2003. On the concepts of usability and reusability of learning objects. International Review of Research in Open and Distance Learning (4) 2, 1-11. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/155/702

Siciliano, P.C., M.A. Jenks, M.N. Dana and B.A. Talbert. 2011. The impact of audio technology on undergraduate instruction in a study abroad course on English gardens. NACTA Jour. 55(2), 46-53.

Schunk, D.H. 2004. Learning theories: An educational perspective (4th ed.). Upper Saddle River, NJ: Pearson Education.

Stephens, C.A. and D. Little. 2008. Testimonies from four agricultural education student teachers related to completing an international student teacher experience in New South Wales, Austr. Jour. of Agr. Education 49(3), 46-55.DOI: 10.5032/jae.2008.03046

Strong, R., T.L. Irby, J.T. Wynn and M.M. McClure. 2012. Investigating students' satisfaction with eLearning courses: The effect of learning environment and social presence. Jour. of Agr. Education 53(3), 98-110.DOI: 10.5032/jae.2012.03098

Study Abroad Programs Office. 2009. International education participation: College distribution executive summary (2008-2009 Report). Retrieved from Texas A&M University website: http://globalsupporttest.tamu.edu/sites/default/files/files/SAPO%20Breakdown%20by%20College&Major%2008-09.pdf

Tate, M. and D. Hoshek. 2009. A model for the effective management of re-usable learning objects (RLOs): Lessons from a case study. Interdisciplinary Jour. of E-Learning and Learning Objects 5, 51-72.

Thurstone, L.L. 1928. Attitudes can be measured. American Jour. of Sociology 33(4), 529-554. Retrieved from http://www.jstor.org/stable/2765691

Trochim, W.M.K. and J.P. Donnelly. 2007. The research methods knowledge base (3rd ed.). Cincinnati, OH: Atomic Dog Publishing.

Walter, G. and A. Reisner. 1992. Developing student opinions on agricultural issues. Jour. of Environmental Education 23(4), 15-21.DOI:10.1080/00958964.1992.9942803

Wingenbach, G.J., B.L. Boyd, J.R. Lindner, S. Dick, S. Arispe and S. Haba. 2003. Students' knowledge and attitudes about international agricultural issues. Jour. of International Agr. and Extension Education 10(3), 25-35.DOI: 10.5191/jiaee.2003.10304

Wingenbach, G.J., N. Chmielewski, J. Smith, M. Piña, Jr. and W.T. Hamilton. 2006. Barriers to international experiential participation. Jour. Of International Agr. And Extension Education 13(3), 79-89. Retrieved from http://www.aiaee.org/attachments/165 _Wingenbach-Vol-13.3-6.pdf

College Students' Knowledge of Sustainable Agriculture and its Implications on the Agricultural Education Curriculum[1]

Isaac Sitienei[2]
Louisiana State University
Baton Rouge, LA

Douglas G. Morrish[3]
Texas State University-San Marcos
San Marcos, TX

Abstract

The purpose of the study was to assess college students' level of agreement with statements defining sustainable agricultural practices and their knowledge level of twelve selected sustainable practices. A total of 500 students from the Departments of Agriculture and Geography were selected to participate in the study, out of which, 301 responded, for a 60.2 % response rate. The results of the study indicate that students were in general agreement with statements defining sustainable agriculture. However, many students indicated having little knowledge on the most common sustainable agricultural practices. Out of the twelve sustainable agricultural practices analyzed, students indicated that they had the least knowledge on integrated pest management (IPM) (M = 2.57) and the most knowledge on using animal manure as fertilizer (M = 3.46). Mean comparison of students' knowledge levels on each of the practices generated the highest mean for the Agricultural Education graduate students. Animal Science majors indicated having the least knowledge in eight out of the 12 practices. Results from this study indicate a clear need for additional efforts from agricultural educators to incorporate sustainable agriculture topics into their curricula.

Introduction

Sustainability rests on the principle that we use available natural resources to meet our present needs without compromising the ability of future generations to derive enough satisfaction from the same set of resources (Muma et al., 2010). In general terms, an activity is considered sustainable if it can be carried out indefinitely without depleting resources. Futures forecasting and early adoption constituents indicate that agricultural systems must provide the food and fiber that humanity needs today, but also be able to sustain what the human family will require a decade or even a century from now (Robertson and Swinton, 2005). Educational systems will need to equip students with the knowledge of sustainable agriculture as a viable solution to combat the problems of resource depletion and environmental misuse.

Inclusion of sustainable agriculture topics in both the high school and college agriculture curriculum can provide solutions to the environmental problems associated with production. Williams (2000) indicated that a sustainable agriculture curriculum could indeed enhance a lasting rural economic development by enriching the scientific teaching of agriculture in colleges and schools. This in turn strengthens and expands college students' prowess. One of the most common inadequacies of the traditional agriculture curriculum may range from too much emphasis on classwork but very little hands-on activities in the field (Borsari, 2001). Experiential learning approach to agriculture avails a practical education system to students. Linking the real world with the classroom should be the concern of every curriculum developer. Sustainable agriculture is an interdisciplinary field in nature that offers solutions to complex societal and environmental problems in the agri-food system, all of which have been unapproachable by any single discipline in agriculture (Francis et al., 2003).

Keating et al. (2010) indicated that a highly technical curriculum for high school and college students

[1]Approval of the study was sought from Texas State University Institutional Review Board (IRB). The study qualified for exemption following the protocols outlined by Texas State University IRB.

[2]PhD candidate, Department of Agricultural Economics, 101 Martin Woodin Hall, Baton Rouge, LA 70803, (512)-216-7622, isitie1@tigers.lsu.edu

[3]Associate Professor, Department of Agriculture, 601 University Dr., San Marcos, TX 78666 (512)-245-3321, dm43@txstate.edu

is mandatory to adequately prepare students for successful careers and enable them to make informed choices in the global agricultural and natural resource management industries. Proper curriculum development and student preparation is important in enhancing the theme of sustainability. Curriculum materials should equip students with appropriate knowledge on how to utilize available resources to generate a lifetime stream of satisfaction. This paper contributes to the general understanding of students' level of agreement on the important practices of sustainable agriculture and the knowledge level of this important field of agriculture.

The Sustainable Agriculture Research and Education program has been on the forefront advocating for farm practices that are profitable and good for the environment. It has been able to do this through research and provision of education grants. The National Research Council is the other agency that has been greatly involved in the promotion of sustainable agriculture curriculum (NRC, 2013). The Council has been instrumental in the distribution of instructional materials nationally to assist in integrating sustainable agriculture into high school agricultural education curriculum addressing topics including soil and water conservation, land use and air quality control (NCAE 2000; Muma, 2006).

Social Reconstruction ideologists uphold similar societal beliefs regarding the role of education in reconstructing society to keep it sustainable. They have confidence in the ability of educators to infuse knowledge to citizens in order to protect their environment and surroundings from destruction (McNeil, 2006). An undergraduate sustainable agriculture program relates well with social reconstruction theory. Social-reconstructionism assumes that the survival of our society is threatened by many problems. The theory proposes that the goals of any education system should include interests of individuals as well as those of the entire society. The most pressing societal needs should be the basis of curriculum development, teaching, learning and evaluation. The theory assumes that all individuals have the responsibility for the stewardship of the natural resources surrounding them. The theory further argues that most curricula lack universal learning objectives and content because they prioritize contextual problems in educational processes (McNeil, 2006). Institutions of higher education should move towards participatory and systemic learning for sustainable development. This action makes students appreciate, understand and think critically about complex environmental, social and economic problems.

This study undertook a wide investigation of students' knowledge and perceptions toward some of the environmental issues raised by Leeuwis (2000) and Al-Subaiee et al. (2005). Major environmental concerns today include soil degradation, erosion, water pollution, excessive use of chemicals, waste of water, decreasing ground water tables, destruction of wildlife natural habitats and insects' and pests' resistance to insecticide and pesticide (Leeuwis, 2000; Al-Subaiee et al., 2005). This study is also meant to arouse the interest among agricultural educators to look at these farming practices from a more holistic perspective when developing educational curriculum addressing sustainability. Integrating knowledge across the many disciplines in agriculture will help to provide solutions to agricultural issues that are informed by social science research (Osborne, 2011).

Materials and Methods

The instrument was comprised of two sections. The first section required students to provide their demographic information such as gender, college major, ethnicity, educational classification, the area they grew up in and age. The source where they gained most exposure to sustainable agriculture: high school, undergraduate courses and/or graduate courses was also included in this section. Section two of the survey was comprised of two sets of questions. The first set required students to rate their level of agreement with statements defining the important aspects of sustainable agriculture on a five-point Likert scale with 1= strongly disagree and 5 = strongly agree. The second set of questions asked students to rate their level of knowledge on twelve sustainable agricultural practices with 1 = no knowledge and 5 = high knowledge.

Selection of the twelve sustainable agricultural practices was guided by extensive review of the appropriate literature materials. Both plant and animal related practices were evaluated to control for any possible bias on the sampled student population. Studies that were instrumental in defining sustainable agricultural practices included: Borsari (2001); Borsari and Vidrine (2005); Conroy (2000); Walter and Reisner (1994). Conroy (2000) defined sustainable agriculture as a system guided by a positive time preference attitude that aim at meeting the basic needs of the present generation without sacrificing the ability of the available resources to satisfy the needs of the future generations.

To account for instrument reliability, a pilot test was conducted with a group of 16 students from the Department of Agriculture who did not appear in the random sample. All 16 students responded to the pilot test for a 100% response rate. The pilot test indicated a reliability coefficient of α = .93 and α = .94 for the two sets of questions on students' level of agreement on the important aspects of sustainable agriculture production and knowledge level of twelve sustainable agricultural practices. The instrument was deemed reliable and the data collection process began.

A list of the total number of students in the Departments of Agriculture and Geography was retrieved from the Administrative Assistant in each of the respective departments. A total of 281 students appeared in the Agriculture database and 219 in the Department of Geography. The sample population consisted of Agricultural Education graduate students and undergraduate

students majoring in Animal Science, Pre-vet, Agricultural Systems, Agriculture Teacher Certification, Horticulture, General Agriculture, Agribusiness and Resource and Environmental Studies. Email surveys were sent on January 26, 2011 to a total of 500 students. Each email contained an introduction from the researcher, an explanation of the survey, an explanation of the incentive drawing of a $25 Wal-Mart gift card and a link to the survey. A total of three reminder emails were distributed, as well as a fourth hard copy mailed instrument to increase response rate (Dillman, 2007).

Data was collected via Qualtrics software and was uploaded directly into an SPSS 13.0 data file. A total of 302 of the 500 students responded, yielding an overall response rate of 60.4%. Results of the survey were reported using frequencies and descriptive statistics. Demographic information obtained from section one as well as results from section two of the survey is discussed below.

Results and Discussion

Of the 301 student respondents, 156 (51.7%) were male and 145 (48.3%) were female. When examining student ethnicities, 236 (78.1%) were Caucasians, 42 (13.9%) Hispanic and the remaining 24 (7.3%) individuals were either African Americans or international students. The respondents were aggregated by major for investigation purposes. Seventy five (24.8%) of the students were majoring in Resource and Environmental studies, 43 (14.2%) General Agriculture, 40 (13.2%) Agribusiness and 38 (12.6%) Horticulture. Additional majors are included in Table 1. Students' major source of exposure to sustainable agriculture was also investigated. Approximately 152 (50.3%) of the students indicated courses taken at the university level as their main source of exposure to sustainable agriculture. The remaining group of students, (n=35), indicated high school and professional development courses as their major sources of sustainable agriculture knowledge (n=18).

The main sources of exposure discussed above alongside others solicited in the survey but not discussed here need to be further explored. This study's main objective was to disaggregate students' perceptions on sustainable agriculture based on their college majors. Additional investigation on the effect of ethnic background on the exposure to this important topic is therefore necessary.

Table 1. Participant Classification Based on Majors

College Major	*n*	%
Resource & Environmental studies-Undergraduate	75	24.8
General Agriculture	43	14.2
Agribusiness Management	40	13.2
Agribusiness Management Horticulture	38	12.6
Animal science	35	11.6
Animal Science – Pre Vet	21	7.0
General Agriculture with Teacher Certification	20	6.6
Agribusiness Management Ag Systems	17	5.6
Agricultural Education – Graduate	12	4.0
Total	301	100

Overall means of students' level of agreement with statements about sustainable agriculture production were evaluated. As shown in Table 2, students were in general agreement that sustainable agriculture production promotes the well-being of the ecosystem (M = 4.28). Following closely was the statement that sustainable agriculture conserves natural resources (M = 4.27). Mean values for the other statements were as follows, sustainable agriculture promotes long-term land productivity (M = 4.25), allows farmers to sell products locally (M = 4.03) and promotes food safety (M = 4.03). The statement that sustainable agriculture assures profitable returns from farm enterprises scored the lowest mean (M = 3.47). This suggests that students were indifferent regarding the relationship between profitability and sustainable agricultural practices. Additional levels of agreement can be found in Table 2.

Table 2. Overall Means for Students' Level of Agreement with Sustainable Agriculture Production

Sustainable agriculture production:	*n*	*M**	*SD*
promotes the well-being of our ecosystem	276	4.28	.84
conserves natural resources	276	4.27	.80
promotes long-term land productivity	276	4.25	.84
allows farmers to sell products locally	276	4.04	.79
promotes food safety	276	4.03	.87
reduces ground water contamination	276	3.99	.90
benefits small-scale farmers	276	3.98	.93
increases farm income	276	3.49	.87
assures profitable returns	276	3.47	.86

* Scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

Descriptive statistics were also utilized to determine students' level of knowledge on twelve sustainable agricultural practices. Means obtained indicated that students who participated in the survey believed themselves to be moderately knowledgeable on the selected sustainable agricultural practices. The overall means for all practices studied ranged between (M = 2.57) and (M = 3.46) which on a Likert-type scale represented a range between little knowledge and moderate knowledge. Students indicated the most knowledge on the use of animal manure as fertilizer (M = 3.46) while IPM generated the lowest mean (M = 2.57). Student knowledge on other sustainable farm practices was evaluated and results recorded in Table 3.

Table 3. Overall Means for Students' Level of Knowledge on Selected Sustainable Agricultural Practices

Practice	n	M*	SD
Use of animal manure as fertilizer	276	3.46	1.04
Crop rotation	276	3.36	1.15
Reduced use of chemical fertilizers	276	3.17	1.15
Genetically modified crops	276	3.17	1.18
Use of cover crops to prevent soil erosion	276	3.15	1.20
Reduced use of herbicides & pesticides	276	3.09	1.11
Rotational grazing	276	3.04	1.23
Recycling agricultural wastes	275	2.92	1.22
Use of green manure (cover crop plowed under)	276	2.70	1.24
Conservation tillage (e.g. no till farming)	276	2.66	1.22
Integrating plant crops with livestock enterprises	275	2.63	1.19
Integrated pest management	276	2.57	1.14

*Scale: 1=No Knowledge, 2=Little Knowledge, 3=Some Knowledge, 4=Moderate Knowledge, 5=High knowledge

Table 4. College Majors Level of Knowledge on Sustainable Agricultural Practices

		Use of animal manure		Crop Rotation		Reduced use of fertilizers		Genetically Modified Crops		Use of cover crops		Reduced use of herbicides	
Major[a]	*n*	*M*[b]	*SD*	*M*[b]	*SD*	*M*[b]	*SD*	*M*[b]	*SD*	*M*[b]	*SD*	*M*[b]	*SD*
AgedG	11	4.00 (1)[c]	0.89	4.00 (1)	1.83	3.82 (1)	0.87	3.55 (1)	1.04	4.00 (1)	1.00	4.00 (1)	0.63
Ansc	31	3.10 (9)	1.01	3.16 (7)	1.19	2.74 (9)	1.03	2.87 (9)	1.09	2.61 (8)	1.26	2.58 (9)	0.92
AnscPv	20	3.40(6)	1.05	3.00 (9)	1.26	2.95 (7)	1.04	3.15 (5)	1.35	2.50 (9)	1.32	2.80 (8)	1.24
GenAg	40	3.33 (7)	1.14	3.05 (8)	1.34	2.98 (6)	1.31	3.08 (6)	1.27	2.80 (7)	1.34	2.93 (6)	1.21
GenAgT	18	3.94 (2)	0.87	3.44 (3)	1.45	3.11 (4)	1.18	3.44 (2)	1.15	3.06 (5)	1.06	3.11 (5)	1.37
Agbm	36	3.25 (8)	0.94	3.31 (6)	1.01	2.92 (8)	0.86	2.89 (8)	0.95	3.14 (4)	1.02	2.83 (7)	0.91
AgbmH	38	3.55 (4)	0.98	3.34 (5)	1.07	3.53 (2)	1.22	3.21 (4)	1.36	3.50 (3)	1.13	3.45 (2)	1.08
AgbmAs	16	3.56 (3)	1.53	3.38 (4)	1.20	3.00 (5)	0.97	3.00 (7)	1.32	2.88 (6)	1.26	2.94 (4)	1.00
REnst	65	3.54 (5)	1.05	3.65 (2)	1.01	3.45 (3)	1.06	3.40 (3)	1.09	3.54 (2)	0.95	3.34 (3)	1.08

Taking the analysis one step further indicates a very noticeable knowledge gap in the scores between majors on the twelve sustainable agricultural practices. When examining Table 4, one can see that Agricultural Education majors had the highest score in all of the sustainable agricultural practices. Mean averages for this group of students ranged from M = 3.18 to M = 4.00, respectively, indicating at least some or moderate knowledge on the topics. Animal Science majors on the other hand, indicated having little to no knowledge on many of the sustainable agriculture topics. Compared to the other eight majors, the knowledge level of Animal Science majors ranked in last place in eight of the twelve sustainable agriculture practices. Table 4 ranks the knowledge levels of the remaining majors on the sustainable agriculture practices.

Summary

Agricultural education needs to address elements of emerging agriculture including sustainable production, processing, and marketing and distribution systems. Osborne (2011) underscored the importance of sensitizing the public about sustainable agriculture. He suggested an interdisciplinary approach that promotes sustainable agriculture right from the classroom to the field. Increased interdisciplinary research projects and promotion of graduate and undergraduate programs on sustainable agriculture will increase student interest and exposure in this important field of agriculture. Mean disparity across the selected college majors is a clear indication of lack of an interdisciplinary approach in studying sustainable agriculture topics. Researchers have advanced that sustainability education that infuses concepts that link social, economic and ecological systems allows students to understand and make a connection with real world problems involving agricultural production (Santone, 2003; Osborne, 2011).

Use of animal manure as a fertilizer obtained a relatively high mean (M = 3.46) across the entire population studied. Students' level of knowledge on crop rotation obtained (M = 3.36), the second highest mean. It was quite disappointing that the widely advocated practice of IPM generated the lowest mean (M = 2.57). IPM is an effective and environmentally sensitive approach to pest management that relies on a combination of available pest control methods to manage pest damage (Van den Berg and Jiggins, 2007). IPM uses the most economical means which are least hazardous to people, property and the environment to control pests. Integrating plant crops with livestock enterprises (Mixed farming) had the second lowest mean (M = 2.63). It refers to the use of a single farm for multiple purposes such as the growing of cash crops and raising of livestock. Generally, undergraduate students from the two Departments reported low means for this practice. Low means obtained by Animal Science students indicated that little is covered on crop science in their curriculum.

Muma (2006) and Osborne (2011) proposed an interdisciplinary move to address issues regarding sustainability. He argued that interdisciplinary perspectives are crucial in reinforcing new forms of learning in solving complex problems on sustainability. According to Francis et al. (2003) sustainable agriculture is an interdisciplinary field of study which demands enormous effort from experts in different disciplines to address the existing societal and environmental problems in the agricultural and food system. Graduate students perceived themselves to be relatively more knowledgeable than the undergraduates on this topic as shown in Table 4. This concurs with the assertion made by Borsari and Vidrine (2005) that incorporation of topics relevant to sustainable agriculture, environmental science, policy and holistic management are made at the graduate level.

Based on findings related to the three research questions it is possible to make the following recommendations: (1) undergraduate agriculture curriculum needs to be improved to include more topics in sustainable agriculture, (2) interventions aimed at igniting learners' interest in this very important topic should be pursued, (3) difference in students' level of knowledge on the topic across disciplines and/or majors calls for further scientific inquiry into possibilities of advocating interdisciplinary measures to promote the topic and (4) an educational system that integrates curriculum and instruction with concepts linking social, economic and ecological systems should be embraced.

Literature Cited

Al-Subaiee, S., E. Yoder and J. Thomson. 2005. Extension agents' perceptions of sustainable agriculture in the Riyadh Region of Saudi Arabia. Jour. International Agricultural Extension Education 12: 5–13.

Borsari, B. 2001. Sustainable agriculture: Its time has come. Jour. of College Science Teaching 90(5): 336-338.

Borsari, B. and M. Vidrine. 2005. Undergraduate agriculture curricula in sustainability: An evaluation across borders. Jour. of Sustainable Agriculture 25(4): 93-112.

Conroy, C.A. 2000. Reinventing career education and recruitment in agricultural education for the 21st century. Journal of Agricultural Education 41(4), 73-84

Dillman, D.A. 2007. Mail and internet surveys: The tailored design method. 2nd Ed. New Jersey: John Wiley and Sons, Inc.

Francis, C., G. Leiblein, J. Helenius, L. Salomonsson, H. Olsen and J. Porter. 2003. Challenges in designing ecological agriculture education: A Nordic perspective on change. American Journal of Alternative Agriculture 16(2): 89–95.

Keating, M., V. Bhavsar, H. Strobel, L. Grabau, M. Mullen and M. Williams. 2010. Engaging agriculture and non-agriculture students in an interdisciplinary curriculum for sustainable agriculture. NACTA Journal.

Leeuwis, C. 2000. Learning to be sustainable. Does the Dutch agrarian knowledge market fail? Jour. Agricultural Education and Extension 7: 79–92.

McNeil, J.D. 2006. Contemporary Curriculum: In thought and action. 6th Ed. New Jersey: Wiley.

Muma, M., R. Martin, M. Shelley and L. Holmes. 2010. Sustainable agriculture: Teacher beliefs and topics taught. Journal of Sustainable Agriculture 34: 439-459.

Muma, M.A. 2006. Sustainable agriculture and the perception of high school agriculture teachers in the North Central Region of the United States. Retrieved from http://proquest.umi.com/pqdlink?Ver=1&Exp=06-18-2016&FMT=7&DID=1216741141&RQT=309&attempt=1&cfc=1

National Council for Agricultural Education (NCAE). 2000. The reinventing agricultural education for the year 2020: Introduction to environmental science. Madison, WI: The National FFA Foundation

National Research Council (NRC). 2013. Toward sustainable agricultural systems in the 21st Century. Washington, DC: National Academy Press.

Osborne, E.W. 2011. Taking agricultural education to the next level. Journal of Agricultural Education 52 (1): 1-8 .

Robertson, G.P. and S.M. Swinton. 2005. Reconciling agricultural productivity and environmental integrity: A grand challenge for agriculture. Frontiers in Ecology and the Environment 3(1), 38-46.

Santone, S. 2003. Education for sustainability. Educational Leadership 61(4): 60- 63.

Van den Berg, H.and J. Jiggins. 2007. Investing in farmers - The impacts of farmer field schools in relation to integrated pest management. World Development 35(4), 663-686.

Walter, G. and A. Reisner. 1994. Midwestern land-grant university scientists' definitions of sustainable agriculture: A Delphi study. Am. J. Alt. Ag. 9(3), 109-121.

Williams, D.L. 2000. Students' knowledge of and the expected impact from sustainable agriculture. Jour. of Agricultural Education 41 (2): 19-24.

NACTA Reprint

December 2001

Higher-order Thinking in a College Course: A Case Study

Josué López, Graduate Student
Department of Agriculture and Extension Education
The Pennsylvania State University
University Park, PA 16802

and

M. Susie Whittington, Associate Professor
Department of Human and Community Resource Development
The Ohio State University
Columbus, OH 43210-1067

Abstract

The Florida Taxonomy of Cognitive Behavior (FTCB), created by Webb (1968) and based upon Bloom et al. (1956), Taxonomy of Educational Objectives in the Cognitive Domain, was used to measure the level of cognition of professors evoked using various classroom behaviors. Students were randomly selected from a lower level agricultural engineering course to engage in a think-aloud protocol to determine their cognitive level of thought during class, given the professor's classroom behaviors. The professor's cognitive level of classroom discourse and students' cognitive level of thoughts during class were assessed and compared.

The professor taught 47% of the time at the knowledge level of cognition, while the most common type of thought displayed by students in class was "random or nonsense thoughts" (27%). The least frequently utilized cognitive levels by professors were application (5.2%), analysis (9.5%), synthesis (.5%), and evaluation (2.2%), and by students were analysis (4.2%), synthesis (3.4%), and evaluation (<1%).

Agricultural educators need to challenge students to develop cognitive abilities and critical thinking at higher levels via the instruction they provide. Thinking at higher levels of cognition is an indispensable skill in the learning process and in everyday life.

Introduction

Educators are being asked to develop more than basic skills in their classrooms. An information base is only of benefit when a person can combine information memory with new information—that is interrelate or rearrange the information (Underbakke et al., 1993). Higher-order thinking is a name given to the type of cognitive activity where thinkers solve a problem, analyze an argument, negotiate issues, or make a prediction.

The public is becoming increasingly aware of the need for student to develop the higher-order thinking abilities needed to cope with the exigencies of living in modern society (National Science Board, 1984). In this case study, Bloom et al. (1956) Taxonomy is used as a basis for examining the cognitive levels of thought of a college professor and students in a classroom setting. The objective was to determine whether or not students in colleges and universities are learning to their full potential. In addition, the Florida Taxonomy of Cognitive Behavior (FTCB) created by Webb (1968), and based upon Bloom et al. (1956), Taxonomy of Educational Objectives in the Cognitive Domain was used as the framework to measure the level of cognition evoked by the professor using various classroom behaviors.

Higher-order thinking

A clear and comprehensive definition of higher-order thinking has the potential to help educators transcend the split between the sciences' "problem solving" and the humanities' "critical thinking" (Lewis & Smith, 1993). To this end higher-order thinking occurs when a person takes new information and information stored in memory and interrelates and/or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations. A variety of purposes can be achieved through higher-order thinking as defined above. These would include: deciding what to believe, deciding what to do, creating a new idea, a new object, or an artistic expression, making a prediction, and solving a nonroutine problem.

Higher-order thinking accordingly consists of ways of handling content; to learn to think more effectively is to learn more effective ways of dealing with information (Halpern, 1984).

According to Swartz and Perkins (1990) content provides something to think about, but cognitive instruction provides ways to engage students in dealing with that content in thoughtful manner (or to meaningfully use content knowledge). Methods of interrelating information such as selecting and organizing are not simply added to content but rather constitute procedures that are internalized and used as novel ways of responding successfully to situations or information (Underbakke et al., 1993). Fogarty and McTighe (1993) suggested cooperative learning and graphic organizers are two approaches that provide powerful, interactive and organizational mind tools for helping students think more effectively about content. Through cooperative learning, students articulate their thoughts to each other and thus engage in an interactive approach to processing information. Similarly, graphic organizers serve to make the invisible become visible by assisting students in generating and organizing ideas and information.

Too often students do not link what they are learning to their lives. Students need ample experiences in organizing and applying what they are learning as well as frequent opportunities to assess what they have accomplished (Ogle, 1989). Applying learned principles to real life situations and allowing students to actively participate in an understanding-based activity will engage them in higher levels of cognitive thinking (Perkins & Blythe, 1994).

Think-aloud Protocols

At the midpoint of this century, the cognitive revolution initiated a new era of thinking about thinking by addressing fundamental questions about the human mind and by creating perspectives and tools to pursue the answers to those questions (Kucan & Beck, 1997). These tools consisted of think-aloud protocols or verbal reports used as data for psychological research because they provided information as to "what is going on in the mind" (Bowen, 1994). Psychologists and intelligence researchers have legitimized the successful use of think-aloud protocols for verbal reports to collect and analyze human thoughts (Simon & Kaplan, 1989).

Purpose and Objectives

The purpose of this study was to assess and compare the cognitive levels of instruction among a professor in the College of Agricultural Sciences and the cognitive levels of thought among seven students in his class. Specifically, the research questions that guided this study were:

- At what level of cognition was the professor actually teaching?
- At what level of cognition were students actually operating?
- What is the comparison between the cognitive level of the professor's classroom discourse and the cognitive level reached by the students in his classroom?

Methodology

Population and Sample

This case study research focused on one professor from the College of Agricultural Sciences at The Pennsylvania State University, and 101 students enrolled in a lower level agricultural engineering course during the fall of 1998. At the beginning of the fall semester, seven students were randomly selected from the class. Letters were mailed to the students describing the study and soliciting their participation. All seven agreed to be interviewed.

Instrumentation

In 1968, Webb used Bloom et al. (1956) Taxonomy to create the FTCB to assess the cognitive level of classroom discourse (the formal speech or conversation delivered during class) professors use when they teach. The FTCB utilizes 55 observable behaviors indicative of the various cognitive levels identified by Bloom et al. (1956) Taxonomy. In the "knowledge" category, 17 observable behaviors are listed on the instrument; for "comprehension," 12 observable behaviors are listed; for "application," four observable behaviors are listed; for "analysis," 11 observable behaviors are listed; for "synthesis," nine observable behaviors are listed; and for "evaluation," two observable behaviors are listed. The FTCB was used to assess the cognitive level of the professor in this case study.

Validity for this instrument was based upon its direct development from Bloom et al. (1956) Taxonomy and the support generally given to this hierarchy of cognitive behaviors. Reliability for this instrument was established by coding audiotapes of lectures and establishing Spearman Rho reliability coefficients. Inter-rater reliability was approximately $r = .97$. Intra-rater reliability between previous researchers and the researchers in this study was approximately $r = .96$.

A questionnaire designed by the researchers provided insight into potential reactions of students to being interviewed, classes previously taken that would give background in the material being taught, and information about the students' interests and reasons for enrolling in the course. Students completed the questionnaire prior to the interview.

Data Collection

While attending the professor's class seven times during the semester, researchers recorded the frequency of observable teacher behaviors in six-minute intervals. Examples of observable behaviors at each level of Bloom et al. (1956) hierarchy include: "defines meaning of a term" (knowledge level); "shows cause and effect relationship" (comprehension level); "applies previous learning to new situations" (application level); "shows interaction or relation of elements" (analysis level) "formulates hypothesis" (synthesis level); and "evaluates something from evidence" (evaluation level).

In order to collect data on the professor's background, teaching skills, and knowledge of cognitive levels of teaching, the professor completed a questionnaire. The professor was also videotaped during the lecture for consequent analysis.

To understand how students are thinking during class, researchers used think-aloud protocols (verbaliza-

Table 1. A Synopsis of Bloom's Hierarchy of Thought.

Cognitive Level	Definition	Activity
Knowledge	Recall subject matter	List, define, label, and match
Comprehension	Know information that has been communicated, but cannot apply in other situations	Explain, rewrite, paraphrase, summarize, and give examples
Application	Apply information to different situations and learning tasks	Compute, demonstrate, use, predict, discover, and solve
Analysis	Separate data into its component parts; these parts are differentiated and related based on their relationship	Differentiate, discriminate, relate, diagram, and distinguish
Synthesis	Combines learned elements to create a new whole; working into pieces and elements, arranging so as to create new forms, patterns, or structures	Create, compose, produce, and develop
Evaluation	Make judgments on the value of materials and methods for given purposes	Justify, compare, contrast, evaluate, and interpret

Note: Adapted from Bloom et al. (1956).

tion of thought processes). Students were told the objectives of the study and knew prior to class that they would be interviewed about their thoughts during class. Immediately following class, students were given a hand-held tape recorder and asked to watch the videotaped lecture, listen, and audibly recall and describe their thoughts during class.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Frequency of behaviors observed across all cognitive levels was totaled. Then the frequency within each cognitive level was divided by the overall total to acquire percentages of classroom discourse at each cognitive level. Cross-tabulations, frequencies, and means were calculated. Only descriptive statistics were used.

A staff assistant transcribed the audiotapes of cognitive processes. Thoughts of students were sorted into six research-generated categories and then classified into Bloom's cognitive levels. The researchers categorized the thoughts as:

- Thoughts or observations about professor, people, and objects in classroom
- Nonsense or unrelated thoughts
- Thoughts connected to previous learning
- Thoughts about past experiences prompted by class subject matter
- Deeper learning/questioning thoughts
- Thoughts about behavior that got/maintained attention

Results and Discussion

Professor

After seven sessions, the professor's cognitive level of instruction was at the knowledge (compilation of the first three categories) level of cognition 47% of the time, 36% at the comprehension (translation and interpretation) level, 5.2% at the application level, 9.5% at the analysis level, .5% at the synthesis level, and 2.2% at the evaluation level (see Table 2). The most frequently utilized classroom discourse was at the "knowledge of specifics level." The least frequently utilized levels during classroom discourse were at synthesis and evaluation.

Table 2. Professor's Assessed Cognitive Level of Instruction During Class.

Level of Cognition	Mean of frequencies	Range (%)	Total (%)
1.0 Knowledge of specifics	21.2	13 - 30	23.4
1.2 knowledge of ways and means of dealing with specifics	16.1	11.7 - 25	17.5
1.3 Knowledge of universal and abstracts	5.6	3.0 - 9.2	5.7
2.0 Translation	18.1	18.2 - 27.3	21.8
3.0 Interpretation	12.7	10.3 - 16.7	14.0
4.0 Application	5	1.1 - 7.7	5.2
5.0 Analysis	8.8	5.5 - 15	9.5
6.0 Synthesis (Creativity)	.43	0 - 2.4	.5
7.0 Evaluation	2	0 - 3.8	2.2

Note. 1.0 + 1.2 + 1.3 = Bloom et al. (1956), "Knowledge" level; 2.0 + 3.0 = Bloom et al. (1956), "Comprehension" level.

Table 3. Assessment of Students' Cognitive Levels of Thoughts During Class.

Categories of Thoughts	Range of frequencies	% of time
Thoughts or observations about professor, people, and objects in classroom	2 - 21	27.0
Nonsense or unrelated thoughts	4 -24	29.0
Thoughts connected to previous learning	1 - 26	20.1
Thoughts about past experiences prompted by class subject matter	0 - 8	5.8
Deeper learning/questioning thoughts	0 - 5	5.3
Thoughts about behavior that got/maintained attention	2 - 8	12.0

Table 4. Students' Cognitive Level of Thought During Class.

Cognitive Level	Frequencies	(%)
Knowledge	28	23.7
Comprehension	15	12.7
Application	7	5.7
Analysis	5	4.2
Synthesis	4	3.4
Evaluation	1	<1
Other	58	49.1
Total	118	100

Students

The most common type of thought expressed by students (29%, see Table 3) was "nonsense or unrelated thoughts" (metacognitive processes unrelated to class subject matter). An example was, "I'm just praying nobody asks any more questions so we can keep moving." The second most common category of thought (27%) was "thoughts or observations about professor, people, and objects in classroom." An example was, "He really likes to use different colors of chalk." The least used category of thought (5.3%) was, "deeper learning/questioning thoughts," and one example was, "I don't understand how you can make something with that little of a depth. It doesn't seem to make sense, but that's what it says in the book, so I guess it's the right answer."

The following categories, "thoughts connected to previous learning, thoughts about past experiences prompted by class subject matter, and deeper learning/ questioning thoughts" were collapsed into one category called "thinking." This "thinking" category was then

assessed for its cognitive level content. As can be seen in Table 4, approximately 24% of students' thoughts were at the knowledge level. The second most common cognitive level was comprehension (12.7%). The least common students' cognitive level of thought was at evaluation level (approximately 1%). However, approximately 50% of the students' thoughts during class were not classified as a part of the cognitive assessment since they were "nonsense or unrelated thoughts."

Students' Cognitive Level of Thoughts

As mentioned previously, the most common cognitive level of students' thoughts was "knowledge level" (23.7%, see Table 5). Knowledge was considered in two different forms: (a) searching for, and (b) expressing the recognition of basic knowledge. For instance, when the professor was explaining sediment traps in class, one student thought, "What are they trying to do with this filter fence?" This example is a search for knowledge. However, when the professor was further discussing sediment traps, one student thought, "I do remember the part of sediment traps from Friday class," the student was demonstrating an expression of basic knowledge.

The next most used level of cognitive thinking was comprehension (12.7%). Comprehension involves two forms; to understand information and to question the information given. For instance, with regard to understanding information, when the professor was talking about the advantages of wetlands, one student thought, "In South Carolina, they have taken so much fresh water out of the ground that the sea water is starting to come in and cause problems." The questioning form of comprehension is shown in the following situation: when the professor discussed ecological problems with the Penn State living filter, one student thought, "I'm wondering why Penn State's filter system keeps going on if it's not really functioning properly."

The application level of cognitive thinking involved an average of 5.7% of the students' thoughts in class. For example, while the professor was discussing a homework problem in class from the book, one student thought, "Now, this makes sense to me because I know how to place the sprinklers in the field."

The analysis level of cognition consumed an average of 4.2% of the thoughts in class. For example, when discussing how to calculate spacing of irrigation sprinklers in class, a student thought, "Why did they not choose 80 feet when you would have to buy less sprinklers per foot?"

The synthesis level of cognition involved an average of 3.4% of the thoughts in class. Less than 1% of

Table 5. Comparison of Professor's and Students' Cognitive Level of Thought During Class.

Cognitive Level	Professor (%)	Students (%)
Knowledge	46.6	23.7
Comprehension	35.8	12.7
Application	5.2	5.7
Analysis	9.5	4.2
Synthesis	<1	3.4
Evaluation	2.2	<1
Other	0	49.1
Total	100	100

students' thoughts could be classified at the evaluation level. However, almost half (49.1%, see Table 4) of thoughts generated by students during class were "random nonsense thoughts;" these were not classified as part of the cognitive assessment.

Summary

Professor

The professor in this study, who was teaching an introductory course, was generally teaching at lower cognitive levels. The most common teaching behaviors recorded in this study were: basic elicitation of facts, verbalizing from and/or creating graphic representations, making generalizations about concepts or ideas, summarizing and concluding from what had been said, and giving reasons for facts. However, when the professor was aware of cognitive levels, teaching was more effective and the most common behaviors were: producing unique communication and/or divergent ideas, showing the interaction and relationship among elements, and applying abstract knowledge in a practical situation (Perkins & Blythe, 1994). This led to improving classroom behaviors and teaching techniques that helped students to think at higher cognitive levels.

This case study showed that the first task professors need to realize is that the subject matter content is not the focus but rather the means to engage students to think at higher-order levels (Swartz & Perkins, 1990). Students deal with content in a thoughtful manner when professors give them the opportunity to reach higher levels of thoughts through the lecture. Since professors' performance is the most powerful predictor of students' learning at higher levels of cognition, they should learn more effective ways to deal with information to produce desirable outcomes (Halpern, 1984).

More importantly, when professors give students the opportunity to interrelate information, students internalize the procedures beyond successfully real-life situations (Underbakke et al., 1993). Further, when professors used inquiry-oriented approaches in class, students reach higher level of cognition. For example, it is desirable for students that professors provide time for peer-and self-assessment throughout the class, helping students to analyze, synthesize, and evaluate knowledge.

Students

Students, primarily thought "random nonsense thoughts" during lectures. They rarely thought at the higher cognitive levels no matter the cognitive level at which the professor taught.

When students find information relevant to their daily lives, the information was interrelate, rearranged, and extended to achieve a purpose or find possible solutions (Lewis & Smith, 1993). Students in this study engaged in higher-order thinking when situations in class were associated to recent circumstances. Therefore, information was more readily absorbed and easily understood.

Students in this case study were stimulated to think at higher levels when inquiry-oriented questions were asked. In some instances, students were motivated when visual aids were used during the lecture. When shown a visual aid from class, students could describe what the professor was discussing and what they were thinking in regard to the subject matter.

Recommendations

Based on the conclusions of this study, the researchersrecommend that professors:

- become more aware of cognitive level of teaching in order to achieve higher outcomes from their teaching,
- participate in seminars, workshop, forums, presentations, and conferences that highlight the use of higher-order thinking in their lectures,
- provide students opportunities to connect their class to real-life situations,
- be aware of various class behaviors and teaching techniques used to engage students in higher-order thinking,
- use inquiry-oriented approaches during class more often and the lecture approach less often,
- and provide students opportunities to peer-and self-evaluate their performance in class.

Based on the conclusions of this study, the researchers recommend that students:

- connect learned information to previous and future life situations,
- be more aware of how to interrelate, rearrange and handle information independently,
- discipline themselves to pay attention and focus on the lesson,
- take advantage of any opportunity to apply, analyze, synthesize and evaluate knowledge.
- and be more independent in their learning process regardless of the professor.

Implications

This case study suggests that there is a need to provide college and university professors with teaching training on critical thinking and higher-order thinking. Moreover, educators should engage students in higher-order thinking activities from elementary school levels. Classes should be less crowded in order to provide more opportunities for professors to use inquiry-oriented approaches

and less lecture-based teaching. In addition, further research in cognitive teaching should be conducted at all educational levels.

Literature Cited

Bloom, B. S., M. D. Englehart, E. J.Furst, W. H. Hill, and D. R. Krathwohl, 1956. Taxonomy of Educational Objectives Book 1: Cognitive Domain. New York: David McKay.

Bowen, C. W. 1994. Think-aloud methods in chemistry education: Understanding student thinking. Jour. of Chemical Education 71(3): 184-190.

Halpern, D. F. 1984. Thought and Knowledge: An Introduction to Critical Thinking. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Fogarty, R., and J. McTighe, 1993. Educating teachers for higher-order thinking: the three story intellect. Theory Into Practice 32(3): 161-169.

Kucan, L., and I.L. Beck, 1997. Think-aloud and reading comprehension research: Inquiring, instruction, and social interaction. Review of Educational research 67(3): 271-299.

National Science Board 1984. Educating Americans for the 21st century: Source materials. Washington, DC: U. S. Government Printing Office.

Ogle D. M. 1989. Implementing strategic teaching. Educational Leadership 46(4): 4-60.

Perkins, D., and T. Blythe, 1994. Putting understanding up front. Educational Leadership 51(5): 4-7.

Simon, H. A., and C.A. Kaplan, 1989. Foundation of cognitive science. In: M. I. Posner (Ed.), Foundations of Cognitive Science (pp. 1-91). Cambridge, MA: MIT Press.

Swartz, R., and D. Perkins, 1990. Teaching thinking: Issues and approaches. Pacific Grove. CA: Midwest Publications.

Underbakke, M., J. M. Borg, and D. Peterson, 1993. Researching and developing the knowledge base for teaching higher-order thinking. Theory Into Practice 32(3): 13 -144.Table 1. A Synopsis of Bloom's Hierarchy of Thought.

Office Hours: Bringing Them to Where Your Students Are

Introduction

Students lead busy lives; so do instructors. While institutions of higher learning require faculty members to post and keep office hours, students don't always come to our offices; in fact, the frequency of student meetings in our offices may be declining. Times that work for our schedules often don't work for theirs even if we include an open door policy. All of us value the rationale behind office hours, and know that the more we can promote contact with our students, the better the possibility is for student success. The fact is, even our on campus students may need alternatives to coming to our offices. For distance students, office hours may not work at all because of their work lives. Few of us have evening office hours where distance students (or others) can call us since they can't come to where we are. Email works for both student groups, but doesn't have the immediacy that students want. And there is no face-to-face with email. While students may get their questions answered via email, it feels more distant and less connected than meeting in person. Students use their phones, laptops, iPads and other tablets many times a day. Using Skype for office hours is a possible solution to bringing office hours to where the students are.

Procedure

Start a Skype account by going to http://www.skype.com. It's free and you can set up an account with a Skype name that reflects that the site is one you'll be using only for student contacts. I use "profkcw" as my Skype name to keep it separate from my personal Skype account. I don't add details to my contact information; students have that in my syllabus, webpage, and within my distance course shells. I prefer to keep things professional. Then, as you are creating your syllabus, add your Skype name to your contact information along with your phone and email information. As you pass out your syllabus, let your students know that you will be available by phone, in your office, or through Skype during office hours. If you teach online, use the email class function to direct students to that portion of your online syllabus. I like to do an intake survey for my distance students to find out their comfort level with online learning, interests, chat time availability, etc. I also ask if they have a Skype address and to share it with me if they do. I email them if I see that they have a Skype account, alerting them that they will receive a Skype invitation shortly. Then, within my Skype account, I send them an invitation to be a contact. When they accept, we can communicate via Skype.

Assessment

I have been using Skype office hours for some time. During my posted office hours, students know they can come to my office, call, or connect via Skype. I do not keep my Skype status as "online" except during office hours unless a student has requested to meet at an appointed time that works for both of us. This reinforces that I'm using Skype for work, and that I won't be constantly available there. There is no cost for them or for me. If I have to be at a conference or out of town, or home with an illness that I don't want to spread to the students, I can still be on Skype. I expected my distance students to use Skype the most. It's actually the on campus students who connect using the instant messaging, video chat or audio chat options that Skype provides. For example, one of my students is an RA in the dorm and Skype allows her to be there in case students need her. Another is a stay-at-home mom who is also working on her degree. Skype allows her to connect with me when she can't come to campus. There are some changes I will make next semester. I do plan to have one hour in the evening for office hours to better accommodate the needs of my distance students, perhaps rotating nights of the week the way I do chat sessions in my course. I will also let students know that we can connect via Google Hangout or Face Time if those are things that work better for them than Skype.

Submitted by:
Karen Cachevki Williams
Department of Family & Consumer Sciences
University of Wyoming
Email: cachevki@uwyo.edu

Participatory Learning Experiences: What These Mean to Me as an Agroecology Instructor

Introduction

Participatory learning and action (PLA) are well-known activities in the development community. A robust literature has been developed over the

past several decades. The International Institute for Environmental Development in the U.K. [http://www.iied.org/participatory-learning-action] has published over 65 documents in 25 years on PLA.

Farmer learning as a component of transfer of technology has been described by Warner (2008) as critical to adoption of new ideas about how to prevent pollution from agriculture. He maintains that technologies related to large issues in agriculture need to be spread through social networks. This concept is similar to our social learning in agroecology classes and team projects. Learning in agroecology courses that is initiated with phenomena in the field and close interactions with farmers to uncover the bases for decisions have been found to increase effectiveness of education on practical challenges in farming. This is best accomplished by teams of students, instructors and stakeholders (Francis et al., 2012a). Jordan et al. (2005). incorporated the idea of transformation, defined as a "systemic change that addresses a certain ecological problem in an agricultural system, into an action learning component of agroecology courses." Francis et al. (2012b) described the importance of students exploring the agroecological learning landscape as part of their immersion in the real situation of farmers, and a path toward active learning. These concepts are being incorporated more every year into courses on organic farming and agroecology.

In a recent teachers' workshop in Plovdiv, Bulgaria, we began an interactive session with the assumption that a lecture of participatory learning would be an unacceptable contradiction in terms and process, thus the session itself should reflect the principle of participation. To explore the topic, we asked people to reflect on their personal experiences and write down specific impactful learning activities, discuss these with one or two colleagues and then share with the group. After a larger discussion among everyone, we attempted to draw out commonalities. The conclusions were summarized.

Methods

Sixteen participants in the European Network of Organic Agriculture/Agroecology Teachers [ENOAT] workshop were given five minutes to write a response to this challenge: "Think of one personal learning experience, as a student or as a teacher, when you thought participation was the most important part of learning?" After writing down one or more experiences, participants were given ten minutes to discuss their personal learning highlights with one or two others and why they were important. We followed this in a plenary session with the instruction to "Share one or two of these experiences with the larger group in plenary and think about key issues we have to consider?" Key issues were recorded and individual written papers were collected to summarize and to identify commonalities.

Results

Part 1: Personal learning experiences as student or teacher: A wide range of unique personal learning experiences were shared by participants, including memories both as students and more recently as teachers. Some noteworthy examples follow:

Experience 1: Over a decade ago we were focused on the potentials of biotechnology and genetic engineering in a discussion group of 18 students and instructor. Each person voted "yes," "no" or "no opinion" on a series of new technologies that were available only by GMO techniques. One technology was use of human growth hormone to stimulate growth early in life to achieve normal height. Seventeen out of 18 voted against using this medical technique due to potential abuses. In the discussion that followed, the normal-appearing young man, who voted in favor, told his personal story. "*I was born with a hormonal deficiency and without this treatment with implants and later injections of the hormone, I would now be only 1 m tall instead of 1.60 m – this is why I voted for the use of HGH technology."* As a class we voted again, and of course everyone voted in favor of HGH use in appropriate ways. As an instructor, I was amazed at the power of this situation for learning, and was delighted with the safe learning space and level of trust we established in that discussion group which empowered this student to share his story.

[NOTE: This type of learning situation cannot be created, but could be called an emergent property of the classroom environment where trust among discussion participants was high enough that people felt safe in sharing their personal experiences. The example speaks to the importance of establishing a trusting and caring learning community, that can be called the social capital associated with this particular group.]

Experience 2: When I started as an academic teacher, I organized the final oral assessment of students for the course. One student told me it was possible to have the cysts of Trichinella, a dangerous parasite from wild pigs, in the human heart muscle. I was angry with him, because in a textbook written by a respected specialist this possibility was not mentioned, so of course I wanted to give him a negative grade. But he told me, "I am personally ill because of this parasite, as is my father." Therefore, I understood that we can learn from our students, and knowledge is not a closed area, so we can never know everything.

[NOTE: We learn every day, if we are open to new ideas and evidence about the world around us. To ever assume that we are the experts and should have the last word on a topic is to miss out on a wealth of experience and learning that is possible if we value the life experiences of others, especially our students. To affirm their prior knowledge and experience, and to provide students with confidence to express themselves, even to disagree with instructors and with others, is a valuable gift we can provide as a useful tool in education.]

Experience 3: As a student, many years ago, I remember the soil science practical work when a group of students, supervised by the professor, dug a soil profile to study. We worked hard, but we had the opportunity

to explore layer after layer while digging through the profiles. The most important part was the group work involved in this educational, field experience.

[NOTE: This field group activity combined the practical and academic dimension of learning different soil strata while opening the profile, with the social learning that goes along with the group effort to accomplish the task.]

Experience 4: As a teacher, I find the most exciting learning experiences are when my students visit real organic farms and learn directly from farmers about their problems and successes.

As a student, I liked field trips because when I saw what we were learning, and not reading it from a book, the experiences stayed in my mind so I could see them later. They were not just concepts from a book.

[NOTE: Seemingly, nothing can substitute for the direct student discussions on site, on farms, with people who are making the decisions and living with the consequences. This type of reality is difficult to achieve in the classroom, and somehow we need to find the mobility funds to use more field excursions as an integral part of our classroom teaching.]

Experience 5: Good results are achieved when students work in groups. Preparing reports, seminars or other output helps them build communication skills, learn effective ways of exchanging knowledge, and practice responding to questions to clarify their ideas and information.

[NOTE: In reality that most people will be working in teams for the rest of their agricultural careers. – in business, in academia, in government, or in non-profit sectors. Improving group learning skills in the relatively safe space of the classroom environment benefits students.]

Experience 6: As a student, in one course, I read about 200 pages of scientific text and prepared three questions. In order to ask a good question, you must be familiar with the topic. To understand something well enough to ask good questions is an excellent way to learn. In the same course, the next task was to read about 200 pages of text and make a 30-minute presentation. Effective presenting means clearly explaining the topic to others.

[NOTE: New instructors soon recognize that teaching a topic is one of the best ways to learn. Although one can never anticipate all the questions students will raise, having the confidence to present a topic requires a basic appreciation and understanding of the subject. Pressure to do a good job in front of one's peers is also beneficial.]

Experience 7: As a student, I did practical work in ecology involving a small research project on fruit trees in meadows with bees compared to those without bees. I still remember this work in detail, cooperating in a group of three, and completing the difficult statistical analyses. Working in the field made the project fun and I really liked the course.

[NOTE: Often, learning statistical methods are complicated by lack of context or relevance. When statistical methods are tied to a real world situation, this presents a motivation to understand the theory and methods and to use the tools to draw sound conclusions (Salomonsson et al., 2005.]

Experience 8: Personal experience, as a student, was to solve a problem on an organic farm. The context of the farm provided motivation and relevance.

[NOTE: Projects in the classroom are often context free. Students experience difficulty making connections with a farm and real-world challenges.]

Experience 9: As high school students in their first agriculture course, we went to a pig farm where the teacher would demonstrate castration. He put the small pig on a table, made the first cut and out came half of the pig's intestines. The teacher calmly explained that sometimes mistakes happen, pushed the intestines back in, sewed up the belly and completed the intended operation. This was a real learning experience for all of us and showed the importance of resilience and staying calm in a stressful situation.

[NOTE: The teacher's dealing with a difficult situation was one of the most important lessons for him and for the students. We need to adjust to change, react positively to adversity when possible, and make the most of each learning situation.]

Experience 10: A professor in agriculture and herbology at our university always came into the classroom with a smile on his face. He was never read from any textbooks during class. He really knew his teaching.

[NOTE: First impressions and lasting opinions of the students are highly valuable. Providing a friendly and welcoming environment in the classroom is very important. But also important, is knowing the material and how to present it in an active and participatory way.]

Part 2: General comments developed from presentations and discussion: Based on the written experiences from workshop participants, and plenary discussions, general observations about participatory learning included these ideas or requirements:

Small class size is preferable: Organizing meaningful participation and discussion that includes everyone is difficult in large classes.

Project groups of three: After considerable discussion about the optimum size of groups for participatory work in classes, the general opinion was that two people did not provide a critical mass or enough combined energy for completing complex tasks, while with more than three there was high probability of at least one person 'floating along' without making a contribution. The nature of project work could be a factor in deciding how many to place in a team.

Creative funding options: Often transportation to field sites, cost of lodging and meals, and other logistical challenges require creative solutions and funding.

Practical exercises, good timing: Planning of participatory learning activities often requires more time in planning than lectures or simple laboratory exercises. Explicit learning goals, clear objectives and thoughtful communication are especially important ensure that all are informed.

Participatory lectures: Even with relatively large groups, it is possible to encourage discussion and questions during the class; for example: "clicker technologies" allow students to quickly respond to surveys or to multiple choice questions. Results are immediately available for all to see and for the instructor to adjust the presentation. More sophisticated cell phone apps are also available. But without this technology, many options are open to encourage voting in class, breaking into small groups to discuss and form consensus, sharing one-on-one or two-by-two, and other creative ways to stimulate sharing and capture ideas from students' experiences.

Hand out data sheet and maps: Time can be saved on field excursions by preparing a map of the community, landscape, or farm, or a simple data sheet with important facts about the farm to be visited. This saves time on site and assures data will be correct, so valuable time can be spent in discussion rather than on available facts. On the other hand, discovery is also valuable and students should be able to discuss and decide what is important to learn. Some balance is necessary.

Clear demonstrations: As with any class activity, clear learning goals, adequate preparation are needed so instructors and stakeholders are fully aware of the type of learning desired. A structured evaluation of the exercise or demonstration should be used to review what was learned and what could be improved.

Excursions and preparing questions: Students should have enough background information before an excursion so they can prepare with readings and develop key questions. Student groups may decide to specialize their questions, to be sure different individuals ask about production, economics, environmental impact and social aspects, and specifically listen for answers to their questions.

Establish motivation for individuals and groups: To improve the value of the learning experience, an imbedded evaluation or other type of post-experience validation of learning is useful. This can be in the form of reports, presentations, short quiz, or other type of feedback. This serves to legitimize the experience in learning and provides information on how to improve the exercise in the future.

Confidence to say "I don't know:" One method of establishing trust through transparency is to clearly admit that you, as an instructor, do not always have the answers, both in the field or in the classroom. Useful questions to expand the discussion include, "What do you think are the possibilities?" "How does this depend on the context or the situation?" "How important is this question relative to others?" "Where do you think we can find the answer?" or "Who would be willing to research this and report back to class in the next session?" Given that many classrooms are connected today, the last suggestion could be, "Who can quickly look this up on the internet and give us some relevant ideas?"

Conclusions

The ENOAT participants concluded this was a useful topic to explore, and that using a participatory method to capture individual past experiences was a valuable process to uncover unique learning situations from our time as an instructor or as a student. Several specific experiences were given under methods, and then a number of general comments were taken from the group discussion. Participatory learning can build interest and enthusiasm in the classroom and in the field, and that every possible effort should be made to include hands-on and active learning for individuals and for groups in agroecology and organic farming learning environments.

Useful References

Francis, C., T.A. Breland, E. Ostergaard, G. Lieblein and S. Morse. 2012a. Phenomenon-based learning in agroecology: A prerequisite for transdisciplinarity and responsible action. J. Agroecology & Sustainable Food Systems 37(1):60-75.

Francis, C., S. Moncure, N. Jordan, T.A. Breland, G. Lieblein, L. Salomonsson, M. Wiedenhoeft, S. Morse, P. Porter, J. King, C. Perillo and M. Moulton. 2012b. Future visions for experiential education in the agroecology learning landscape. In Integrating Agriculture, Conservation, and Ecotourism: Societal Influences, Vol. 2. W.B. Campbell and S. Lopez Ortiz, editors. Springer Publishers, New York. p 1-105.

Jordan, N.R., D.A. Andow and K.L. Mercer. 2005. New concepts in agroecology: A service-learning course. Journal of Natural Resources and Life Science Education. 34:83–89.

Manolov, I., E. Embialkowska and C. Francis, editors. 2013. European collaboration in organic agriculture and agroecology education. Proc. ENOAT Workshop, Plovdiv, Bulgaria, 29-31 August 2013. p. 30-35.

Salomonsson, L., C.A. Francis, G. Lieblein and B. Furugren. 2005. Just in time education. NACTA J. December 49(4):5-13

Warner, K.D. 2008. Agroecology as participatory science: Emerging alternatives to technology transfer extension practice. Science, Technology & Human Values. 33(6):754-777.

Submitted by:
Charles Francis
UMB, Norway
Email: charf@umb.no

Using Guided Discovery as an Active Learning Strategy

Teachers continuously search for innovative ways to help their students learn course content. Many curricula are organized to foster continual learning over a student's academic career, thus the implementation of pre-requisites for upper-level courses. However, seldom do students recognize the importance or utilize the knowledge acquired from the required pre-requisites of a given class. Bruner (1967) advocated a method of inquiry-based instruction known as discovery learning, where students use previous knowledge and experience to discover new facts for themselves. Critics argue that there are a high rate of misconceptions and inaccuracies when utilizing this learning method. Therefore, by including the instructor as a guide during discovery learning, students can still be involved with an active learning strategy, utilize previous knowledge and experiences, and not be wary of learning inaccurate information. Guided discovery can be used as a vehicle for learning in multiple instances in numerous courses. This teaching tip will explain how learning through guided discovery was implemented in a swine production and management course in an effort to improve student success of feedstuff identification and understanding the basics of swine nutrition. Students enrolled in the course must have previously completed an introductory animal science and nutrition class.

Procedure

Twelve common feedstuffs utilized in swine diets were selected and placed into disposable paper cups. On the bottom of each cup a letter was written for identification purposes. Students formed self-selected groups of four and received a tray with the unidentified feedstuffs. The first activity was to identify each feedstuff using prior knowledge and experience from within the group. The consensus-based answers were written on a handout given to each group. After the initial identification was complete, hints were given to all the groups. For example, two different cups were identified as being from the same source (i.e. ground corn and shell corn). After a series of eight hints, the groups were allowed to change their answers if they discovered errors in their initial identifications. The next "round" consisted of each group identifying whether each feedstuff was classified as a carbohydrate or protein. At the end of the activity each group indicated whether their answer changed throughout the course of the activity and determined the accuracy of their answers by comparing their final answers to the actual answers.

Assessment

Students were evaluated through pre- and post-activity assessments to determine if the guided discovery structure increased their understanding and application of knowledge, based on a scale where 1 = strongly disagree and 10 = strongly agree. Students enjoyed the method of learning (8.38 ± 1.08) and believed it increased their comprehension of the material (7.33 ± 1.65). Additionally, students believe that the guided discovery method was an appropriate learning strategy to use for various principles in swine production (8.96 ± 1.11) because it provided opportunities for active learning experiences (8.89 ± 1.44), which are continuously requested by students (9.25 ± 0.79).

The graded class average for the feedstuff and nutrition quiz increased six percentage points between the classes that utilized guided discovery learning compared to the classes that were not exposed to guided discovery learning. The improvement seen on the exam that included feedstuffs and nutrition questions followed the same trend as indicated above.

Based on the assessment results and student feedback, guided discovery can be used as an active learning strategy in multiple topics of any course. It is a low-resource, high-impact strategy that carries little risk to the teacher or student. Incorporating guided discovery methods into a traditional lecture-based course can improve student motivation to learn.

Submitted by:
Brian D. Whitaker
University of Findlay
Email: whitaker@findlay.edu

Engaging Students in Large Lecture Classes

The first day of college for a freshman can be intimidating and may negatively impact retention. Student success is imperative to not only the student and their parents, but to the entire university. Chances are the most sought after instructors can be found teaching freshman courses, because this first year is critical for all the reasons mentioned previously. We believe one way to help transition first year students into college is by clearly establishing the expectations and creating a personalized approach to learning. The importance of establishing these expectations resides in the differences we know to exist between high school interaction with students and what they might experience in college; that is, communicating the details of student conduct such as cell phone use to final grading is important. Next, the students need to gain interactions with a well-planned, thoughtful, fair minded, organized and enthusiastic instructor. Additionally, there is value in the instructor arriving early to have some 1:1 dialogue with students and to quiz them not only on instructional materials, but ask how things are going in their new world.

We know through experience, students appreciate knowing details which may not be apparent to a new freshman such as the last day to drop a class without a grade penalty or Spring/Summer/Winter registration. We believe the aforementioned attributes are great starting points for instructing a large freshman class, and

secondly we have to engage them during the classroom period in a way that facilitates academic growth and interest.

In college classrooms keeping the attention and focus of students can be a challenge and below are some approaches used:

1. Stimulate engaged learning:
   a. By using clickers for instant feedback the instructor is able to determine if the students are comprehending the material, and students are actively engaged in considering and answering the items of interest.
   b. Design lectures with engaging problems; for example, at various points in the PowerPoint lecture the word BONUS appears and all students know there will be a math problem relative to the concepts covered. Students break out a calculator anticipating the question and engage in the concept at hand.
2. Personalize the instructional approach:
   a. When establishing expectations for the class, we alert them anyone may be asked a question relative to the materials on any given day so be prepared. In order to do this, come to class with five random names and call on them. In turn, this will allow you an opportunity to place names with faces and the student feels engaged in the conversation by naming them.
   b. Allow students to submit possible test questions, a very engaging activity for the student and at the same time, the instructor has the opportunity to determine if anything has been miscommunicated, so corrective actions can take place before the actual exam.
3. Do the unexpected:
   a. Utilize funny or controversial videos or music during transitions to create a memorable experience.
   b. Address controversial topics as a mediator, or as the proponent of an unpopular approach (i.e. whale harvest). It stimulates conversation and consideration of various points of view.

In summary, engaging first year students is very important to not only the student but the institution. More specifically, institutions are becoming more committed than ever in retaining these students and ultimately realizing them at graduation. Therefore, getting freshman students off to a great start is important to both sides. The actual approach for beginning freshman may be different when compared to older students in college, e.g., Juniors or Seniors, but that would be expected for they have experienced college for a few years vs. the abrupt transition from high school to first semester of college, so doing some highly engaging activities may be a good option for new freshman students.

Submitted by:
Gary A. Apgar, W. J. Banz and M. A. Latour
Southern Illinois University, Carbondale
Email: mlatour@siu.edu

Book Reviews

Cheating Lessons: Learning from Academic Dishonesty

By James M. Lang, Harvard University Press, Cambridge, MA. eBook, 272 pages, $26.95, 2013. ISBN 9780674724631.

Have you ever had a student cheat in one of your classes? Did you wonder what was wrong with them or why they were so lazy? Why didn't they just do the research, write the paper in their own words, or study for the exam? Everything I teach is exciting and relevant; why don't they see that? James M. Lang in his book Cheating Lessons: Learning from Academic Dishonesty explains not only why students cheat but what we, as instructors, can do to reduce cheating. He covers topics of curriculum design and classroom etiquette, including chapters titled Fostering Intrinsic Motivation, Learning for Mastery, Lowering Stakes, and Instilling Self-Efficacy. An understanding of what causes students to cheat inspires simple changes that can be made in any classroom, ultimately resulting in increased student learning.

The book was inspired when Lang saw the opportunity to look "at the problem of cheating through the lens of cognitive theory" and try "to understand cheating as an inappropriate response to a learning environment that wasn't working for the student." With that knowledge faculty could potentially prevent academic dishonesty by "modifying the learning environments they constructed." The book is broken up into three parts. Part 1 is titled Building a Theory of Cheating and is based on a review of the literature on academic dishonesty. In it Lang admits that it's easy to point fingers and blame students, but suggests that students cheat when they are "uninspired to learn, feel challenged instead of helped by their professors, and see their courses as stumbling blocks instead of steps to a better life."

Part 2 is titled The (Nearly) Cheating-Free Classroom. In this section Lang draws on his years of writing columns for the Chronicle of Higher Education, both on his experiences as a new faculty member and later on by highlighting the work of outstanding educators across the country. Part 2 provides examples of some of those outstanding educators and reveals that how they structure their curricula and classroom environments naturally discourages cheating and increases student learning. And in Part 3, Speaking About Cheating, Lang provides solid advice for how to structure our individual classes to reduce cheating and increase learning, while fostering a campus culture that promotes academic integrity in our students.

I found this book to be a thorough summary of the research on cheating in college and it gave me new perspective into situations I've encountered in my own teaching where I've questioned students' academic honesty. As a relatively new faculty member I appreciate the many examples Lang provided of outstanding educators and have already put a few of the recommended strategies into practice. I read the book during the fall semester and was able to discuss a few of the changes I planned to make for spring semester with a group of students and get their feedback; these were not students I suspected of academic dishonesty. They were excited about the course improvements for the positive impact they believed it would have on student learning. I found the book rather empowering because it helped me realize that I am not at the mercy of the vague campus-wide academic honesty policy; in fact, if you're doing it right, it shouldn't even come to that. Lang presents a variety of strategies to reduce cheating in college that individual faculty members can adopt, that will not only increases student learning overall but will help us become better educators in the process.

Submitted by:
Connie Fisk
Sheridan College

Food Science: An Ecological Approach

Edited by Sari Edelstein, Jones & Bartlett Learning, Burlington, MA. Hard cover, 554 pages, $152.95, 2014. ISBN 9781449694777.

Let me preface this by saying that I hold degrees in Nutrition and Food Management (a component of Family and Consumer Sciences; FCSC), Food Science (FDSC), and Horticulture and I know the differences between the disciplines. I also teach in all three of these disciplines at a community college in Wyoming. One of the courses I teach is an introduction to food science (FDSC 1410 Food and Your Well Being) and I've been looking for the "right" textbook for this course for three years; there are only a couple of choices currently on the market and none that meet the needs of my course or degree programs. Last year I discovered Food Science: An Ecological Approach edited by Sari Edelstein. I'm a busy person, as most faculty members are, and I didn't take the time to read the entire book before I adopted it

for my class Fall Semester 2013. I wanted to write this review to describe what I thought of this textbook for any other instructor who may be in the market for an introductory food science textbook. This textbook has several features that I liked, but also a few that, in my opinion, make it unacceptable for an introductory food science class.

One of the reasons I was interested in this textbook was because of its "Ecological Approach." As stated on the back cover, this textbook "explores the idea of global sustainability and examines the ecological problems that challenge our food supply and raise increasing concerns among consumers." Most of the chapters include a section on "Going Green" that I found useful for sparking class discussions. I also appreciate that each chapter contains a section on Food Safety so that students became aware of the unique risks associated with each food product category (meat and meat substitutes, milk and dairy products, etc.) as we addressed that product category. I like the way the chapters are formatted, the use of color and color figures, the companion website for students, and that instructor resources are available.

My biggest concern with this textbook is the authors' presentation of the concept of organic crop and food production. For example, on pages 336-337 it states that, "organic simply means that the food was grown and produced without added chemicals, such as pesticides, herbicides, fertilizers, antibiotics, hormones, or food additives." This statement is misleading. The USDA Fact Sheet titled USDA Oversight of Organic Products (Nov. 2012; http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELDEV3004443) states that, "The organic standards are designed to allow natural substances in organic farming while prohibiting most synthetic substances. A portion of the USDA organic regulations list the exceptions to this basic rule. For example, sewage sludge, irradiation, genetic engineering, and most synthetic fertilizers and pesticides may not be used. In organic processed products, any non-organic ingredients must be specifically allowed (e.g., baking soda)." USDA National Organic Program guidelines do not state that no chemicals can be used, just that synthetic chemicals cannot be used unless they are specifically allowed (ie. they are on the Organic Materials Review Institute [OMRI] lists of approved substances). I believe it is important for students to understand that applied natural chemicals are still chemicals.

In contrast to the editor's statement in the preface that the textbook "presents the introductory concepts students studying food science are required to learn," I found the textbook to primarily have a FCSC-focus, which I should have expected as the majority of chapter authors are registered dietitians. My students are required to take a human nutrition course so I don't need my food science textbook to also address nutrition topics in every chapter, nor do I need it to cover home food preparation principles. Perhaps in future editions the editor will invite contribution from agriculture and horticulture professionals to help present all sides of the food production story and food science professionals to give credence to the textbook title.

I believe this book would be acceptable for a FCSC class if the instructor stresses the USDA definition of organic and introduces the OMRI lists which specify all the chemicals that are allowed in organic crop and food production. Though for this purpose I still prefer Amy Brown's Understanding Food: Principles and Preparation or Marion Bennion and Barbara Scheule's Introductory Foods. In my opinion Food Science: An Ecological Approach is not directed at a food science audience and is unacceptable for an introductory food science course; therefore I am still on the lookout for the "right" textbook for next fall semester.

Submitted by:
Connie Fisk
Sheridan College

NACTA
north american colleges and teachers of agriculture
connect | develop | achieve

Join NACTA today!

(North American Colleges and Teachers of Agriculture)
— a professional organization dedicated to advancing the scholarship of teaching and learning in agricultural, environmental, natural, and life sciences.

- Members have online access to the quarterly NACTA Journal, a professional, peer reviewed journal emphasizing the scholarship of teaching. At the end of the year, members receive a hardcopy of the Journal that combines the quarterly issues. The Journal also includes book reviews, teaching tips, and conference abstracts.
- Members attend the annual conference held at different colleges and universities in the U.S. and Canada, and where members present papers on innovative teaching concepts.
- Each year NACTA recognizes outstanding teachers with a variety of awards including: Teaching Awards of Merit, Teacher Fellows, Regional Outstanding Teacher Awards, NACTA-John Deere Award, Teaching Award of Excellence, Distinguished Educator, and Graduate Student Teacher Awards.

To become a member register online at
http://www.nactateachers.org/online-membershipapplication-renewal.html
or complete and mail in the following form.

Membership Categories (check one):

- ❑ Institutional Active Dues are $75/year (if your University/college is a member)
- ❑ Active Dues are $100/year
- ❑ Graduate Student $25/year
- ❑ Emeritus $25/year
- ❑ Lifetime $750 if made in one payment (or $800 if made in four payments of $200)
- ❑ Institutions $150 for 4 year schools and $100 for 2-year schools

Name:		**Email:**
Institution:		**Telephone:**
Address 1:		
Address 2:		
City:	**State:**	**Zip:**

Send a check payable to NACTA for the correct amount or you can pay using a credit card (VISA and MasterCard only); phone calls also accepted 1-208-436-0692:

Name on Card:_____

Card Number:_____

Expiration (month/date):_____

Three digits on the back of your card to the right of the signature block: _____

Send your completed form to:

Marilyn B. Parker
NACTA Secretary/Treasurer
151 West 100 South
Rupert, ID 83350

For more information visit the NACTA website:
www.nactateachers.org
or email nactasec@pmt.org

NACTA Committee Members 2013-2014*

Journal Awards
Neil Douglas, Chair
Berea College, Kentucky
Neil_Douglas@berea.edu

Membership & Public Relations
Ron Hanson, Chair
University of Nebraska - Lincoln
rhanson1@unl.edu

Educational Issues & Teaching Improvement
Kimberly Moore, Chair
University of Florida
klock@ufl.edu

NACTA Teacher Recognition Committee
Nick Fuhrman, Chair, University of Georgia
Grace Arman-Agyeman, SW MN St University
Kirby Barrick, University of Florida
W. Stephen Damron, Oklahoma State University
Sam Doak, Virginia Tech
Kevin Donnelly, Kansas State University
Jean Gleichsner, Fort Hays State University, KS
Kelsey Hall, TX Tech University
Lynn Hamilton, California Polytechnic State University
Alan Hansen, University of Illinois
Ronald J. Hanson, University of Nebraska-Lincoln
Cindy Haynes, Iowa State University
Jennifer Henke, University of California
Robin Peiter Horstmeier, University of Kentucky
Dann Husmann, University of Nebraska-Lincoln
Donald M. Johnson, University of Arkansas
David Jones, North Carolina State University
Prasanta Kalita, University of Illinois
Angela Kent, University of Illinois
Thomas Kuzmic, Oklahoma State University
Mickey Latour, Southern Illinois University
Lurline E. Marsh, University of Maryland
Ed Miller, Oklahoma State University
Foy Mills, Sam Houston State University
Jeannette Moore, North Carolina State University
Tory Parker, Brigham Young University
Nick Paulson, University of Illinois
Greg Pillar, Queens University, NC
Bryan Reiling, University of Nebraska
Herman A. Sampson, North Carolina State University
Shelly R. Sitton, Oklahoma State University
Robert J. Stephenson, Fort Hays State University, KS
Kirk Swortzel, Mississippi State University
Elaine Turner, University of Florida
Bonnie Walters, University of Wisconsin, River Falls
Wendy Warner, North Carolina State University
Dean Winward, Southern Utah University

Liaisons
NACTA Judging Contest
Lyle Westrom, University of Minnesota, Crookston

Delta Tau Alpha
Jean Gleichsner, Fort Hays State University, KS

AASCARR
Billye Foster, Tenn Tech University

APLU
Jean Bertrand, University of Georgia

CFAVM & CADAP
Kent Mullinix, Kwantlen Polytechnic University, Surrey, BC

CAPICU
Ed Brokaw, Abilene Christian University, TX

International Committee
Chris Morgan, Chair
University of Georgia
acm@uga.edu

Nominating
Rick Rudd
Virginia Tech
RRudd@vt.edu

NACTA Foundation Advisory Council
Rick Rudd
Virginia Tech
RRudd@vt.edu

*** If you are interested in serving on one of the committees contact the Chair.**

NACTA
north american colleges and teachers of agriculture
connect | develop | achieve

the professional journal advancing the scholarship of teaching and learning in agricultural, environmental, natural, and life sciences