Integrating World Structures Reports, Presentations, and Themed Notes

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Increasing Cultural Awareness Amongst Engineering Students by Integrating World Structures Reports, Presentations, and Themed Notes

Abstract

Recently, there has been a widespread movement to implement culturally relevant pedagogical practices into engineering curricula. However, many faculty members do not necessarily know what this means or even how to accomplish the task. For faculty who do have knowledge in being culturally responsive, it is often a struggle to identify finite means by which to implement these ideas into engineering courses and to determine quantitative measures of success.

The following paper will examine the results of a systematic inquiry project undertaken as part of the author's participation in the Certificate of College Teaching and Learning in Hispanic Serving Institutions through ESCALA Educational Services Inc. Through the project, the author took a third-year structural analysis class on a "tour of the world" through pictures, redesigned example problems, stories, and a World Structures Report and Presentation assignment.

In addition to the implementation of the course, assessment data will be presented for two groups of students. The data for the first group includes the analysis of qualitative and quantitative post-test data, while the results of the second group will include a pre-test/post-test comparison to measure the students' increase in cultural awareness.

Motivation

As the world increasingly becomes interconnected via the Internet and other social media apps, many engineering schools are internationalizing engineering courses and curricula to prepare students for careers across countries and cultures. These so-called "global engineers" need to be able to work in a diverse, interconnected, and rapidly changing world [1]. In the field of structural engineering, many large firms regularly work overseas on projects or at least collaborate with other engineers in different parts of the country or world, making it important that the next generation of the profession have a basic knowledge of global contexts and cultures.

Moreover, in the United States, universities have experienced a rapid rise in the enrollment of the Latinx population. Between 2000-2017, Latinx enrollment has increased 142% from about 1.4 million to 3.3 million students, while other ethnicities have remained relatively the same or seen a slight decrease [2]. Part of the increase is directly related to an increasing Latinx population in the United States, which saw an increase from 35.7 million in 2000 to 59.9 million in 2018 according to the U.S. Census Bureau population estimates [3]. Additionally, many Latinx place a high value upon education and see it as a way to increase social and economic status and upward mobility [4]. At the author's institution, Angelo State University, the Hispanic population has increased dramatically in the past two years, rising from 32% in Fall 2017 to 42% in Fall 2019, using the U.S. Department of Education HSI Certification Guidelines, and is forecasted to continue to rise in the coming years.

With an increasingly diverse student population and the demand for global engineers, there is a widespread movement to implement culturally relevant pedagogical practices in university classrooms. However, as with any emerging effort, there is some confusion on the definition of culturally relevant pedagogy as well as determining finite means of implementing these strategies in an engineering classroom.

Broadly, culturally relevant pedagogy "represents a compilation of student-centered approaches to teaching with the intent of connecting the life experiences of students with classroom instruction," [5]. A key aspect to implementation is for instructors to use an asset-based approach to teaching students versus a deficit-based approach [6]. In asset-based thinking, instructors use the previous knowledge and abilities of the students as a tool to teach them new material, whereas a deficit-based approach has the instructor viewing the students as empty vessels (no knowledge related to the subject) needing to be filled. It is generally accepted that student learning increases when it can be tied to existing knowledge. Culturally relevant pedagogy focuses on an asset-based approach at the individual level, attempting to relate the material to experiences the students might have had in their respective families, ethnic cultures, local communities, and wider society. Kitch and Robledo suggest implementing a three pronged approach: (i) cultivating engaging learning environments to support the academic success of all students, (ii) nurturing cultural competence and using students' funds of knowledge to enhance learning, and (iii) developing a critical consciousness and sense of social responsibility in students [7].

Despite the ongoing development and refinement of definitions for culturally relevant pedagogy, engineering instructors may still find it difficult to determine finite ways to implement these approaches in the classroom. As part of a systematic inquiry project undertaken as part of the author's participation in the Certificate of College Teaching and Learning in Hispanic Serving Institutions through ESCALA Educational Services Inc., the author attempted to apply culturally relevant pedagogical practices in a third-year structural analysis course. The following section highlights the major changes that were incorporated into the course.

Structural Analysis I: Case Study

Course Information

The structural analysis course described in this case study is required for all civil engineering majors and covers an introduction to structural form; load path; basic tension and compression member design; the analysis of trusses; the analysis of frames for axial forces, shear, bending moment; and the calculation of deflections in both trusses and frames using virtual work and matrix methods.

In terms of the instructor, it was the fourth time the author was tasked with teaching the subject, so much of the notes and structure of the course had already been developed.

Culturally Relevant Pedagogical Techniques

In order to evaluate the effectiveness of the introduced techniques, the author identified the following learning objective: students will identify the contributions of culture to structural engineering projects. The learning objective was used as the framework for the two main changes to the course; however, students were not made explicitly aware of this learning objective during the course.

Themed Notes and Syllabi

Structures are used by every culture as a means of shelter, transportation, commerce, and gathering. Furthermore, some structures are used by as a symbol of pride or financial growth in a particular region. Although the design of every major structure varies significantly, the fundamental engineering mechanics principles used to analyze the structural forces is the same. With this mindset, one can see structures from around the world, along with their respective design engineers, might have more commonalities than differences.

In order to introduce a cultural element into the course, the instructor decided to have the students take a tour of the world, highlighting various structures and the people who use them. The idea is summarized in a graphic syllabus (see Figure 1), as well as the standard course outline provided to the students (see Figure 2).

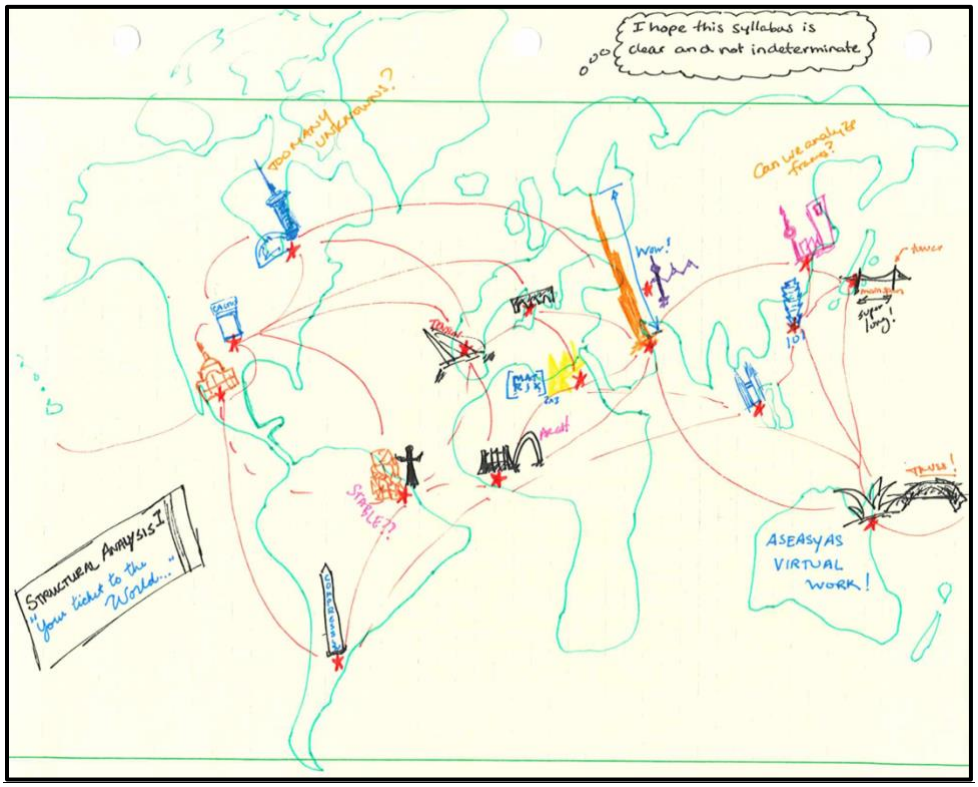

Figure 1: Graphic Syllabus

Lesson	Day	Date	Destination	Text	Notes/Topic	Assignment Due
01	Tuesday	8/27	San Angelo, TX		Syllabus, Course Discussion, Structures Trivia	
02	Thursday	8/29	Puerta Cabeza, Nicaragua	1.1-1.2; 3.1; 5.1; 5.4	Classification of Structures	
03	Tuesday	9/3	Genoa, Italy	1.3	Classification of Loads	Homework 01
04	Thursday	9/5	Kobe, Japan	1.4	Design Methodology; LRFD vs ASD	
05	Tuesday	9/10	Ocean City, NJ	2.1-2.3	Load Path; Tributary Areas	Homework 02
06	Thursday	9/12	Seville, Spain		Tension Member Design	
07	Tuesday	9/17	Toronto, Canada		Compression Member Design	Homework 03
08	Thursday	9/19	Glasgow, Scotland		Truss Bridge Design; Design Project Outline	
09	Tuesday	9/24	Shanghai, China	2.4-2.5	Static Determinacy	Homework 04
10	Thursday	9/26	Sydney, Australia	3.2-3.4	Determinate Truss Analysis I	
	Friday	9/27			**PROJECT PROPOSAL DUE (NO CLASS)**	Project 01
11	Tuesday	10/1	London, England	3.5-3.8	Determinate Truss Analysis II	
12	Thursday	10/3	Berlin, Germany	4.1-4.3	Beams and Frames- N, V, M Diagrams I	Homework 05
	Friday	10/4			**PROJECT PRELIMINARY REPORTS DUE (NO CLASS)**	Project 02
13	Tuesday	10/8	Kuala Lumpur, Malaysia	4.4	Beams and Frames- N, V, M Diagrams II	
14	Thursday	10/10	Rio de Janeiro, Brazil	4.4-4.5	Beams and Frames- N, V, M Diagrams III	
	Tuesday	10/15			**EXAM I**	
15	Thursday	10/17	Machu Picchu, Peru	4.5	Beams and Frames- N, V, M Diagrams IV	
	Friday	10/18			**PROJECT MEETINGS COMPLETE (NO CLASS)**	Project 03
16	Tuesday	10/22	Palanan, Philippines	6.1-6.6	Influence Lines	
17	Thursday	10/24	Tehran, Iran	8.1-8.3	Deflections- Integration, Tables	Homework 06
18	Tuesday	10/29	Accra, Ghana	9.3-9.4; 9.7	Deflections- Virtual Work I	Homework 07, Project 03
19	Thursday	10/31	Barranquilla, Columbia	9.7	Deflections- Virtual Work II	
20	Tuesday	11/5	Cairo, Egypt	9.8	Deflections- Virtual Work III	
21	Thursday	11/7	Rangamati, Bangladesh	10.1-10.4	Indeterminate Structures- Force Method I	Homework 08
	Tuesday	11/12	?		**EXAM II**	
22	Thursday	11/14	Mexico City, Mexico	10.5; 10.8	Indeterminate Structures- Force Method II	
23	Tuesday	11/19	Taipei, Taiwan	10.5; 10.8	**Class Notes/Activity In-Progress** Indeterminate Structures- Force Method III	Homework 09
24	Thursday	11/21	New York, NY	14.1-14.2	Indeterminate Structures- Stiffness Method I	
25	Tuesday	11/26	Dubai, United Arab Emirates	14.3-14.6; 15.1-15.4	Indeterminate Structures- Stiffness Method II	Homework 10
	Thursday	11/28			**NO CLASS- THANKSGIVING**	
26	Tuesday	12/3	Outer Space, Milky Way Galaxy		Final Exam Review; Structures Escape Challenge	Homework 11
	Tuesday	12/3			**PROJECT BRIDGE DESIGN PAMPHLETS AND COMPLETED BRIDGES DUE**	Project 04, 05A
	Thursday	12/5			**PROJECT BRIDGE DESIGN TESTING**	Project 05B
	Friday	12/6			**PROJECT FINAL REPORT AND PEER EVALUATION FORMS DUE (NO CLASS)**	Project 06,07
	Thursday	12/12			**FINAL EXAM, 3:30pm-5:30pm**	

Figure 2: Standard Course Outline

In order to make the tour more authentic, country themes were added to the handouts used by the instructor and where possible, real-world examples were mimicked so students could readily see the applications of the different analysis techniques being learned. In addition, the pictures of structures selected not only were there to inspire the students, but could act as talking points to discuss the country's culture during class and to maybe highlight key societal differences or in the case of structural failures, to discuss the importance of ASCE's Canon 1: engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties [8]. Figure 3 and Figure 4 show two examples of how the course handouts were updated to include the country themes.

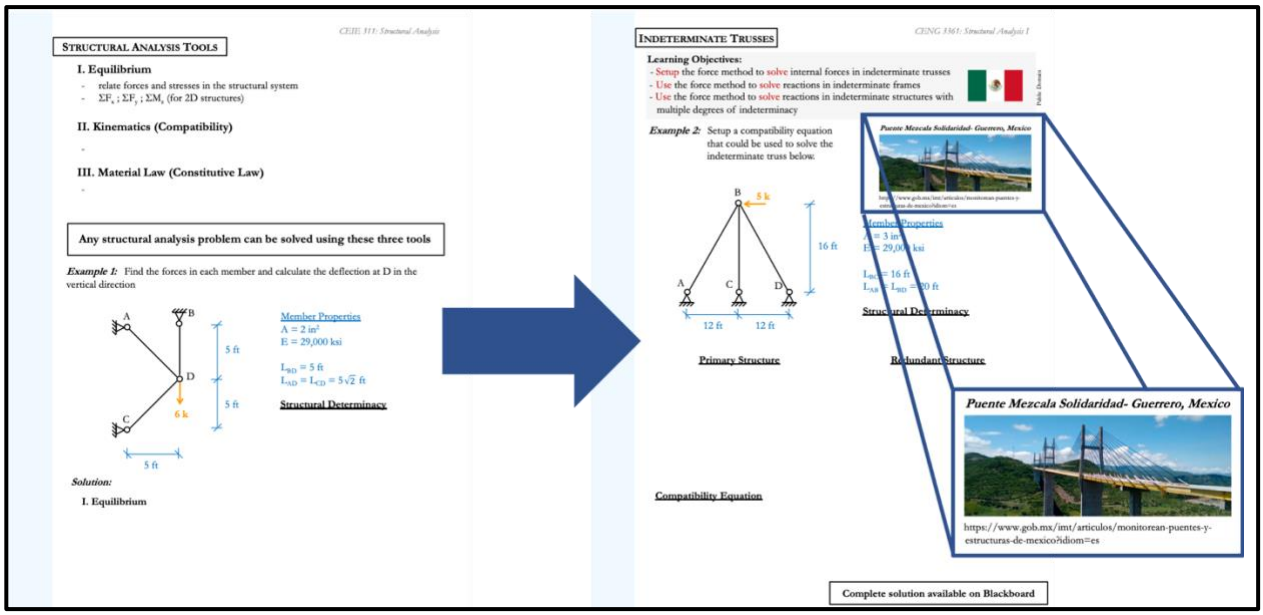

Figure 3: Example #1 of Course Handout Update (Mexico)

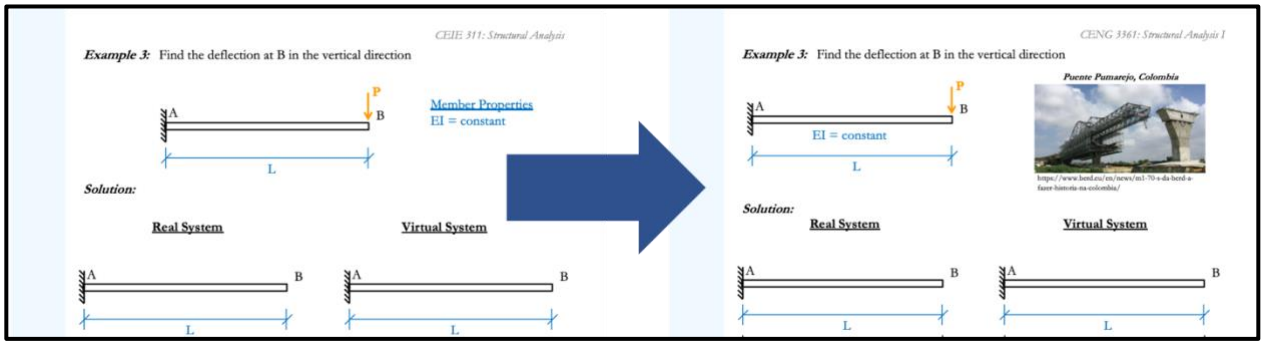

Figure 4: Example #2 of Course Handout Update (Colombia)

When selecting the various countries visited during the course, the author tried to include countries that are typically represented by or associated with many of the students enrolled in the class. In addition, the class visits eight specific countries and places that represent the cultures of

other faculty in the department. This provides students with some cultural context of the other faculty members and an opportunity to engage in conversation relative to engineering in their places of origin.

World Structures Reports and Presentations

As part of the ESCALA certificate program, the author performed a Timed Observation Protocol for Student Engagement and Equity (TOPSE) in the prerequisite Mechanics of Materials course [6]. In the lessons studied, the author noted that he does not regularly give students an opportunity to teach one another in class. Peer-to-peer instruction is a powerful tool; therefore, when incorporating the new culturally relevant pedagogy, the author aimed to design an assignment that would allow students to research structures from around the world and present their findings to the class.

The resulting assignment was called the World Structures Report and Presentation. To begin the assignment, students selected a structure from a pre-determined list given by the instructor. The list provided one structure from each country visited throughout the semester. In terms of selection, the students play an ice-breaker structures trivia game on the first day of class, which includes many obscure facts about some structures to help randomize students' chances of succeeding. Based on how they perform in the trivia game, students are able to select which structure they wish to research which then has a corresponding due date for their report and presentation to match up with the class "travel itinerary" (Figure 5).

For the presentation, students must develop a 5 minute oral presentation to be given at the start of class. In it, we "fly" from the previous country to the new country, and then the student describes the structure and its general structural form, load paths, and cultural significance. A small bonus opportunity exists if that student prepares a snack for the entire class to enjoy that relates to the culture being presented. For the report, the student must write a short 2 page article with figures highlighting the same basic information given in the presentation, as well as any additional facts desired. Students are required to read the reports and score them as part of the homework in the course. The grading for both the presentation and the report is a combination of a peer score and an instructor score.

Day	Date	Destination	Structure of Interest	Presenter
Tuesday	8/27	San Angelo, TX	Cactus Hotel	Dr. Batts
Thursday	8/29	Puerta Cabezas, Nicaragua	Feeding Center; Water Tank Tower	Dr. Batts
Tuesday	9/3	Genoa, Italy	Morandi Bridge	Dr. Batts
Thursday	9/5	Kobe, Japan	Akashi Kaikyō Bridge	Dr. Batts
Tuesday	9/10	Ocean City, NJ	The Boardwalk	Dr. Batts
Thursday	9/12	Seville, Spain	Metropol Parasol	Miguel P.
Tuesday	9/17	Toronto, Canada	Rogers Centre	T.K.
Thursday	9/19	Glasgow, Scotland	SEC Armadillo	Hunter
Tuesday	9/24	Shanghai, China	Shanghai Tower	L. J.
Thursday	9/26	Sydney, Australia	Sydney Harbour Bridge	Dr. Batts
Tuesday	10/1	London, England	The Tower Bridge	Dr. Batts
Thursday	10/3	Berlin, Germany	Reichstag (and Dome)	Jonah
Tuesday	10/8	Kuala Lumpur, Malaysia	Batu Caves	Taylor
Thursday	10/10	?	< Exam I >	-
Tuesday	10/15	Rio de Janeiro, Brazil	Maracanã Stadium	Maria
Thursday	10/17	Machu Picchu, Peru	Temple of the Sun	Nicholas
Tuesday	10/22	Palanan, Philippines	Dibenbenan Bridge	Natalie
Thursday	10/24	Tehran, Iran	Milad Tower	Brandon D.
Tuesday	10/29	Accra, Ghana	Kwame Nkrumah Mausoleum	Lorenzo
Thursday	10/31	Barranquilla, Colombia	Pumarejo Bridge- New and Old	Erica
Tuesday	11/5	Cairo, Egypt	Zayed Crystal Spark	Miguel A.
Thursday	11/7	Dhaka, Bangladesh	City Centre	Dr. Batts
Tuesday	11/12	?	< Exam II >	-
Thursday	11/14	Mexico City, Mexico	Torre Mayor	Nora
Tuesday	11/19	Taipei, Taiwan	Taipei 101* *possible video presentation	Diego
Thursday	11/21	New York, NY	111 West 57th Street	Damon
Tuesday	11/26	Dubai, United Arab Emirates	Burj al Arab	Brandon M.
Thursday	11/28	-	< No Class- Thanksgiving >	-
Tuesday	12/3	Outer Space, Milky Way Galaxy	Presenter's Choice- Space Station, Satellites, Moon/Mars etc...	Jake
Thursday	12/5	-	< Truss Bridge Testing >	-
Thursday	12/12	?	< Final Exam >	-

Figure 5: World Structures Report and Presentation Schedule

Overall, the author believes the themed notes and World Structures Report and Presentation meets the three pronged approach to culturally relevant pedagogy previous described [7]:

(i) The two course changes create a fun and engaging class atmosphere that directly pertains to the study of structural engineering;

(ii) The reports and presentations use the students' funds of knowledge on a particular subject, whether previously existing or learned through research, to have the students teach one another about these unique structures and places from around the world;

(iii) Discussion on cultural significance of structures, as well as some coverage of structural failures or marginalized populations develop a critical consciousness and sense of social responsibility in the students.

Qualitative Data

Recall, the instructor set the following learning objective to measure the effectiveness of the culturally relevant pedagogical interventions: students will identify the contributions of culture to structural engineering projects.

To measure whether or not students met the learning objective, anonymous qualitative data was obtained for the Fall 2018 and Fall 2019 semesters. As part of a work in progress, the following survey questions are still being refined, replaced, and updated.

Fall 2018 and Fall 2019 Combined Results

In total, 39 of the 42 students enrolled during these semesters recorded a response to Qualitative Question #1 using a post-survey. Based on the open-ended answers, the author grouped similar answers into approximate categories as given below.

> *Qualitative Question #1:* What was the purpose of the World Structures Report/Presentation assignment?
>
> *Results:*
> Teach Diversity/Cultures of the World: 17/39 (43.6%)
> *student responses specifically used the words “diversity” and/or “cultures”
> Appreciate World Structures: 14/39 (35.9%)
> Analyze Real World Structures: 5/39 (12.8%)
> No Response: 2/39 (5.1%)
> Other: 1/39 (2.6%)

Based on the student answers as summarized above, the author believes the results are compelling that students are indeed meeting the learning objective to identify the contributions of culture to structural engineering projects.

Fall 2019 Results

In total, 15 of the 19 students enrolled during this semester recorded a response to Qualitative Question #2 in both a pre-test and post-test survey.

> *Qualitative Question #2:* I can name at least three structures in which the culture had a direct impact on the final design.
>
> *Results:*
> Pre-Test: Yes- 7/15 (46.7%), No- 8/15 (53.3%)
> Post-Test: Yes- 14/15 (93.3%), No- 1/15 (6.7%)

Based on the student answers as summarized above, the author believes the results are compelling that students are indeed meeting the learning objective to identify the contributions of culture to structural engineering projects.

Fall 2018 Results

In addition to Qualitative Question #1, other qualitative data was obtained with inconclusive results. In the Fall 2018 semester, students were also asked on the post-survey, "What is one significant thing you learned through doing the assignment?" and, "What is one significant thing you learned by reading the reports and watching the presentations of other students in the class?". Answers referencing the influence of culture on structures made up 4/22 (18.2%) responses and 3/22 (13.6%) responses respectively. The author believes that since these open-ended questions followed Qualitative Question #1 in the survey, students may have assumed to provide other answers. These two questions were deleted for the Fall 2019 post-survey.

Quantitative Data

In addition to qualitative data, quantitative data was obtained for both the Fall 2018 and Fall 2019 semesters. In Fall 2018, the data was collected as an anonymous post-survey, using paper submissions, whereas in Fall 2019, an online pre-test and post-test survey was created. As such, the metrics used were modified and continue to be a work in progress.

Fall 2018 Results

As part of an anonymous post-survey and prior to the aforementioned qualitative data was collected, a series of eight Leikert style questions was posed to 22/23 enrolled students.

Having the opportunity in this course to explore different cultures, circle your level of agreement with the following statements.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree. (5) Strongly Agree

A. Prior to taking the CENG 3361 course, I did not consider how engineers could improve society.
B. Structures are not just a functional use of space, but also represent the culture of the people who use it.
C. The selection of building materials relies on the availability of materials locally.
D. Structural aesthetics should be chosen to relate to local culture.
E. The World Structures Report/Presentation helped me to see the role culture has on structural projects being built across the world.
F. The inclusion of pictures/references/examples to specific countries in the provided class handouts enhanced the educational experience versus if the handouts did not reference these countries.
G. Throughout the course, I can recall instances in which the instructor showed respect for other cultures, including my own.
H. This course has made me more culturally aware as an engineer.

Question:	A	B	C	D	E	F	G	H
% Answering (4) or (5):	4.55%	95.45%	72.73%	63.64%	100.00%	77.27%	100.00%	100.00%

Figure 6: Fall 2018 Quantitative Data

Based on all the student answers summarized in Figure 6, but specifically for Quantitative Questions B, E, G, and H, the author believes the results are compelling that students are indeed meeting the learning objective to identify the contributions of culture to structural engineering projects.

Fall 2019 Results

In Fall 2019, 18 enrolled students completed an anonymous pre-test and post-test survey. Data was tied to student usernames in order to measure the effect the course had on each student. To maintain anonymity, a separate university employee administered the survey and aggregated the data. In the survey, students were asked to use a scale from 0 (unimportant) to 100 (extremely important) to, "Indicate the level of importance you believe each of these factors should have on a structural engineering project." The results are summarized in Table 1.

Table 1: Quantitative Data for Fall 2019 (0 = unimportant, 100 = extremely important)

Factor	Pre-Test Average	Post-Test Average
Functional Use of Space	82.2	84.0
Ease of Performing Structural Analysis	69.1	75.0
Representation of Local Culture	61.4	68.4
Aesthetics	64.8	79.4
Availability of Local Building Materials	69.9	80.5
Strength	87.0	90.8
Discussion with Community Around Project Site	74.7	78.4
Cost	75.2	77.4
Timeline	74.9	84.9
Defining the Scope of the Project	82.9	92.7
Good Engineer-Client Relationship	89.4	91.8
Impact on Society	84.8	86.7

In all categories, students showed improvement, including the categories that relate to the cultural aspect of structural engineering. The author believes the results are compelling that students are indeed meeting the learning objective to identify the contributions of culture to structural engineering projects.

Unfortunately, when trying to measure the change per individual, no major trends were able to be observed. Some students radically changed their perspectives in both positive and negative ways. The author will continue to investigate this raw data, however, he is hopeful the averaged data above helps to better represent the overall change of the students.

Summary of Grades

In order to determine if the new style of teaching has any impact on student grades, summaries of available data from previous semesters are provided. The grades are presented in Table 2 and Table 3.

Table 2: Summary of Grades for Structural Analysis I at Angelo State University

Structural Analysis I at Angelo State University							
Semester	**Enrollment**	**A**	**B**	**C**	**D**	**F**	**QW**
Spring 2017*	2	50%	50%	0%	0%	0%	0%
Fall 2017*	15	33.3%	26.7%	20%	13.3%	0%	6.7%
Total Pre-Change	**17**	**35.5%**	**29.4%**	**17.6%**	**11.8%**	**0%**	**5.9%**
Fall 2018	23	52.2%	34.8%	8.7%	0%	4.3%	0%
Fall 2019	18	22.2%	55.6%	16.7%	5.6%	0%	0%
Total Post-Change	**41**	**39.0%**	**43.9%**	**12.2%**	**2.4%**	**2.4%**	**0%**

* course was not taught by author

Table 3: Summary of Grades for Structural Analysis I Taught By Author

Structural Analysis I Taught by Author							
Semester	**Enrollment**	**A**	**B**	**C**	**D**	**F**	**QW**
Fall 2013*	60	40.0%	35.0%	16.7%	5.0%	1.7%	1.7%
Spring 2013*	59	25.4%	61.0%	13.6%	0%	0%	-
Fall 2015	38	28.9%	36.8%	31.6%	0%	2.6%	0%
Total Pre-Change	**157**	**31.8%**	**45.2%**	**19.1%**	**1.9%**	**1.3%**	**0.6%**
Fall 2018	23	52.2%	34.8%	8.7%	0%	4.3%	0%
Fall 2019	18	22.2%	55.6%	16.7%	5.6%	0%	0%
Total Post-Change	**41**	**39.0%**	**43.9%**	**12.2%**	**2.4%**	**2.4%**	**0%**

* available course data did not specifically include total number of withdrawals; author recalls one specific case

At an institutional level, Table 2 shows that the number of students achieving the grades of A or B at Angelo State University was approximately 64.9% before the introduction of culturally relevant techniques and 82.9% afterwards, representing an overall improvement in performance. However, since the author was not the instructor of the pre-implemented data, this is not a clear indicator.

Table 3 represents data for the author from the same course spanning six years and coinciding with the early development of the author as a professor. The Pre-Change data was collected by the author during his previous positions at two different universities and the Post-Change data is from his current institution. At the instructor level, it is observed that the number of students achieving the grades of A or B was approximately 77.0% before the introduction of culturally relevant techniques and 82.9% afterwards, representing a small overall improvement in performance.

Based on the grade data available, despite the numerous variables affecting the delivery of the course, the author believes the results clearly show that the introduction of culturally relevant pedagogy is not hindering student performance, and shows slight improvement to previous techniques.

Course Equity Index

As the author continues to study the effect of the culturally relevant pedagogical changes, he hopes to gain insight into how the inclusion of cultures in the structural analysis course could help to improve the performance of students identifying as Latinx. As previously mentioned, Angelo State University currently has a Latinx population of 42%. While the Structural Analysis I course does not quite match that statistic, it is rapidly increasing.

In order to compare the relative performance of a particular subgroup, a course equity index can be calculated [6]. In calculating the equity index, it is assumed that the percentage of Latinx students receiving a particular grade should be the same as the overall student percentage receiving the same grade. If the percentages are the same, then the equity index is 1. Unfortunately, socio-economic factors often prevent Latinx students from performing as well as others in the higher education system, resulting in a disproportionate number of Latinx students receiving lower grades [6]. If this is the case, the equity index is greater than 1. It is important to note that when using this index with small sample sizes, the difference from 1 does not accurately reflect a certain impact level. The course equity index analysis for this course at Angelo State University is presented in Table 4.

It is observed that Latinx students are receiving a disproportionate number of the C and D grades given in this course. However, since the change was implemented, improvement in the equity indices across the grades of A, B, C and D are occurring. As a work in progress, the author will continue to monitor this metric in the coming years to see if the pedagogical change continues to help close the equity gap.

Table 4: Course Equity Analysis for Latinx Students

Course Equity Index for Latinx Subgroup								
Semester	**Total Enrollment**	**Latinx Enrollment**	**A**	**B**	**C**	**D**	**F**	**QW**
Spring 2017*	2	0	-	-	-	-	-	-
Fall 2017*	15	2	0	0	2.50	3.75	-	0
Total Pre-Change	**17**	**2**	**0**	**0**	**2.83**	**4.25**	**0**	**0**
Fall 2018	23	4	0.96	1.44	0	-	0	-
Fall 2019	18	6	0.75	0.60	2.00	3.00	-	-
Total Post-Change	**41**	**10**	**0.64**	**0.76**	**1.37**	**3.42**	**0**	**-**

* course was not taught by author

Conclusions

When introducing culturally relevant pedagogy, it is important for instructors to be authentic in their approach to incorporating cultures in the lesson. For the author, his passion for structural engineering and his wonder and awe of structures around the world provided an ideal platform to discuss cultures with the students. In addition, the creation of a culture-specific learning

objective enabled suitable assignments and content to be created. Finally, adopting the three pronged approach helped the instructor determine whether or not the specific intervention is indeed considered to be culturally relevant pedagogy.

While a specific case study idea was the focus of the paper, it is the author's opinion that a similar assignment could readily be applied to other technical areas within civil engineering. Civil engineering infrastructure is necessary for civilizations to thrive across the globe, so instructors in other areas of expertise should be able to adapt their notes and content to include examples from other parts of the world. Even if taking a "world tour" is not appealing, the use of the student presentations and reports in the class is a powerful way to incorporate their existing funds of knowledge to instruct other students on a specific topic, to inspire individuals to pursue continuous learning, and to develop critical consciousness and societal responsibilities in the future engineers of our profession.

References

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