

# Engaging Undergraduate Students from Two Institutions in a Multicultural Synchronously Taught Agriculture Course<sup>1</sup>

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## 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

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– 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 (AANAPIS) – 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). Mulenberg 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. Calhoun 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

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**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 Calhoun 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).

**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) <sup>a</sup>	1.44 (0.26) <sup>b</sup>	1.89 (0.30) <sup>b</sup>	1.71 (0.29) <sup>b</sup>
Social	0.63 (0.17) <sup>a</sup>	0.31 (0.09) <sup>ab</sup>	0.49 (0.11) <sup>ab</sup>	0.19 (0.06) <sup>b</sup>
Total	3.92 (0.50) <sup>a</sup>	1.76 (0.30) <sup>b</sup>	2.38 (0.35) <sup>b</sup>	1.91 (0.32) <sup>b</sup>

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

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 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**

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



**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 <sup>1</sup>				
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 <sup>1</sup>				
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 <sup>1</sup>				
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

<sup>1</sup>Data was combined across three semesters (2010, 2011, and 2012).  
<sup>2</sup>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.  
<sup>3</sup>Values are means; parentheses enclose standard errors.  
<sup>4</sup>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.

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