Intercultural Competency Differences between U.S. and Central Asian students in an Engineering Across Cultures and Nations Graduate Course

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Intercultural Competency Differences between US and Central Asia students in an Engineering Across Cultures and Nations Graduate Course

Abstract

This was an exploratory study to examine the level of ethnocentrism and cultural awareness in graduate students enrolled in a course on Engineering Across Cultures and Nations, jointly offered between a US university and a partner university in Central Asia. The course incorporates cross-cultural, international business aspects of engineering leadership in their shared online curriculum. The course is virtual-team, project-based, and students meet through video conferencing for regular project work. The course introduces students to dimensions of culture, globalization and the impact on engineering, self-awareness of diversity biases/filters and challenges and techniques of effective virtual collaboration. Survey response data were collected during the first week of the course (Pre) and during the last week of the semester (Post) to measure ethnocentrism and cultural awareness/acceptance. The Ethnocentrism Scale (Neuliep & McCroskey, 2013) was used to measure ethnocentrism and the Miville-Guzman Universality-Diversity Scale – Short Form (M-GUDS-S) was used to measure three subscales: Diversity of Contact, Relativistic Appreciation, and Comfort with Differences (Miville et al., 1999; Fuertes et al., 2000). Both of these instruments use Likert scales, which introduces uncertainty in the intervals between scale points. The Likert scale data was treated as ordinal and a nonparametric Mann-Whitney U-test was used to determine group differences based on Mean Rank. Data were matched for pre/post, resulting in 18 paired data sets (11 US students and 7 Central Asian students).

Significant differences were identified between Mean Rank of students from the US university and students from the Central Asian University for measures related to ethnocentrism (Pre: p=0.041; Post: 0.023) and the degree of comfort with diverse individuals (Pre: p=0.028; Post: 0.018). The level of ethnocentrism was greater in Central Asian students compared to US students and the level of comfort with diverse individuals was greater in US students compared to Central Asian students. These differences were observed in both the pre- and post-course assessments. Although only a few significant differences were identified between pre- and post-assessments, the rank mean values indicate a general decrease in ethnocentrism from pre to post and an increase in cultural awareness and appreciation of diversity from pre to post assessments. These results indicate a trend in the direction that was expected, however a limitation of this study is the small number of participants which likely limited our power to detect changes over the length of a semester long course.

Introduction

In today's global marketplace, successful engineers must combine their technical expertise with an ability to live and work in a global community. It is no longer adequate to rely on their technical expertise alone. To be competitive and successful, engineers must combine their technical competencies with intercultural/global competencies. Among other things, this includes an understanding of how professionals in different cultures define problems and develop

solutions. For example, the developed world's business approach to maximize efficiency, minimize labor and maximize financial gain (as seen in Lean/Six Sigma) may not apply in some societies and developing economies. Engineers need to be aware of cultural differences and potential implications for successfully working on and/or leading cross-cultural and international engineering projects/teams.

Industry and academia recognize the need for global/intercultural competence in engineering graduates. Many universities are incorporating global programs and initiatives into their strategic plans. Engineering programs are also incorporating global competency development into co-curricular activities and in some instances entire courses are devoted towards it, such as the engineering across cultures course that is the focus of this study. One might ask what a course in engineering across cultures should cover given that this subject matter spans many disciplines.

The relevant discussion has been motivated by the seminal publications of the National Academy of Engineering (2004, 2005) attempting to describe the vision of the Engineer of 2020 and the resultant implications for engineering education. These reports inspired various compilations of global engineering competencies covering the diverse technical, professional, and cultural attributes that engineers are expected to possess when practicing in global contexts.

Literature Review

Global Competencies for Engineers

Downey et al. (2006) examined what it means for engineers to be globally competent. Downey et al. report that a globally competent engineer must be able to work effectively with people who define problems differently than themselves, they must be able to integrate knowledge with everyday engineering practices, and should have/develop a predisposition to treat people from other countries/cultures as individuals who have knowledge and value (Downey et al., 2006).

Parkinson et al. (2009) was the first to consolidate these compilations into a single list of global competencies for engineering students. Specifically, their study identified 13 dimensions/attributes of global competence and reported their importance as assessed by engineering experts from both academia and industry. The following includes the 13 dimensions/attributers in order of rating based on the sum of the academic and industry expert ratings for each dimension (ordered from highest rating to lowest rating): Appreciate other cultures *(understanding and avoiding ethnocentrism);* Work in teams of ethnic and cultural diversity; Communicate across cultures *(understand cultural differences);* Practice engineering in global context *(international internship, service learning, virtual global engineering project, etc.);* Deal with ethical issues that arise from cultural or national differences; View as citizens of the world *(appreciate challenges facing mankind: sustainability, environmental protection, poverty, security, and public health);* Understand connectedness of the world, global economy; Understand cultural issues on product design, manufacture, and use *(understanding of customer needs based on cultural differences);* Understand cultural differences relative to engineering tasks *(impact of culture on approaching/solving problems);* Speak at conversational level; Exposure to global supply chains, intellectual property, liability and risk, and business practices;

Speak at a technical level; Familiar with history, government, economics *(understand elements of societal context)* (Parkinson et al., 2009).

These global competencies were later verified in a study that combined extensive literature review along with a survey instrument, polling mechanical engineering alumni of Brigham Young University in 17 countries (Warnick, 2011). Twelve of the thirteen global competencies identified by Parkinson et al. (2009) were mapped to Purdue's Engineer of 2020 Target Attributes in a study to determine whether these attributes can be improved via specifically designed global engineering curricula (Dare et al., 2011).

After a comprehensive literature review from engineering education, business and management, organizational psychology, and human resources, Jesiek et al. (2013) came to similar conclusions, albeit with a slightly different taxonomy. Ultimately, the question is not whether this or that set of attributes is more inclusive but rather whether curricular interventions can impact student development of cultural intelligence and cross-communication skills (Davis and Knight, 2018). This study is a contribution to the corresponding debate and the emerging body of knowledge in the field.

Assessing Intercultural Competence in Engineering Students Using the M-GUDS-S

The Miville-Guzman Universality-Diversity Scale Short Form (M-GUDS-S) has been used extensively to assess factors related to global competency. The instrument assesses one primary construct of Universal-Diverse Orientation (UDO) which "describes an attitude of awareness and acceptance of both the similarities and differences among people" (Miville et al., 1999; Fuertes et al., 2000). The UDO construct includes three main factors (sub-scales): Diversity of Contact, Relativistic Appreciation, and Comfort with Differences.

The M-GUDS-S has previously been used to assess cultural orientation and intercultural competence development in engineering students. First used by Bielefeldt and High (2007) in an engineering curriculum, the M-GUDS-S was used to evaluate the impact of curriculum on the development of students' intercultural competency in first year and senior students. Within the freshman course, comparison of first and last day responses indicated that only two of the instrument questions had significant changes, indicating that a single semester, or at least these specific culture-related activities had minimal impact on cultural competency. Within the senior design course, females scored significantly higher than males on three questions, with a suggestive trend of a higher score on the Comfort with Differences sub-scale (Bielefeldt and High, 2007). Higher scores on the Comfort with Differences sub-scale, as with the other two sub-scales reflects greater ability to deal with this cultural factor. That is the higher score reflects greater comfort with cultural differences.

In a follow-up report, using additional pooled data, Bielefeldt (2008) indicates within freshman students, females had significantly higher scores in all three sub-scales of the M-GUDS-S compared with males. Male students raised outside the U.S. had significantly higher scores for Diversity of Contact compared with students raised primarily within the U.S. Comparison of white students to all other students indicated that non-white students had higher Diversity of Contact scores. Comparisons of freshman and senior/graduate students indicated higher scores for Diversity of Contact and overall UDO in senior/graduate students compared to freshman.

The higher scores among senior/graduate students was attributed to increased exposure to diverse cultures (Bielefeldt, 2008).

Jesiek et al. (2012) utilized the M-GUDS-S instrument to determine whether there are differences in openness to and appreciation of cultural diversity between engineering students that self-select into global engineering programs compared to first-year engineering honors students as a baseline. Three different global programs were utilized in the comparisons. The authors report that students self-selected to enter all three of the global engineering programs had higher total UDO and Diversity of Contact sub-scale scores compared to the freshman baseline group. The International Research and Education in Engineering (IREE) program was one of three programs evaluated in this study. Students in the IREE program participated in a 10–12 week long research abroad experience in China. Students in the IREE group also had higher levels of Relativistic Appreciation and Comfort with Differences sub-scale scores compared to the freshman baseline group. Jesiek et al. also investigated the impact of participating in the IREE immersive global education experience on the same measures. Pre and Post program participation scores were compared and indicated that students participating in the global immersive experience increased their scores on the total UDO and Relativistic Appreciation sub-scale. The authors also report that female graduate students had much larger gains compared to undergraduate females, whereas male undergraduates had greater gains compared to male graduate students. The authors also report interesting interactions between gender and prior international experience, with the greatest increases from pre to post scores in females without prior experience living abroad and in males with prior experience living abroad (Jesiek et al, 2012).

Main and Sanchez-Pena (2015) modeled relationships between predictor variables (gender, age, ethnicity, travel experience, and fluency in more than one language) and M-GUDS-S sub-scales and total UDO scores. Within domestic students, of these predictors, gender was the only variable that significantly predicted all three sub-scales and total UDO scores, with females scoring higher than males. Asian and underrepresented minority students scored higher on the Diversity of Contact sub-score compared to white students. Underrepresented minority students also scored higher on the Comfort with Difference sub-score and total UDO score. Travel abroad was positively associated with Diversity of Contact, Comfort with Difference, and total UDO scores. Fluency in two or more languages was positively associated with the Relativistic Appreciation sub-score and total UDO score. Within the international student subgroup, gender was a significant predictor of the total UDO score and the Diversity of Contact sub-scale score, with females scoring higher than males. Age was negatively associated with the Comfort with Differences sub-scale. Ethnicity was not a significant predictor of any sub-scale or total scores among international students. Language ability was significantly predictive of the Diversity of Contact sub-score (Main and Sanchez-Pena, 2015).

Global Virtual Teams

Many universities provide their students with international travel experiences to help develop an appreciation and understanding of other cultures as well as an opportunity to work on multi-cultural teams. However, these types of experiences, such as study abroad and short-term immersion programs, require considerable resources and are not scalable to a large student population. In response to these challenges, global virtual teaming opportunities have emerged

as an alternative to sending students abroad. These same pressures exist in industry – travel is expensive, yet teams of engineers, requiring diverse expertise are required, thus virtual teaming has emerged as a common part of the engineer's tool kit. Ball et al. (2012) performed a comparative evaluation of several traditional study abroad programs with a global virtual teaming course to evaluate the effectiveness of each modality in building student's global competencies. The comparative evaluation was conducted utilizing a survey instrument to evaluate the effectiveness in developing 23 global competencies in students from a study abroad program that included a significant team engineering experience compared to students in a global virtual teaming-based course. Students indicated their level of agreement, using a six-point Likert scale, on whether their respective course taught and enabled them to develop global competencies. While this study indicated that the study abroad program had significantly higher agreement ratings for 12 of the 23 competencies, compared to the virtual global teaming course, they did report that for 11 competencies there were no significant differences. This lack of significance indicates that the global virtual teaming course was equally effective in developing these competencies as compared to the study abroad program. These competencies were: using collaboration technologies in intercultural interactions, collaborating and working towards a common goal as a team member on a multicultural team, developing multicultural team leadership skills, understanding and respecting engineering practices and contributions that were foreign to you, explain basic principles of global businesses, and communicate in a second language, practice tolerance and flexibility when involved in intercultural interactions, describe how culture influences team processes, develop a desire to interact with people from different countries to solve global problems, objectively evaluate and adopt advantageous cultural practices and values, and apply principles of intercultural communication (Ball et al., 2012). These results do not negate the fact that several important competencies were rated significantly higher in the study abroad program, supporting the advantages of physically traveling abroad and experiencing cultural differences first hand, however, they do provide encouragement that global virtual teaming can be an effective alternative when resources prohibit intercultural experiences on a larger scale.

Ethnocentrism

Ethnocentrism has been identified as the greatest hurdle to an individual's ability to understand another culture (Ferraro, 2005). Parkinson (2009) suggests that engineers may be susceptible to an ethnocentric view where they relate their technological superiority to a cultural superiority, and need to develop an appreciation and sensitivity toward other cultures. Previous studies have investigated the impact on cross-cultural courses in reducing ethnocentrism. Pettijohn and Naples (2009) incorporated cross-cultural training into an introductory psychology course and compared ethnocentrism levels pre- and post- course completion to similar assessments of an introductory psychology course without the cross-cultural training. Students in the cross-cultural section significantly reduced ethnocentrism from pre- to post-course assessment, whereas students in the regular section did not. The authors also report that within the cross-cultural section, changes in ethnocentrism was not related to course grade but changes in ethnocentrism were related to involvement with the course material. Providing opportunities for intercultural experiences, such as global virtual teaming described above, may provide students with greater engagement with the course material, leading to greater opportunities for ethnocentrism reduction. Boehm et al. (2010) reported on the impact of an online international collaborative learning project on ethnocentrism, as assessed with the Generalized Ethnocentrism Scale

(GENE), within STEM higher education classrooms across six semesters. The hypothesized reduction in ethnocentrism from pre- to post-course completion was not supported in any of the semester comparisons.

Methods

Current Study Overview and Hypotheses

This study investigated the impact of an online Engineering Across Cultures and Nations course on ethnocentrism and Universal-Diverse Orientation (UDO), which "describes an attitude of awareness and acceptance of both the similarities and differences among people" (Miville et al., 1999; Fuertes et al., 2000), in graduate engineering students. The course provided a global virtual teaming opportunity to students from a US University and Central Asia University. The study hypotheses included the following:

1. Ethnocentrism will decrease in students from pre- to post-course completion.
2. Measures of Universal-Diverse Orientation will increase in students from pre- to post-course completion.
3. The Central Asia University is located in a country that was previously a part of the Soviet Union, with a significant socio-political influence from Russia. Based on Russia's high level of Uncertainty Avoidance, and the reported link between Uncertainty Avoidance and a resistance to accept polycentrism compared with cultures with low Uncertainty Avoidance, such as the United States (Hofstede et al., 2010), it is expected that ethnocentrism will be higher in the Central Asia University students compared to the US University students.

Course Description

This study was conducted within a graduate course on Engineering Across Cultures and Nations, which explores cultural differences and the impact on business practices and team dynamics. The course focuses on the primary knowledge areas and essential competencies required for successful engineers to live and work in today's global marketplace. Within the context of engineering, the course examines individual and cultural differences and how they impact communication and team dynamics. Students from XXX and a partner international university participated in course instruction and worked together on virtual project teams composed of students from both universities. Students gained an understanding of sources of conflict that can arise from multicultural teams and effectively use the tools and resources discussed in class to manage individual and team motivation and minimize or effectively deal with conflict, while harvesting the benefits of diversity as they work on a real-world virtual team project.

This course explores the role of culture in identifying and solving engineering problems. Readings, lesson commentaries, projects and group discussions focus on intercultural knowledge and case studies of engineering projects in a global context. The course incorporates an experiential learning project, in collaboration across two international universities, where virtual, cross-cultural challenges are encountered and resolved through an international team-based engineering project, where students apply course concepts. Students participate in discussions on

what potential obstacles or synergies might exist when working on a team with someone from another culture.

The learning outcomes for students in this course are to:
- • Demonstrate a proficiency in team-building, leadership, and service in the context of cross-cultural engineering teams.
- • Construct creative solutions to engineering problems incorporating cultural differences among team members and external stakeholders.
- • Critically analyze personal and team-member competencies and biases.
- • Formulate and apply strategies to improve engineering team dynamics.
- • Provide effective feedback, recognition, motivation and corrective guidance for team members with various cultural and national backgrounds.
- • Evaluate strategies for the diffusion of ideas within international and cross-cultural markets.
- • Examine moral, ethical, and legal dilemmas in cross-cultural engineering environments.

The course material aligns significantly with the global competencies identified by Parkinson (2009). The course is composed of 15 modules with one module covered during each week of a 15-week semester. In addition to supplemental readings and online course commentary focused on the topics outlined below, the course includes content from two books: *Cultures and Organizations* by Hofstede, Hofstede, and Minkov, and *Kiss, Bow, or Shake Hands,* by Morrison, Borden and Conaway. Both books are used to examine cultural norms of 12 different countries, focusing on one country per lesson module. The course modules cover: Studying Cultural Differences (the need for global competencies and barriers to intercultural competency development); Global Economy and Trading Blocs; Globalization and Engineering Practices; Globalization and the Impact on Communication & Knowledge Sharing; Understanding Yourself and Others (MBTI and teams); Developing Effective Cross-Cultural Engineering Teams (impact of diversity filters, personal preferences and biases on team dynamics); Evolution and Blending of Cultures and Acculturation Strategies; Culture, Innovation, and Technology; International Business Environments; Conflict Management and Negotiations Across Cultures; Corporate and Individual Values and Motivation; Organizational Cultures; and Preparing for International Assignments.

A significant component of the course is aimed at developing the student's understanding of themselves and how their own biases and diversity filter can impact how they see others and consequently work effectively on diverse engineering teams. When working on project teams, students are required to develop a team MBTI, diversity report, and team contract where they are given an opportunity to explore individual strengths and weaknesses, which helps them develop an appreciation of differences and a sense for how diversity can strengthen their team. Student teams are also required to produce a stakeholders' perspectives report to explore their course project solution in the context of all stakeholders, with a primary focus on the end users in their project's host country. This activity is intended for students to explore the cultural implications of their project solution by examining how the various stakeholders view the problem and their engineering solution. Activities such as these are expected to decrease ethnocentrism and increase an appreciation of other cultures and comfort with differences, while providing students with an opportunity to work on an international engineering team.

Survey Instrument

Two instruments were utilized in this study and both were used in a pre- and post-course assessment. The instruments included the Miville-Guzman Universality-Diversity Scale – Short Form (M-GUDS-S) (Miville et al., 1999; Fuertes et al., 2000) and the Ethnocentrism Scale (Neuliep & McCroskey, 2013). Demographic data were also collected and included age, gender, ethnicity, and semester standing. In addition, three questions were included in the survey to assess whether the students have had previous intercultural/global training, the type of previous training, whether they had previous international travel, and the type/length of travel. Survey response data were collected during the first week of the course (Pre) and during the last week of the semester (Post) to measure ethnocentrism and cultural awareness. The Ethnocentrism Scale (Neuliep & McCroskey, 2013) was used to measure ethnocentrism and the M-GUDS-S was used to measure attitudes, cognitions, and behaviors related to diversity (Miville et al., 1999; Fuertes et al., 2000).

The M-GUDS-S is a 15-item questionnaire that presents statements related to diversity where respondents are asked to indicate how descriptive each statement is of the respondent using a 6-point Likert scale with response options that include: Strongly Disagree, Disagree, Disagree a Little Bit, Agree a Little Bit, Agree, and Strongly Agree. The instrument assesses a person's awareness and acceptance of similarities and differences among individuals and includes three subscales: Diversity of Contact, Relativistic Appreciation, and Comfort with Differences (Fuertes et al., 2000). The *Diversity of Contact* subscale measures the respondent's interest in participating in diverse social and cultural activities. The *Relativistic Appreciation* subscale measures the extent to which the respondent values the impact of diversity on self-understanding and personal growth, and the *Comfort With Differences* subscale measures the respondent's degree of comfort with diverse individuals. In addition to the three sub-scales, a total score was tabulated from the sum of the three sub-scale scores and represents the level of *Universal-Diverse Orientation (UDO),* which is "an attitude toward all other persons which is inclusive yet differentiating in that similarities and differences are both recognized and accepted" (Miville et al., 1999; Fuertes et al., 2000).

The Revised Ethnocentrism Scale measures a respondent's level of ethnocentrism, which is the belief that one's own cultural group is superior and the center of everything and other cultures are rated in comparison to one's own culture. The scale consisted of 22 items, with 15 items that are scored on a five-point scale. Seven items are included in the instrument, but not scored, to provide balance between positively and negatively worded items. Respondents rate items using a five-point Likert scale with response options that include: Strongly Disagree =1; Disagree =2; Neutral=3; Agree=4; Strongly Agree=5. A composite ethnocentrism score is determined using the sum on the 15 scored items, with 3 items that are reverse coded.

Participants

Participants in this study included students enrolled in an Engineering Across Cultures Course that was offered online to graduate masters-level students from a university in the northeast of the United States and an international university located in Central Asia. This research study, protocol # 00006973, was approved as exempt by the US University institutional Review Board (IRB). Due to the sensitive nature of the survey questions, the IRB required that the researchers

use security questions to match pre and post data instead of obtaining identifying information. Participants were not provided any incentive for their participation.

Seventeen students were enrolled in the course from the US university and twenty-two students were enrolled from the Central Asian university. Table 1 provides an overview, by university, for the total enrollment, the number of pre-course assessments completed, the number of post-course assessments completed, and the number of pre/post matched surveys for students that consented to have their data included in this research study. Table 1 also includes a breakdown by gender for the students that consented to the study.

Table 2 includes a breakdown by university for additional demographic data including mean age, age range, semester standing, and ethnicity. The mean age of Central Asian students was 25.14 compared to the mean age of the US students which was 31.73. The majority of the Central Asian students were 2nd and 3rd semester graduate students while the US students ranged from 1st semester to 4th semester graduate students. Of the Central Asian university students, 6 reported their ethnicity as Asian and 1 student reported White and Asian. Within the US student group, 9 students reported their ethnicity as White, 1 as White and Hispanic Latino, and 1 as Arab.

Table 1: Summary of participant survey completion and gender.

	Total Enrolled	# Pre Surveys	# Post Surveys	Pre-Post Matched (n)	Females (n)	Males (n)
Central Asian University	22	8	7	7	3	4
US University	17	15	14	11	2	9

Table 2: Participant demographics: mean age, age range, semester standing, and ethnicity.

	Mean Age	Age Range	Graduate Student Semester Standing (1st, 2nd, etc.)	Ethnicity
Central Asian University	25.14	22-31	2nd: n=2 3rd: n=5	Asian: n=6 White, Asian: n=1
US University	31.73	24-49	1st: n=1 2nd: n=5 3rd: n=2 4th: n=3	White: n=9 White, Hispanic, Latino: n=1 Other, Arab: n=1

Study participants were asked a two-part question to determine the amount of intercultural training they have received previously. Part one of the question asked: "*Have you previously taken any college/university level workshops or courses that provided intercultural training?*" (response options: Yes, No). Respondents with previous intercultural training were asked a follow-up question: *"Please indicate the amount of previous training you have received (check all that apply):".* Table 3 summarizes participant responses to the two survey questions. Within the Central Asian student group, five students indicated no previous training and two students indicated that they had previously participated in a workshop or course lasting multiple days. Within the US student group, seven students indicated no previous training. Of the four students that indicated previous intercultural training, the training included multiple formats and all four

students reported having participated in a full course devoted to intercultural and/or global awareness and/or communication.

Table 3: Participant responses to the survey question on previous intercultural training: *"Please indicate the amount of previous training you have received (check all that apply):"*

Response Options	Central Asian Students (n)	US Students (n)
No training	5	7
Workshop (lasting an hour to a full day)	0	1
Workshop or course lasting multiple days	2	1
Individual lectures that are part of another course	0	2
A full course devoted to intercultural and/or global awareness and/or communication.	0	4
Please provide additional information describing the extent of prior training: Student responses: - World Religions class at Penn State, Contemporary Australia Class during a study abroad. - Tactic knowledge shared from those experienced at work. - My undergrad degree is in Media Studies with an International focus.	0	3

To assess the amount of previous international travel experienced by study participants, students were also asked: "*Please indicate the amount of international travel you have participated in previously (check all that apply)*". Table 4 summarizes participant responses to the survey question. Within the Central Asian student group, 6 of the 7 students reported previous international travel. Within the US student group, all 11 students reported previous international travel. Table 4 provides a breakdown of the type of prior international travel, with travel experience ranging from a family vacation to work related assignments lasting more than 6 months.

Table 4: Participant responses to the survey question on international travel: "*Please indicate the amount of international travel you have participated in previously (check all that apply)*."

Response Options	Central Asian Students	US Students
None	1	0
Family vacation	5	6
Church/Mission trip	0	1
Student exchange program (middle school or high school)	0	0
School sponsored trip (middle school or high school)	0	1
Study abroad (college/university); semester or longer	4	2
School sponsored trip (college/university); less than a month	1	1
Work related trip (lasting less than a month)	2	0
Work related assignment (lasting 1-6 months)	1	2
Work related assignment (lasting more than 6 months)	1	4

Data Analyses

Data from both instruments (M-GUDS-S and Ethnocentrism Scale) were matched for pre/post by individual study participant, resulting in 18 paired data sets (11 US students and 7 Central Asian students). Means were determined for each pre- and post- by US/Central Asia group and are reported for descriptive purposes only. Both instruments use Likert scales, which introduces uncertainty in the intervals between scale points. Because of this uncertainty, the Likert scale data was treated as ordinal and a nonparametric Mann-Whitney U-test was used to determine group differences based on Mean Rank. While it is common to use parametric tests to analyze ordinal data, the data must meet several assumptions of the parametric test including a sample size greater than 30. From the Mann-Whitney test, the Mean Rank provides a comparison between two groups. When comparing two groups, the group with the greater Mean Rank corresponds to the group with the higher measurement level. According to Siegel & Castellan (1988), this data set met the threshold for sample size. For the Mann–Whitney U-test, when one group has a sample size larger than four, the other group sample size should be larger than 10.

Two separate analyses were performed to determine: 1) changes from pre to post-course assessment and 2) differences between the US and Central Asian student groups. Data were separated by University and then the nonparametric Mann-Whitney U-test was used to determine group differences between pre- and post-course assessment scores based on differences between Mean Rank. A second analysis was conducted to determine differences between Universities by separating the data by pre- and post-course assessment and then using the nonparametric Mann-Whitney U-test to determine group differences between the US and Central Asian student groups.

Ethnocentrism Data Analysis

The Ethnocentrism Scale, with response options of: Strongly Disagree =1; Disagree =2; Neutral=3; Agree=4; Strongly Agree=5, is designed such that agreeing with the survey items (or disagreeing with the recoded survey items) results in higher measures of ethnocentrism. Thus, higher values for each survey item represents greater levels of ethnocentrism. Individual assessment items were evaluated as well as an overall ethnocentrism score. The overall ethnocentrism score was obtained by summing across all 15 items, again with greater values indicating higher levels of ethnocentrism. Pre- and post-course data were evaluated to determine if ethnocentrism was reduced due to participation in the semester long course. Since greater values indicate greater levels of ethnocentrism, it was expected that item scores as well as the overall ethnocentrism score would go down from pre- to post-assessment. When evaluating the ethnocentrism data using the Mann-Whitney U-test, the group with the greater Mean Rank corresponds to the group with the higher level of ethnocentrism. Our expectation is that ethnocentrism will be lower in the post-course data, compared to pre-course data, which would correspond to a lower Rank Mean in the post-course group.

Cultural Awareness Data Analysis

The M-GUDS-S, with response options of: Strongly Disagree =1; Disagree =2; Disagree a Little Bit=3; Agree a Little Bit=4; Agree=5; and Strongly Agree=6, is designed such that agreeing with the survey items (or disagreeing with the recoded survey items) results in higher levels of interest

in other cultures, appreciate other cultures, and comfort with differences and is represented by greater values for each assessment item and each sub-scale. Individual assessment items were evaluated as well as three sub-scales: Diversity of Contact, Relativistic Appreciation, and Comfort with Differences. The three sub-scales were obtained by summing across 5 corresponding items, again with greater values indicating more favorable measures. Pre- and post-course data were evaluated to determine if these measures were increased due to participation in the semester long course. Since greater values indicate more favorable responses related to cultural appreciation and comfort, it was expected that item scores as well as the sub-scale scores would go up from pre- to post-assessment. When evaluating these data using the Mann-Whitney U-test, the group with the greater Mean Rank corresponds to the group with the higher levels of interest in other cultures, appreciation of other cultures, and comfort with differences. Our expectation is that these measures will be higher in the post-course data, compared to pre-course data, which would correspond to a higher Rank Mean in the post-course group.

Results

Figure 1 includes group means for the overall ethnocentrism score and the total Universal-Diverse Orientation (UDO) score that was obtained from the sum of the three M-GUDS-S sub-scales: Diversity of Contact, Relativistic Appreciation, and Comfort with Differences. Figure 2 includes the means for the three sub-scales of the M-GUDS-S: Diversity of Contact, Relativistic Appreciation, and Comfort with Differences. Within Figures 1 & 2, group mean and standard error of the mean are provided for pre- and post-course assessment by university: Central Asia Pre (CA-Pre), Central Asia Post (CA-Post), United States Pre (US-Pre), and United States Post (US-Post).

Figure 1: Group means for overall ethnocentrism and diversity scores for pre- and post-course assessment by university.
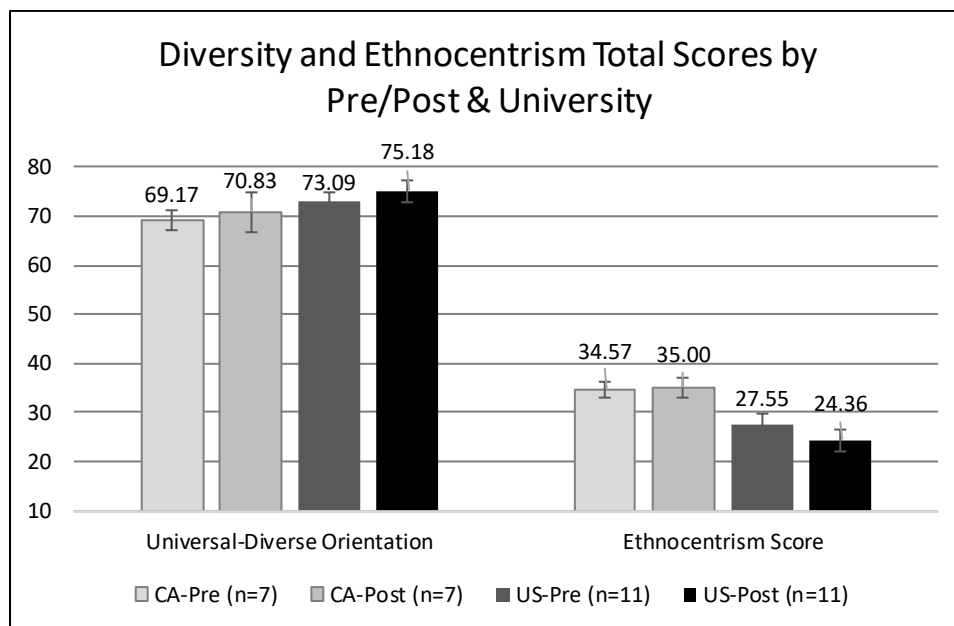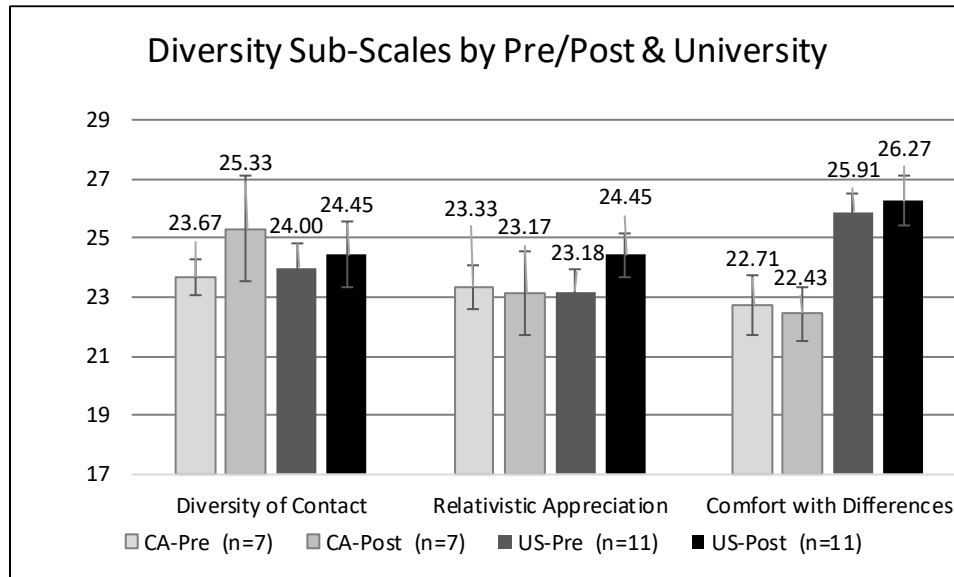
Figure 2: Group means for the three M-GUDS-S sub-scales: Diversity of Contact, Relativistic Appreciation, and Comfort with Differences for pre- and post-course assessment by university.

Diversity Sub-Scales by Pre/Post & University

Bars labeled with values: Diversity of Contact: 23.67, 25.33, 24.00, 24.45; Relativistic Appreciation: 23.33, 23.17, 23.18, 24.45; Comfort with Differences: 22.71, 22.43, 25.91, 26.27.

Legend: CA-Pre (n=7), CA-Post (n=7), US-Pre (n=11), US-Post (n=11)

Changes from Pre- to Post-Course Assessment

Table 5 (Ethnocentrism scale) and Table 6 (Diversity scale) (see appendix) include the Mean Rank by pre- and post-course assessment group for each survey item and composite ethnocentrism score and diversity sub-scales and total UDO score as assessed within each university separately. Mean Rank and the corresponding p-value were obtained from the Mann-Whitney U-test, to evaluate group differences. Group differences between pre- and post-assessment were conducted within the US University student data and a second analysis was conducted within the Central Asian student data. P-values are reported for each pre- and post-comparison by university, with p-values < 0.05 indicating a significant difference between groups.

It is important to note that the Mean Ranks are only appropriate for comparison within a University's Pre and Post values in Tables 5 and 6, i.e. you cannot make any judgement on level of ethnocentrism between one university's values for Pre or Post and another university's values in Tables 5 and 6. The individual university analyses are independent and the Mean Rank for the 'Pre' US student group is only in comparison to the 'Post' US student group.
Changes from Pre- to Post-Course: Ethnocentrism

As a reminder, lower levels of ethnocentrism are desired, and it was hypothesized that ethnocentrism would be lower in the post-course assessment as compared to the pre-course assessment, indicated by a reduction in Mean Rank from pre to post. Within the US University student group results (Table 5), only one survey item had a significant reduction from pre to post: '*I dislike interacting with people from different cultures.*' (p=0.034) and one survey item had a suggestive decrease from pre to post: '*I respect the values and customs of other cultures.*' (p=0.079; note this item was reverse coded). Within the Central Asia University student data,

only one survey item had a significant decrease from pre to post: '*Most people would be happier if they lived like people in my culture.*' (p=0.010).

Although only two survey items had a suggestive or significant difference between pre- and post-assessments in the US University group, the Mean Rank values indicate a decrease in ethnocentrism from pre- to post-assessment across all but two items. These results indicate a trend in the direction that was expected.

The picture is somewhat less clear within the Central Asia University results (Table 5) where only six survey items had a decreasing trend from pre to post, with seven items increasing and three items with no change.

Changes from Pre- to Post-Course: Diversity of Contact & Appreciation/Comfort with Cultural Difference

The results from the M-GUDS-S Survey for measures of diversity of contact, appreciation of diversity, and comfort with diversity are reported in Table 6. For each of the survey items, higher ratings are desired and an increase from pre to post was hypothesized. Within the US University student data, only one survey item had a significant increase from pre to post: '*I can best understand someone after I get to know how he/she is both similar to and different from me.*' (p=0.014). Of the 15 survey items and 3 sub-scales, all but 5 survey items supported a trend of an increase from pre to post in the US University student group.

Within the Central Asia University student group, no significant differences were identified from pre to post, eight survey items and two of the sub-scales indicated an increase in scores from pre to post, whereas, six survey items and one sub-scale decreased in score from pre to post.

Differences between US University Students and Central Asian Students

Data were also evaluated across universities. Tables 7 and 8 presents differences between the US Northeastern University and the Central Asian University, with comparisons made within the pre-course assessment data and a second analysis within the post-course assessment. Both sets of results are presented within Tables 7 and 8 (see appendix). P-values are reported for each university group comparison, with p-values < 0.05 indicating a significant difference between groups. Table 7 presents the ethnocentrism results and Table 8 presents the Diversity assessment results. Within Tables 7 and 8, significant group differences are shaded grey and bolded (p≤0.05) and suggested trends are bolded (p≤0.09) for ease in identification.

It is important to note that the Mean Ranks are only appropriate for comparison within a row in Tables 7 and 8, i.e. you cannot make any judgement on level of ethnocentrism between Pre and Post values in this table. The Pre and Post analyses are independent, and the Mean Rank for the 'Pre' US group is only in comparison to the 'Pre' Central Asia group.

Differences in Ethnocentrism between US and Central Asia University Students

Table 7 presents the results from the ethnocentrism group differences analysis between the two university student groups (US and Central Asia). Two sets of analyses are presented within the

table. They include an analysis of university student differences in ethnocentrism prior to the start of the course (pre) and a separate analysis of university student differences in ethnocentrism at the conclusion of the course (post). Mean Ranks and associated p-values are presented for each of the independent analyses.

Within the pre-course data analysis, 4 of the ethnocentrism survey items (p<0.05) as well as the Ethnocentrism Overall Score (p=0.041) indicated significant differences and 2 items had a suggestive trend (p<0.09) between Mean Rank of students from the US university and students from the Central Asian University. The level of ethnocentrism was greater in the Eastern Asian student group compared to the US student group across all six survey items and the *Ethnocentrism Overall Score*. All but three of the ethnocentrism items indicated a general trend of greater ethnocentrism in the Central Asia student group compared to the US student group.

Within the post-course data analysis, five ethnocentrism survey items (p<0.05) as well as the *Ethnocentrism Overall Score* (p=0.023) had significant differences and two items had suggestive trends (p<0.09) between Mean Rank of students from the US university and students from the Central Asian University. Within the post-course assessment, ethnocentrism was greater in Central Asian students compared to the US student group across all survey items as well as the *Ethnocentrism Overall Score*.

Differences in Diversity of Contact & Appreciation/Comfort with Cultural Differences between US and Central Asia University Students

Within the pre-course Diversity data (Table 8), one survey item: '*It is very important that a friend agrees with me on most issues.*' (reverse scored; p=0.012) and the *Comfort with Differences* sub-scale (p=0.028) had significant differences and one item had a suggestive trend (p=0.099) between Mean Rank of students from the US university and students from the Central Asian University. Within the pre-course data, measures of diversity were greater in the US student group compared to the Central Asia student group for 10 of the survey items as well as two of the sub-scales: *Diversity of Contact* and *Comfort with Differences* (p=0.028). Whereas five survey items, including the item with the suggestive trend ('*I attend events where I might get to know people from different racial backgrounds.*'; p=0.099) and one of the sub-scales, *Relativistic Appreciation*, had greater Mean Ranks in the Central Asian student group compared to the US student group.

Within the post-course Diversity data, four survey items and one sub-scale had significant differences between the US and Central Asia student groups. Within the post-course data, measures of diversity were greater in the US student group compared to the Central Asia student group for 10 of the survey items as well as two of the sub-scales: *Relativistic Appreciation* and *Comfort with Differences* (p=0.018). The three survey items with significantly higher Mean Rank in the US student group were: '*I can best understand someone after I get to know how he/she is both similar to and different from me.*' (p=0.020); '*It's really hard for me to feel close to a person from another race.*' (reverse scored; p=0.024); and '*It is very important that a friend agrees with me on most issues.*' (reverse scored; p=0.010). Whereas five survey items and one of the sub-scales, *Diversity of Contact*, had greater Mean Ranks in the Central Asian student group compared to the US student group. One of the survey items with a greater Mean Rank in

the Central Asian student group was also one of the four survey items with significant differences between the two groups: '*I often listen to music of other cultures.*' (p=0.046).

Discussion

Pre- to Post-Course changes in Ethnocentrism and Diversity of Contact, and Appreciation and Comfort with Cultural Differences

This Engineering Across Cultures and Nations course was designed to build global competencies around team-building, leadership, and service in the context of cross-cultural and cross-national engineering teams. The course material examines cultural differences as they relate to engineering practices, business practices, teamwork, innovation, conflict and negotiations, corporate and individual values and motivation, and organizational cultures. A key component of this course is to provide an intercultural engineering teaming experience through a virtual teaming project with international partner universities in the US and Central Asia.

As mentioned previously, ethnocentrism has been identified as the greatest hurdle to an individual's ability to understand another culture (Ferraro, 2005) and Parkinson (2009) suggests that engineers may equate their technological superiority to a cultural superiority, and need to recognize this potential obstacle and the need to develop an appreciation and sensitivity toward other cultures. The Ethnocentrism Scale and the M-GUDS-S were used to assess baseline levels of ethnocentrism and diversity of contact, and appreciation and comfort with cultural differences of students prior to the start of the semester-long course and then again at the conclusion of the course to evaluate the impact of participation in the course.

Within each of the university student groups, only one survey item had a significant decrease from pre to post ethnocentrism assessment. This lack of significant improvement in ethnocentrism was not expected but is consistent with other reports from the literature. The results from the pre- to post-course assessment from the Universality-Diversity Scale were equally non-significant, with only one survey item indicating an increase from pre to post in the US student group and no significant changes in the Central Asia student group.

However, within the US University student group, trends of reduced ethnocentrism were noted across all but two survey items and increases in the Universality-Diversity items were present in all but five survey items. This trend is encouraging given the limited sample size (n=11).

Within the Central Asia University results, the picture is somewhat less clear for both the Ethnocentrism Scale measures and Universality-Diversity Scale measures. Only six out of the 15 Ethnocentrism Scale items and eight of the 15 Universality-Diversity Scale items had changes in the expected direction from pre- to post-course assessment. Again, of all these measures, only one ethnocentrism item had a significant change in the desired direction. As with the US University student group, the ability to detect differences is even more limited in the Central Asia student group with a sample size of n=7.

Differences between US and Central Asia University Students in Ethnocentrism

The more interesting and significant findings of this study were from the comparisons across the US and Central Asia University student groups. As reported in the results section above, ethnocentrism was higher in Central Asia students compared to US students at the start of the course. This trend was consistent across all but three survey items and was significant for four items as well as the *Ethnocentrism Overall Score*. Similar trends were evident in the post-course data, with ethnocentrism levels higher in Central Asia students compared to US students across all survey items, with five items indicating significant differences as well as a significant difference in the *Ethnocentrism Overall Score*. Three of the survey items as well as the *Ethnocentrism Overall Score* were significantly different between university student groups in both the pre- and post-course assessments.

One survey item was only significantly different between universities in the pre-assessment data: '*Most people would be happier if they lived like people in my culture.*'. Comparing this result to the pre-post changes, we find that this survey item was also the only item that indicated a significant reduction from pre to post in the Central Asia student group. The reduction from pre to post in the Central Asia student group, but not the US student group, accounts for the non-significant differences between universities in the post course assessment.

Two survey items were only significantly different between universities in the post-assessment data: '*Most other cultures are backward compared to my culture.*' and '*I do not trust people who are different.*'. Both of these items had suggestive trends in the pre-assessment data with $p=0.085$ and $p=0.067$ respectively, however, within the Central Asia student group both of these items had increases from pre- to post-assessment (the opposite direction from what is expected), contributing to the significant difference in the post-assessment data.

Insight into these differences in ethnocentrism may be found in the recent history of this Central Asian country. Following the dramatic transformations that took place in the Soviet Union in the 1990's, ethnicity became a focal point of the new nation states. Identities and nationhood in post-Soviet Central Asia became critical issues in nation-building. While the influence of Russia remained strong within the Commonwealth of Independent States (CIS), the historical references of the Soviet era were moderated by the newly-gained independence (Rakhimov, 2018).

The resultant ethnocentrism is not based on feelings of superiority over other cultures but rather on the need to forge national identities in de facto multicultural and multiethnic societies. University students in Central Asia that have lived their entire life in the independent states project in their views an element of ethnocentrism that is directly tied to their national pride. In this context, ethnocentrism in Central Asia is really a reflection of a complex form or regionalism.

Differences between US and Central Asia University Students in Diversity of Contact & Appreciation/Comfort with Cultural Differences

Within the Universality-Diversity Scale items, four survey items had significant differences between the US and Central Asia university student groups in the post-assessment data, whereas only one of these items was also significant in the pre-survey assessment data. In addition, the

Comfort with Differences sub-scale had significant differences between university student groups in both the pre and post assessment. Ratings for three of the four items, as well as the *Comfort with Differences* sub-scale were greater in the US University student group compared to the Central Asia University student group. One of the items that was significantly different between universities also had a significant increase from pre to post in the US University student group: '*I can best understand someone after I get to know how he/she is both similar to and different from me.*'; (p=0.014). US student ratings increased from pre to post, whereas the Central Asia student ratings decreased slightly, resulting in a significant difference in the post-assessment data. A similar trend was also observed in the following survey item with significant university differences in the post assessment only: '*It's really hard for me to feel close to a person from another race.*' (p=0.024). For this item, although not significant, ratings increased from pre to post by US students, whereas the Central Asia student ratings decreased from pre to post, contributing to a significant difference between US and Central Asia students in the post assessment data.

The outlier in these results was the significant difference between university students, with the Central Asia student ratings higher than US student ratings, for the following survey item: '*I often listen to music of other cultures.*'; (p=0.046). Within the pre-post analysis, this item was not significant but the ratings for US students went down from pre to post, whereas the ratings of the Central Asia students went up from pre to post, resulting in a significant difference between university student groups within the post-assessment data only. One factor that might have contributed to this rating is the ability to speak a second language. The Central Asia students spoke English, perhaps increasing the likelihood of them listening to music from another culture, however, it is not known whether the US students speak a second language, or whether speaking a second language increases the likelihood of listening to music from another culture.

Conclusions

This exploratory study identified marginal changes in ethnocentrism and diversity measures over the length of a 15-week semester long course. However, consistent trends were observed in the US University student group, providing encouragement for further study. Results from the Central Asia student group are less consistent, with changes from pre to post often in the opposite direction from what was expected. However, none of the reverse direction changes were significant and may well be within the margin of error.

Significant differences in ethnocentrism and comfort with differences was identified between the US University students and the Central Asia University students. The results indicate that Central Asia students have higher levels of ethnocentrism and lower levels of comfort with differences compared to US students. The higher level of ethnocentrism and lower comfort with differences in the Central Asia University students may be a reflection of their post-Soviet need to forge national identities directly tied to their national pride.

Study Limitations and Future Directions

Assessments were only available in English and could be a contributing factor for students from the Central Asia University student group. Particularly when it came to questions that were reverse scored. In addition, this study utilized instruments that were based on student self-report,

which have inherent limitations. As mentioned previously, sample size was a limiting factor within both student groups. With such a small 'n', this likely limited our power to detect changes over the length of a semester long course.

Another weakness of this study was the lack of student assessment of the course's ability to meet the learning objectives of the course, including an assessment of the course in terms of the students' global competency development, beyond reducing ethnocentrism and increasing cultural appreciation and comfort with differences. Future studies will incorporate a student perspectives survey in addition to an assessment of intercultural development.

Acknowledgment

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Appendix

Table 5: Differences between pre and post Ethnocentrism data within each University.

Ethnocentrism Scale Survey Item (higher values=more ethnocentrism; lower values and a reduction from pre to post are desired) (*item was reverse scored)	Pre/Post	US Northeastern University		Central Asian University	
		N=11		N=7	
		Mean Rank	Pre-Post p-value	Mean Rank	Pre-Post p-value
Most other cultures are backward compared to my culture.	Pre	12.55	p = 0.401	7.00	p = 0.606
	Post	10.45		8.00	
My culture should be the role model for other cultures.	Pre	12.14	p = 0.625	7.50	p = 1.000
	Post	10.86		7.50	
Lifestyles in other cultures are just as valid as those in my culture.*	Pre	12.09	p = 0.645	8.86	p = 0.193
	Post	10.91		6.14	
Other cultures should try to be more like my culture.	Pre	11.91	p = 0.738	7.50	p = 1.00
	Post	11.09		7.50	
People in my culture could learn a lot from people in other cultures.*	Pre	10.50	p = 0.386	6.71	p = 0.431
	Post	12.50		8.29	
Most people from other cultures just don't know what's good for them.	Pre	12.18	p = 0.583	8.29	p = 0.424
	Post	10.82		6.71	
I respect the values and customs of other cultures.*	Pre	13.64	**p = 0.079**	6.71	p = 0.424
	Post	9.36		8.29	
Other cultures are smart to look up to our culture.	Pre	12.27	p = 0.563	6.14	p = 0.155
	Post	10.73		8.86	
Most people would be happier if they lived like people in my culture.	Pre	12.36	p = 0.509	10.07	**p = 0.010**
	Post	10.64		4.93	
People in my culture have just about the best lifestyles of anywhere.	Pre	12.45	p = 0.468	5.93	p = 0.114
	Post	10.55		9.07	
Lifestyles in other cultures are not as valid as those in my culture.	Pre	11.50	p = 1.000	7.00	p = 0.624
	Post	11.50		8.00	
I do not cooperate with people who are different.	Pre	11.73	p = 0.852	7.50	p = 1.000
	Post	11.27		7.50	
I do not trust people who are different.	Pre	13.00	p = 0.204	6.71	p = 0.424
	Post	10.00		8.29	
I dislike interacting with people from different cultures.	Pre	14.00	**p = 0.034**	7.93	p = 0.674
	Post	9.00		7.07	
I have little respect for the values and customs of other cultures.	Pre	12.09	p = 0.559	8.57	p = 0.304
	Post	10.91		6.43	
Ethnocentrism Overall Score	Pre	12.91	p = 0.308	8.14	p = 0.560
	Post	10.09		6.86	

Table 6: Differences in Pre and Post M-GUDS-S Diversity data within each University.

Miville-Guzman Universality-Diversity Scale – Short Form (M-GUDS-S) Survey Item (greater mean rank values and increase from pre to post are desired) (*item was reverse scored)	Pre/ Post	US University		Central Asian U.	
		N=11		N=7	
		Mean Rank	Pre-Post p-value	Mean Rank	Pre-Post p-value
I would like to join an organization that emphasizes getting to know people from different countries.	Pre	9.91	p = 0.209	6.29	p = 0.241
	Post	13.09		8.71	
Persons with disabilities can teach me things I could not learn elsewhere.	Pre	10.91	p = 0.639	7.93	p = 0.678
	Post	12.09		7.07	
Getting to know someone of another race is generally an uncomfortable experience for me.*	Pre	10.64	p = 0.467	6.64	p = 0.334
	Post	12.36		8.36	
I would like to go to dances that feature music from other countries.	Pre	12.18	p = 0.589	6.71	p = 0.435
	Post	10.82		8.29	
I can best understand someone after I get to know how he/she is both similar to and different from me.	Pre	8.36	**p = 0.014**	7.71	p = 0.838
	Post	14.64		7.29	
I am only at ease with people of my race.*	Pre	12.45	p = 0.443	7.86	p = 0.709
	Post	10.55		7.14	
I often listen to music of other cultures.	Pre	12.09	p = 0.650	6.36	p = 0.266
	Post	10.91		8.64	
Knowing how a person differs from me greatly enhances our friendship.	Pre	10.68	p = 0.526	5.67	p = 0.404
	Post	12.32		7.33	
It's really hard for me to feel close to a person from another race.*	Pre	10.27	p = 0.316	8.21	p = 0.455
	Post	12.73		6.79	
I am interested in learning about the many cultures that have existed in this world.	Pre	10.27	p = 0.316	6.33	p = 0.865
	Post	12.73		6.67	
In getting to know someone, I like knowing both how he/she differs from me and is similar to me.	Pre	10.77	p = 0.573	7.14	p = 0.708
	Post	12.23		7.86	
It is very important that a friend agrees with me on most issues.*	Pre	12.00	p = 0.703	7.93	p = 0.693
	Post	11.00		7.07	
I attend events where I might get to know people from different racial backgrounds.	Pre	10.77	p = 0.571	7.64	p = 0.886
	Post	12.23		7.36	
Knowing about the different exper. of other people helps me understand my own problems better.	Pre	11.68	p = 0.888	6.50	p = 1.000
	Post	11.32		6.50	
I often feel irritated by persons of a different race.*	Pre	10.50	p = 0.403	7.43	p = 0.936
	Post	12.50		7.57	
Diversity of Contact (sub-scale)	Pre	11.18	p = 0.816	5.33	p = 0.250
	Post	11.82		7.67	
Relativistic Appreciation (sub-scale)	Pre	10.05	p = 0.287	6.17	p = 0.744
	Post	12.95		6.83	
Comfort with Differences (sub-scale)	Pre	11.27	p = 0.868	7.86	p = 0.746
	Post	11.73		7.14	
Universal-Diverse Orientation (UDO) (sum of sub-scale scores)	Pre	10.68	p = 0.55	5.67	p = 0.421
	Post	12.32		7.33	

Table 7: Differences between the US and Central Asian Universities within Ethnocentrism data; analyses were conducted within pre- and post-course data separately.

Ethnocentrism Scale Survey Item (higher values=more ethnocentrism; lower values and a reduction from pre to post are desired) (*item was reverse scored)	Pre/ Post	Mean Rank		P-value
		US University N=11	Central Asian University N=7	
Most other cultures are backward compared to my culture.	Pre	7.91	12.00	p = 0.085
	Post	6.82	13.71	p = 0.004
My culture should be the role model for other cultures.	Pre	8.86	10.50	p = 0.496
	Post	8.23	11.50	p = 0.173
Lifestyles in other cultures are just as valid as those in my culture.*	Pre	7.32	12.93	p = 0.025
	Post	7.14	13.21	p = 0.012
Other cultures should try to be more like my culture.	Pre	8.41	11.21	p = 0.213
	Post	8.23	11.50	p = 0.160
People in my culture could learn a lot from people in other cultures.*	Pre	8.64	10.86	p = 0.327
	Post	8.32	11.36	p = 0.157
Most people from other cultures just don't know what's good for them.	Pre	7.27	13.00	p = 0.019
	Post	6.68	13.93	p = 0.003
I respect the values and customs of other cultures.*	Pre	9.91	8.86	p = 0.643
	Post	7.82	12.14	p = 0.057
Other cultures are smart to look up to our culture.	Pre	9.73	9.14	p = 0.810
	Post	8.23	11.50	p = 0.180
Most people would be happier if they lived like people in my culture.	Pre	7.41	12.79	p = 0.028
	Post	8.59	10.93	p = 0.325
People in my culture have just about the best lifestyles of anywhere.	Pre	10.36	8.14	p = 0.365
	Post	8.23	11.50	p = 0.160
Lifestyles in other cultures are not as valid as those in my culture.	Pre	7.32	12.93	p = 0.020
	Post	6.82	13.71	p = 0.004
I do not cooperate with people who are different.	Pre	8.14	11.64	p = 0.133
	Post	7.86	12.07	p = 0.064
I do not trust people who are different.	Pre	7.86	12.07	p = 0.067
	Post	6.55	14.14	p = 0.001
I dislike interacting with people from different cultures.	Pre	8.91	10.43	p = 0.493
	Post	8.05	11.79	p = 0.080
I have little respect for the values and customs of other cultures.	Pre	7.91	12.00	p = 0.077
	Post	8.55	11.00	p = 0.225
Ethnocentrism Overall Score	Pre	7.45	12.71	p = 0.041
	Post	7.23	13.07	p = 0.023

Table 8: Differences between the US and Central Asia Universities within Diversity data.

Miville-Guzman Universality-Diversity Scale – Short Form (M-GUDS-S) Survey Item greater mean rank values and increase from pre to post are desired) (*item was reverse scored)	Pre/ Post	Mean Rank		p-value
		US N=11	Central Asia N=7	
I would like to join an organization that emphasizes getting to know people from different countries.	Pre	10.59	7.79	p = 0.240
	Post	10.41	8.07	p = 0.319
Persons with disabilities can teach me things I could not learn elsewhere.	Pre	9.91	8.86	p = 0.659
	Post	10.55	7.86	p = 0.260
Getting to know someone of another race is generally an uncomfortable experience for me.*	Pre	10.00	8.71	p = 0.527
	Post	9.73	9.14	p = 0.795
I would like to go to dances that feature music from other countries.	Pre	10.27	8.29	p = 0.396
	Post	9.05	10.21	p = 0.617
I can best understand someone after I get to know how he/she is both similar to and different from me.	Pre	9.27	9.86	p = 0.811
	Post	**11.64**	**6.14**	**p = 0.020**
I am only at ease with people of my race.*	Pre	10.86	7.36	p = 0.135
	Post	10.82	7.43	p = 0.144
I often listen to music of other cultures.	Pre	8.77	10.64	p = 0.429
	Post	**7.59**	**12.50**	**p = 0.046**
Knowing how a person differs from me greatly enhances our friendship.	Pre	8.77	9.42	p = 0.788
	Post	8.45	10.00	p = 0.525
It's really hard for me to feel close to a person from another race.*	Pre	10.77	7.50	p = 0.128
	Post	**11.59**	**6.21**	**p = 0.024**
I am interested in learning about the many cultures that have existed in this world.	Pre	9.55	8.00	p = 0.513
	Post	9.86	7.42	p = 0.284
In getting to know someone, I like knowing both how he/she differs from me and is similar to me.	Pre	9.95	8.79	p = 0.628
	Post	10.27	8.29	p = 0.357
It is very important that a friend agrees with me on most issues.*	**Pre**	**11.95**	**5.64**	**p = 0.012**
	Post	**12.00**	**5.57**	**p = 0.010**
I attend events where I might get to know people from different racial backgrounds.	**Pre**	**8.00**	**11.86**	**p = 0.099**
	Post	9.05	10.21	p = 0.630
Knowing about the different experiences of other people helps me understand my own problems better.	Pre	8.41	10.08	p = 0.473
	Post	8.41	10.08	p = 0.490
I often feel irritated by persons of a different race.*	Pre	10.59	7.79	p = 0.184
	Post	10.91	7.29	p = 0.114
Diversity of Contact (sub-scale)	Pre	9.32	8.42	p = 0.720
	Post	8.36	10.17	p = 0.478
Relativistic Appreciation (sub-scale)	Pre	8.64	9.67	p = 0.680
	Post	9.50	8.08	p = 0.578
Comfort with Differences (sub-scale)	**Pre**	**11.68**	**6.07**	**p = 0.028**
	Post	**11.86**	**5.79**	**p = 0.018**
Universal-Diverse Orientation (UDO) (sum of sub-scale scores)	Pre	10.09	7.00	p = 0.226
	Post	9.64	7.83	p = 0.481