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Cultural Competence Lessons for Engineering Students Working on Global Virtual Teams

Jennifer Alyce Alexander
Brigham Young University - Provo

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Working on Global Virtual Teams

Jennifer Alyce Alexander

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Randall Spencer Davies, Chair
Larry Lynn Seawright
David Arnin Wiley

Department of Instructional Psychology and Technology

Brigham Young University

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ABSTRACT

Cultural Competence Lessons for Engineering Students
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Jennifer Alyce Alexander
Department of Instructional Psychology and Technology

With funding from the National Science Foundation (NSF), the Ira A. Fulton College of Engineering and Technology at BYU has been furthering their research on Global Virtual Teams. After Cultural Competence lessons were implemented into the classroom setting in 2010, it was decided that teaching the lessons online asynchronously could have advantages in decreasing the time professors needed to cover the content in class. In 2011, Jennifer Alexander teamed with faculty involved with the NSF grant to design and develop online Cultural Competence lessons. Beginning in August 2011 students at BYU and other cooperating campuses participated in the online Cultural Competence lessons. The online lessons were complete and ready for implementation on time; changes were made after implementation based on feedback given in student interviews; and the lessons are now ready for further development and implementation.The lessons will be shared openly with a global audience through Global Hub beginning in summer 2012.

Keywords: cultural competence, global virtual teams, engineering, Global Hub, online lessons, development, instructional design, National Science Foundation grant.

ACKNOWLEDGMENTS

This project was supported by grant WC100.6th edition by the National Science Foundation. Thanks to Dr. Randy Davies for continual support through the design, development and writing process; Dr. David Wiley and Dr. Larry Seawright for helpful suggestions and support along the way; Holt Zaugg whose research this project is dependent upon; Dr. Alan Parkinson, Dr. Spencer Magleby and Dr. C. Greg Jensen for being instrumental in making this project happen in the Mechanical Engineering Department. Lastly, thanks to supportive parents and especially to my husband who encouraged me along the way.

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Introduction

With the growth of globalization in the field of engineering, cultural competence has become increasingly vital to the success of new graduates from the Ira A. Fulton College of Engineering and Technology at Brigham Young University (BYU). Consequently, BYU's Mechanical Engineering department has invested time and resources into creating opportunities for their students to develop skills that will prepare them for a global work environment. The purpose of this paper is to report my experience in designing and developing an online course to support cultural competence in students of the Mechanical Engineering department. I will discuss in detail the project origination, design and development, implementation, and evaluation of the project. Further, I will provide recommendations for the future enhancement of the online lessons.

Project Origination

One of the desired outcomes of a university-level engineering program is that students leave the program prepared to work in the engineering field. With the increased globalization of the workplace this often means working on culturally diverse teams using virtual communication technologies. While existing engineering courses teach students engineering concepts and skills, many universities find they need to create courses to teach cultural competencies and skills students will need to work effectively in the global workplace.

Since 2009, the Engineering Department at BYU has offered several courses in which students are required to work on Global Virtual Teams (GVTs) with other students in various worldwide locations and cultures to solve real-world engineering problems. These courses provide a unique experience where Mechanical Engineering (ME) students learn about the challenges of working in a global environment. To facilitate more effective teamwork in

culturally diverse GVTs, the ME department developed a Principles of Global Virtual Teams course. The main objective of the course was to teach students about the globalization of engineering and how to interact with others in culturally diverse work environments using virtual communication technologies.

Sponsor and Need

In 2009 the National Science Foundation (NSF) was made aware of BYU's ME department and their development of GVTs and awarded Dr. Alan Parkinson, Dr. Spencer Magleby, Dr. Randy Davies, and Dr. C. Greg Jensen a grant to support the continuation of the project. With funding from the NSF grant, further research and development of GVTs and how to support them with Cultural Competencies continued. During the first year of the grant, the ME department taught the course in a traditional classroom setting with the Cultural Competencies (or GVT) content as part of the regular course instruction. This was a pilot course for BYU and National University of Singapore students working together distantly on capstone projects.

Due to time constraints for in-class instruction, including loss of time for instruction on engineering-specific content, there arose an interest in developing a more efficient method of presenting the GVT content to the students. ME department faculty, Dr. Parkinson, Dr. Magleby and Dr. Jensen requested that an online asynchronous, version of the lessons be created and given to students to work through independently. The same lesson content as had been used synchronously during the pilot course would be used. Minor changes to the content would be made under the direction of Dr. Magleby. Presenting the lessons in an online asynchronous setting would decrease the time spent on the lessons during class increasing the time students could spend on other engineering content. Dr. Davies invited me to join the team as the developer of the online Cultural Competencies (CC) lessons. The success of GVTs was a high

priority in the ME department. Because the CC lessons were aimed at supporting GVTs, the development of the online lessons was consequentially of high importance to the department as well. My involvement in the development of the online CC lessons gave me an opportunity to build new skills working with content experts of another field and applying principles learned in the Instructional Psychology and Technology (IP&T) department concurrently.

Circumstances

In February 2011 I began participating in weekly meetings with the GVT project team. The project team included Drs. Parkinson, Magleby, Davies, Jensen and two other graduate students whose research was in GVTs. At our weekly meetings, we discussed the design needs, constraints, and logistics pertaining to the CC lessons. The online CC lessons were to be designed in a way that would become accessible to the worldwide engineering public on Global Hub, a virtual organization that houses research and education tools for engineers around the globe. The NSF grant would pay for me to put 20 hours of design and development work into the CC lessons each week as well as for any research that needed to be contributed by the other graduate students involved. Additional materials needed for the design and development of the online lessons included one computer with high speed Internet, web-development software, photo-editing software, and a server. Other required resources included content experts who would play a crucial role in deciding the learning materials that would be presented in the online CC lessons.

Prior to my involvement on the project team, learning materials were created and implemented in the 2010 synchronously presented CC course. An outline of the lesson objectives can be found in Appendix A. I was not employed to develop the content, but it was my

responsibility to help with the technical side of the editing process and improving the presentation of the materials including the images used to support the content.

Due to the immediacy of the need, my involvement was very helpful, because it sped up the process of preparing and transferring the materials onto a new platform. The online CC lessons needed to be ready for presentation by August 2011 to the cooperating GVT schools in Mexico, Taiwan, Canada, and Indian students based in a U.S. university. It should also be noted that while the readiness of the materials was beneficial to the speed of the design process it was also a constraint, because there was very little flexibility within the content and how it would be presented.

Preliminary Analyses

The CC lessons were implemented in a face-to-face classroom setting, synchronously presented, in the year prior to the transition of the lessons to an online platform. The lessons were supplemental materials, as the majority of class time was spent focusing on other engineering-specific materials. This was a crucial step in preparation for the lessons to be transferred to an online learning environment. Because the implementation was initially presented in an online, synchronous class, some of the issues with content were found and improved upon by the instructors of the course.

Design Goals and Criteria

The goal of the design, as determined by the ME faculty, was to provide an efficient way for students to become aware of the special needs for Cultural Competence and virtual communication while working on GVTs. A secondary goal of the design was to create lessons in a format that would be accessible to a public audience, particularly those who would access Global Hub in the future. Global Hub is a digital library where engineers share resources openly,

including learning materials. The project was to be completed by August 2011, as it would be used by the ME students beginning Fall semester 2011. No additional specific goals were initially determined or expressed by the client. As the project developed over time and through various iterations, additional goals were added to the scope of the project. After the first iteration of the online lessons on a platform that I felt would lend to an interactive and highly engaging learning environment, the client expressed a desire for the online lessons to be placed on a platform that was strictly linear, much like a digital textbook with an assessment at the end of each lesson. In many ways this goal limited the ability for the lessons to invite the users to have autonomy as they completed the lessons, which was one of my goals in choosing the design platform that would be used.

Design Development Process

Prior to choosing a platform, I created a list of possible platforms based on the criterion expressed by the client. Included in the table was a description of the pros and cons to each platform (see Table 1). At the same time that we were in the decision-making process for the platform, research and development was underway in the IP&T department to create an interactive online learning environment tool. The tool being created by IP&T graduate students was inspired, in part, by Brown, Collins, and Duguid (1989), who stated that "approaches…that embed learning in activity and make deliberate use of the social and physical context are more in line with the understanding of learning and cognition that is emerging from research." The platform, known as the Simulation platform, was a non-linear learning management system (LMS) that would present the course materials in a form similar to a "Choose your own adventure." Students would navigate through many scenarios to learn the principles that contributed to the overarching learning outcomes. The other platforms that were considered

Table 1

Platform Options

Platforms	Pros	Cons
Blackboard	High volume management	Need for private access
	Familiar to many educational institutions	High overhead cost
	Assessment tool	BYU may be moving away from this
		Not portable
Simulation (from IP&T)	User friendly	Uncertainty in long-term maintenance
	Assessment customizable	Currently still under development
	Assessment can be tracked or open	Needs a host
	Currently no overhead cost	
	Can suggest further development	
Moodle	Open Access	Cannot track individual students
	Free Accounts	Not portable, set-up is not transferrable
		Needs a host
TCC	High volume management abilities	Similar to Blackboard in set-up, not up-to-date (visually and mechan. "clunky")
	BYU ME Dept. already has it up and running	Not portable
	Already familiar to current ME students	Overhead cost (requires a system host)
Brainhoney		Not portable
		Overhead cost
		Setup not transferrable with customizable settings
		Requires that all users have accounts

included Moodle, a open source modular LMS that provides a basic frame for creating an online learning environment; Blackboard, the current closed-source LMS being used by BYU; TCC, the current closed-source LMS being used by many of BYU's ME students; and Brainhoney, a closed-source LMS that BYU was currently exploring and developing further for campus-wide use. After considering the proposed platforms and the pros and cons of each, the client requested that a customized website be created following a linear model, similar to a textbook. This website would fall under the same deadline initially set as August 2011.

After the client requested that a linear textbook-like online learning environment be created, I worked with Dr. Davies to come up with a basic design flow (see Figure 1) that the lessons could follow. There would be ten lessons total, with a varied number of principles taught within each lesson, and one quiz at the end of each lesson.

Dr. Davies and I found some source code that followed this desired flow, which I modified to what I thought would be suitable for the needs of the client. I used the source code and made the adjustments using Text Wrangler, a free text editor on my MacBook, to create our first full prototype with a linear progression through the lessons. In reviewing the prototype with the client, we concluded that a more flexible flow needed to be integrated into the functionality of the lessons, enabling students to move between principles with a single click on a forward/backward button next to the lesson content. The current design allowed user to move between principles only by selecting the principles in the sidebar menu. Other adjustments were also discussed for change, including the amount of information within each principle. While the initial feeling of the client was to have a large amount of text on a single page, we discussed simplifying each of the pages to keep the user moving through the lesson at a faster pace. Decreasing the amount of information on each page also made the content more accessible for

future access when users desired to refer to a specific concept, since the concepts were broken down more specifically in the menu. Rather than breaking a lesson down into five to ten "Principles" within a lesson, lessons were broken into more than double (in most cases) the number of information segments pertaining to the each lesson. Figure 2 illustrates the change in flow after for the third prototype.

To develop the changes in flow, forward and back buttons were created using Adobe Photoshop for appearance and JavaScript for functionality. This was an important change, because it allowed students to move from screen to screen within each lesson without burdensome scrolling and searching. The ability for students to navigate and search the lessons for specific content questions was maintained in the flow by keeping a sidebar menu with all of the principles listed, and it was improved by breaking down the more text-heavy principles into sub-principles in the menu.

The added and improved functions of the online lessons satisfied the wishes of the client. With an agreement on the basic flow and function of the site after the third prototype, we were able to focus more on the content goals and needs of the students, or users of the lessons. Content had been previously developed and was being reviewed and revised by faculty. Assessments were also being revised.

Assessment and Practice Activities

In the previous year that the class had taken place, assessments were sent by e-mail to students who completed the assignments and returned them to the course instructor. All assessment materials were created as traditional assessments and graded by the course instructor. After exploring other options, such as Brainhoney, which is under development, the client chose Qualtrics as an assessment engine because it is available through BYU and would not add to the

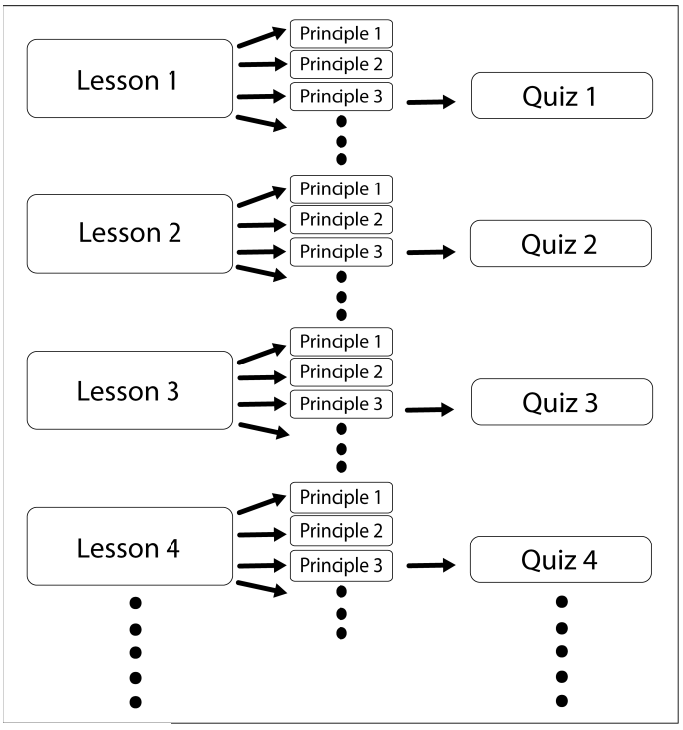


Figure 1. Basic design flow of online lessons.

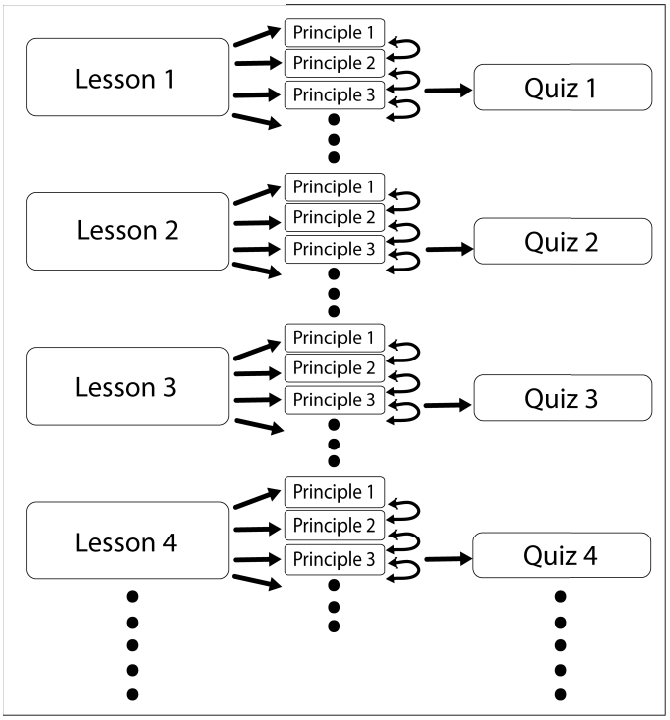


Figure 2. Second design flow of the online lessons.

cost of the course. It also increased efficiency since assessments were changed to a multiple choice or alternate format that could be automatically be scored by Qualtrics to provide immediate feedback to students and test results could be easily retrieved by the instructor. Another aspect of assessment was practice activities that students would participate in and then report to their professor via email.

In a conversation with the professor who would be using the CC lessons, it was decided that a report on student participation in the practice activities was not necessary. It was mutually agreed, however, that providing students with the opportunity to reflect throughout the lessons was a valuable activity and should be included. Reflection and practice activities involved students in the construction of "their own meaning from knowledge and information in the learning process… emphasis[ing]… interaction and socialisation among learners" (Oliver, 2006, p. 242). Oliver's research closely corresponds with the initial goal of situated learning. "Reflection and Practice" activities were spread throughout each of the lessons to encourage students to pause in their reading and reflect on their learning by considering a variety of scenarios in which the principles could be applied. Participation in Reflection and Practice activities would not be assessed, evaluated, or reported on.

Design Evolution

With the framework of the online lessons in place, I was then able to focus specifically on presentation aspects of the design. Because the content had previously been implemented in another setting and the client was inclined to not make any major changes to it, the process of collecting the content was not difficult. A co-partner on the project, Holt Zaugg, met regularly with Dr. Magleby to edit the content, and I was given one or two lessons each week for integration into the online templates I had created. Each week, for about 6 weeks, I had the

chance to input the new content and test the template and make adjustments in the appearance and flow of the pages as the client and I saw a need. We aimed to have all of the online lessons prepared for testing and final editing by July 20, 2011.

During the month of June and July, many small appearance and functional decisions were reconsidered and modifications were made to improve the experience of future users. While most of the images were previously determined for the lessons by the content expert, I was given the liberty to find images on the internet to replace any images that I felt did not fit the lessons. I determined that many of the images previously employed were of very low quality or obsolete. I replaced about 50% of the previously used images (see Figure 3). Nonetheless, I found it very difficult to find enough relevant images available for public use on the internet to satisfy the client. As a result, I chose to create some images using Adobe Photoshop and Illustrator (see Figure 4).

Upon completion of all of the lessons and a few editing iterations in early July, video illustrations of concepts were considered for creation to improve the experience of the students, again supported by Brown, Collins, and Duguid's (1989) findings of situated learning, creating a visual representation of conversations that students may find themselves in on their GVTs. This idea had been discussed early in planning; however, it was decided that it should not take priority over the work that we had accomplished to this point. While the client felt this would be nice, it was decided that time and resources would not be used to find or create video illustrations to support the lessons.

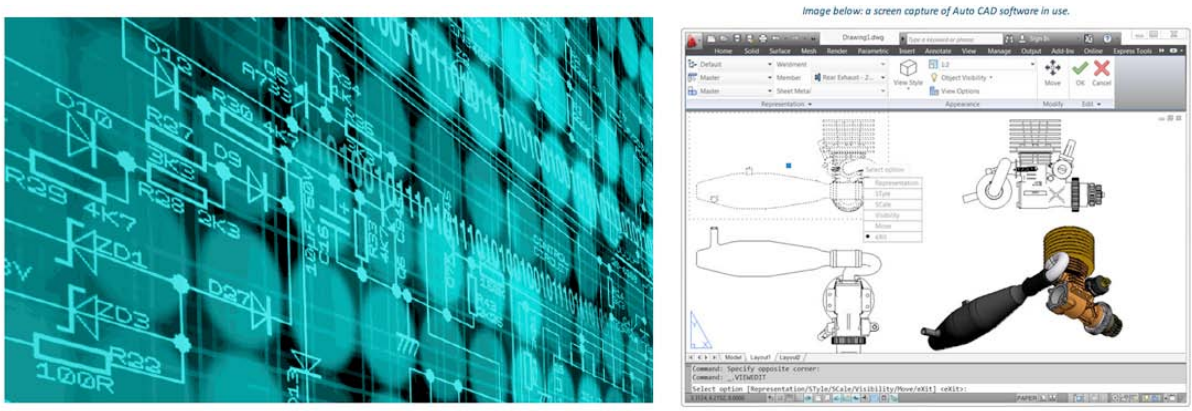


Figure 3. The AutoCAD image (right) replaced the generic technology image (left).

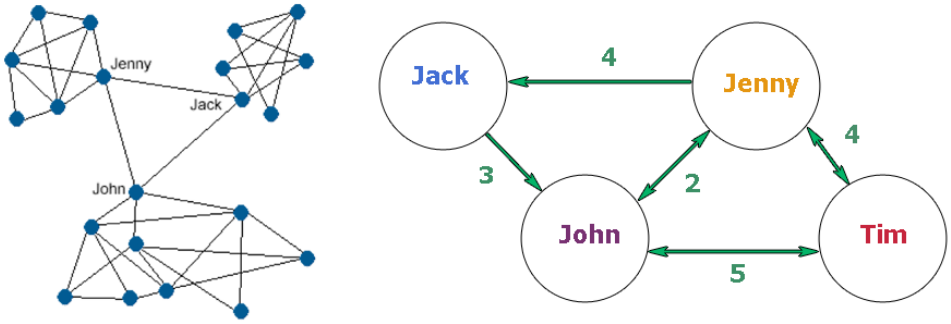


Figure 4. The image created in Photoshop (right) replaced the original image (left).

Further consideration of the international students was taken, and prototypes of audio narrations and summaries of lesson pages to be made for non-native English speaking students to listen to. After creating a few example prototypes and presenting them to the client, it was again decided that while the narrations would support some students with weaker English literacy abilities, it was not a current priority of the client's. With that, I began working on alternate language support, creating text box pop-ups that would give definitions of difficult words. The words that had pop-up definitions were highlighted yellow, and students would hover their mouse over the word to activate the pop-up definition without a click and without having to

leave the current page. This form of language support was approved by the client and would be further evaluated prior to implementation.

Design Documentation

The desire of the client was to disseminate information and assess whether or not the students could use that information to answer a series of questions at a knowledge and understanding level. Because the client's focus was merely on propagating the content and assessing knowledge, the design became quite simple and very linear, and I was limited in my ability to use any formal theoretical design models. Elements of the design included the content, ways students would access and consume each piece of content, a summative assessment, and the way that success or failure to know or understand the concepts would be expressed to the student and professor. The design was made up of multiple files all of which were packaged in one website, including an index file, an introduction file, 10 lesson files, 10 assessment files, and a style sheet that dictated to appearance of the pages. Each of these elements of the website connected linearly to one another and back to the index file. The design of the content and assessment were predetermined and input as text and references into the lesson and assessment files. More details to the decisions made regarding the presentation of the content and assessments are given below.

Access to the website, and thus the content of the lessons, was made fully public and housed on the IP&T department server. This decision was made merely for convenience of the client, in that they were not held responsible for the initial set-up or maintenance of the online lessons but would later be given those rights and responsibilities of housing and maintaining the lessons. Additionally the images and all files used within the site were relatively small files,

which was done intentionally so that students with various speeds of Internet and bandwidths would not have trouble accessing the materials.

The content was fully dictated by the content expert, in the form of text and images. The text was broken into chapters, or lessons, and then further broken down into pages. The pages could have anywhere from a single paragraph to about 20 minutes worth or reading, coupled with a few pictures to support the text, embedded in line with the text, similar to a textbook. Students would eventually come to an assessment page of the lesson, which would have a link to the lesson assessment.

The content expert also decided on the assessment questions, which would be used similar to the previous year in the synchronous version of the lessons. The client wanted the students to be able to complete the reading and assessment within one hour time period, so I recommended that some of the question banks be decreased to 10–15 questions each, which was done. I did not have any control over which questions were chosen to be part of the assessment and which were not included, other than a few suggestions on wording. A meeting was held with the professor whose students would be using the lessons, Dr. Jensen. As a result of his request, the assessments were password protected, and the questions all remained multiple-choice and true/false. Qualtrics was chosen to be the assessment manager because of the easy access that Dr. Jensen and students would have to the quizzes and results. Qualtrics was also chosen because of its common use on BYU campus, so future instructors and developers of the course would likely be familiar with how the system functions.

With Qualtrics selected as the assessment tool, a few other decisions were to be made regarding what features of the tool would be used. All assessment data was stored on the Qualtrics server, freeing the ME department from having to store such information in their

database. The 10–15 selected quiz questions were input into the system, a common password was set on all of the quizzes, and randomization of the questions was programmed. The choice to randomize the questions was also a decision made between the content expert, Dr. Jensen, and myself. The reason for this choice was to help decrease the chances of students copying and distributing answers among themselves. The quizzes were decidedly "open resource," so students would be encouraged to keep the lessons open in one window on their screen with the quiz open in another window at the same time. The goal was for students to gain exposure to the principles within the lessons and not for them to memorize specific facts or details. Allowing students to use the lessons as a reference to the extent that they needed, we felt the amount of exposure that the students had to the content would increase. And lastly, immediate feedback was given to the students through the Qualtrics system, alleviating the instructor(s) from having to spend time hand-scoring each quiz.

Design Rationale

What many would call "traditional" teaching methods was employed in the creation on the CC online lessons. One of the earliest known technology based learning systems is that of Skinner's (1958) "Teaching Machines," which provided automated feedback for students as they practiced spelling, arithmetic, or physics facts. One of Skinner's main goals was to help education become more efficient (Skinner, 1958). Similarly one of the main goals of the ME department, or stakeholders, was to increase the efficiency of disseminating the CC lessons, with hopes that it would support students on their GVTs throughout the semester without taking away class time to cover this content. Another key priority of the stakeholders was to distribute the lessons to the students beginning in August 2011, giving us about three months to create a working design functional system.

The background of the stakeholders, being in Engineering, was vastly different from that of myself and others from the IP&T department, making decisions about the design to be used a challenging debate at times. In previous years, PowerPoint presentations were used during online synchronous course teaching of the CC lessons, and it was the decisions of the stakeholders and content expert to make very few changes to the content, increasing the efficiency of the design process. The stakeholders had previously reviewed and approved all of the selected content with a few minor changes needed to bring some of the outdated examples up-to-date.

With the content decided upon and finalized, the structure and presentation of the lessons was the next piece of the design. In the eyes of the client, it was believed that engineers think in a very linear fashion. As a result, a structure that disseminated the content in a very straightforward, textbook-like format was the overarching vision of the design. Students would be led directly from point A to point B through the content and then into an assessment on the content, per the client's priorities.

The content expert created many of the questions for the assessment, and the client dictated any changes to be made. There were two main changes that were made in the design of the assessment. One was the number of questions, as mentioned previously, which was decreased to meet the time reduction that the stakeholders wanted to make for the students who would be completing the lessons and assessments. The other main change that was made was that feedback was added to the assessments for students to receive immediately after submitting their responses in each quiz. Mason and Bruning (2001) and Shute (2008) support the claim that providing feedback beyond "correct" or "incorrect" supports student learning. While it is recognized that there is still debate over what is optimal timing for feedback, delayed or immediate, indicating the correct response coupled with descriptive feedback specific to the student's response choice

supports the majority of learners (Mason & Bruning, 2001). This is the type of feedback that was added to the assessments to support student learning. Additionally, to provide the desired simplicity for the professor, each student's score would ultimately be recorded in the Qualtrics database and received by the professor for use in student grades.

Full rights to the content files, including the index page, style sheet, lesson files, image files, and assessment editing access were in my hands and the hands of the content expert throughout the design process. These rights would all be turned over to the ME department upon completion of a post-implementation evaluation of the online lessons in April 2012. Beginning in April 2012 a ME department server will house the lessons. The assessments will continue to be stored in the Qualtrics database, with editing access changed to the appropriate person(s) who will be responsible for maintaining the assessments.

Project Plans

When the need for someone to develop the online Cultural Competencies lessons arose in February 2011, as mentioned previously, I began attending meetings with the ME department leaders and other that were involved in research relating to the lessons. The deadline for the lessons to be ready for implementation was in August 2011, so I made a list of the main deadlines that would be important to meet along the way (see Figure 5). Much of the content; including text, media, and assessments; had been prepared in previous years for the earlier iterations that were used in the face-to-face CC lessons, making the process much more reasonable than starting from scratch.

Development Team

There were many people involved in the design and production process, many whom have been referred to previously. The NSF grant was given to Dr. Alan Parkinson, Dr. C. Greg

Friday, April 1

- Lesson content: Jenni will have reviewed content with Holt and prepare prototype lesson modules in potential platform.
- Assessment questions for prototype lesson: hardcode into a potential platform by IP&T Programmer, Ben McMurry

Friday, April 9

- Prototype Presentation: Jenni will share a lesson and assessment prototype in a meeting with the project team.
- Platform Rationale: Jenni will share a written rationale for the platform options and choices. Pros and Cons of each will have been considered and can be considered further, if needed.

Friday, April 16

- Platform adjustments: If there is a need for a change in platforms, further considerations will be made and share with the project team.

Spring 2011 (April 26 – June 13)

- Lesson Objectives: All lesson objectives will be reviewed and revised, as needed by Jenni and Holt.
    - A more specific timeline of this process will be clarified prior to April 26.
- Lesson Content: All lessons presentations/activities will be review and revised to specifically meet the intended lesson objectives by Jenni and Holt.
- Assessment questions: All assessment questions will be reviewed and revised to specifically address the modified objectives by Jenni and Holt. These will be reviewed by Randy Davies and the project team.
- Module completion: All lessons and corresponding lessons will be complete and ready for testing by the end of Spring 2011 term, June 13.

Summer 2011 (June 20 – August 8)

- Testing: a class of IP&T Graduate students in an instructional design course will test all lessons and assessment, and program flow and functionality.
    - Professor David Wiley will lead this class.
    - Revisions will be made and presented to the project team on a scheduled basis, to be determined by June 20.

Fall 2011 (August 29)

- Implementation: engineering students outside of regular classroom will use these lessons. Jenni and Holt will provide support as needed.
- Evaluation: Jenni will conduct a developmental evaluation on the course/program, including an evaluation of the platform in use.

Figure 5. Schedule for design and production of the online cultural competencies lessons.

Jensen and Dr. Spencer Magleby, of the ME department, and Dr. Randy Davies, of the IP&T department. Drs. Parkinson, Jensen and Magleby would be the main client, while Davies would be my faculty support during the design and development process. Holt Zaugg, a PhD student in the EIME department, would be the main content expert and creator of the assessments. A portion of Zaugg's research is closely tied to the CC lessons and their impact on student interactions on the GV Teams. Additionally, Kevin Ashton, a PhD student in the IP&T department, who has extensive experience with JavaScript and PHP helped troubleshoot programming errors and navigate the best solutions in making the website flow and function in the beginning stages of production.

Implementation Plan

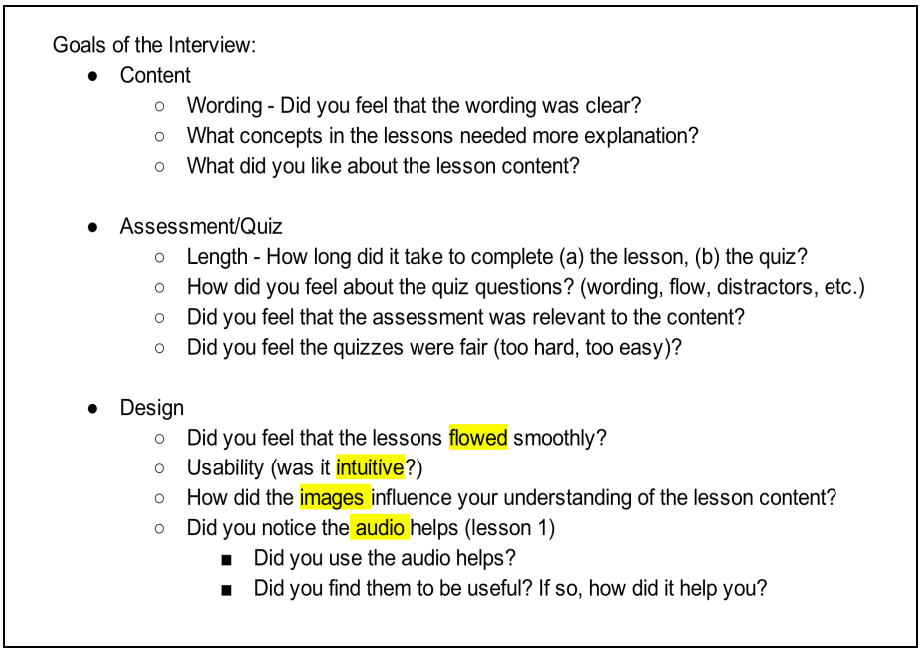
Upon completion, in August 2011, the online CC lessons would be distributed to a select group of ME students at BYU and collaborating campuses, including Universidad Iberoamericana Cuidad de México (UIA), Toluca, National Taiwan University (NTU), University of British Columbia (UBC), and Wayne State University. Dr. Jensen would be traveling to Mexico and would inform the collaborating teachers and students of the lessons and assessments and how they would be used throughout the semester. Zaugg would inform the participating BYU students in the same manner in September. Zaugg would also contact the professors of the other participating schools at the end of August, giving them instructions to share with their students regarding the lessons and assessments. Additionally, an introduction to how the lessons and assessments functioned was included on the home page of the website.

The CC lessons were incorporated into each of the weekly labs for BYU's ME 471 students. Although each lab was graded, these grades were not used in any part of the student's course grade, as it was the pilot of the CC lessons and assessment materials. Students were not

informed that the grades would not count in their course grade, a choice of the instructor of the course. Those students in the ME 471 course who complete 80% or more of the online CC lessons were offered a reduced final exam. During the pilot study in 2010, Zaugg found that giving credit for participation in the CC lesson assessment increased the number of students that followed through with the assessments. Consequently, each of the instructors at cooperating campuses would be invited to find a way to incorporate the lesson assessments into their own grading system in a way that would encourage students to complete the lesson and assessments. This might look different at each of the cooperating campuses, based on the decisions of the cooperating professors.

Formative Evaluation Plan: Production

Throughout the development process, reports on the progress of the design and production of the online CC lessons would be given in the weekly meetings with the stakeholders. Changes would be made at the various stages of its development, based on conversations with the stakeholders and content experts. Additionally, as noted in the schedule mentioned in Figure 5, four engineering students from the ME department would participate in an external evaluation of the lessons between June 20th and August 8th, prior to the final changes being made. Each of the engineering students who would participate in the pre-implementation evaluation would be asked to read one of three randomly selected lessons and assessments, then they would be invited to a face-to-face interview with me where I would ask them a series of questions, as outlined in Figure 6. A few other ME students, who would not be participating in the lessons in the Fall, would also be invited to participate in a learners analysis to evaluate if we were missing any key elements that might help students in a similar situation as the students who would be participating in the actual online CC lessons.


Goals of the Interview:

- Content
  - Wording - Did you feel that the wording was clear?
  - What concepts in the lessons needed more explanation?
  - What did you like about the lesson content?
- Assessment/Quiz
  - Length - How long did it take to complete (a) the lesson, (b) the quiz?
  - How did you feel about the quiz questions? (wording, flow, distractors, etc.)
  - Did you feel that the assessment was relevant to the content?
  - Did you feel the quizzes were fair (too hard, too easy)?
- Design
  - Did you feel that the lessons flowed smoothly?
  - Usability (was it intuitive?)
  - How did the images influence your understanding of the lesson content?
  - Did you notice the audio helps (lesson 1)
    - Did you use the audio helps?
    - Did you find them to be useful? If so, how did it help you?

Figure 6. Interview questionnaire used prior to implementation.

Formative Evaluation Plan: Implementation

Throughout the semester as the students completed the lessons and assessments, they were invited help with a continual evaluation of the online CC lessons. Zaugg was the advocate for the students, as they reported on any problems they had with the lessons or assessments. Based on the emails he would receive from students, Zaugg recorded any concerns brought forward. Any technical issues that were pertinent for students to continue in the lessons or assessments would be brought to my immediate attention so that a change or fix could be made quickly.

Further evaluation of the online CC lessons took place at the close of the semester when the students had completed the majority of the lessons and assessments. This evaluation consisted of a series of 10 questions asked in a face-to-face with participating BYU students and virtual interview using Skype with non-BYU students. The results of these interviews were used

to drive some of the changes made prior to handing over all of the files to the ME department for use in future semesters.

Projections

Upon completion of final changes, it is projected that the lessons could be used indefinitely, with time-specific aspects being updated as needed. All files have been commented on with notes to help any future web-master navigate the template used for the lessons. The assessments have been created in Qualtrics, an environment familiar to and accessible by faculty of the ME department, for future editing. Both the lesson and assessment files could easily be transferred to an alternative platform if the client chose to change platforms in future years. Currently there is no overhead cost for the maintenance of the content files and assessment manager other than those associated with hosting the website and assessment tool online. The University has covered these costs.

Project Outcomes

The design and development of the online CC lessons followed the original schedule quite precisely. The main changes made to the design during production pertained to the particular flow and function of the lessons, which will be explained more completely later. The stakeholders remained constant throughout the entire process. Erin Kim, a PhD student in the IP&T department, was the only additional member of the team to help with the evaluation of the lessons during and after implementation.

Implementation

The first group of students at UIA, Toluca, received instructions and information about the CC lesson from Dr. Jensen, as initially planned at the end of August 2011. The remainder of the students at BYU, NTU, UBC, and Wayne State University received the lessons and

instructions on how to use them in early September. The primary piece of the implementation that did not happen quite as we intended was the motivation from the instructors for the students to complete the lessons. This was mostly resolved within the first few weeks of the semester, however.

The initial understanding with the instructors was that they would provide some sort of academic incentive in connection with the quizzes, thus motivating students to complete each of the lessons to their highest ability. After about two weeks passing where students were to have completed the first two lessons and submitted the corresponding quizzes in Qualtrics, Zaugg and I noticed that the quizzes were not being submitted. When Zaugg attended student meetings to observe some of the students who were taking the lessons for his research, he learned that Dr. Jensen had told the students that a pizza party at the end of the semester was the incentive for completing all of the online CC lessons.

A meeting with the stakeholders was held soon after we discovered that students were not completing the lesson assessments. In this meeting Dr. Jensen agreed to reconsider the incentive he offered the students, and he changed it to have academic significance. Students who completed all of the online CC lessons and assessments would be excused from answering a few extra questions on their final exam and would be still rewarded the points for those questions on their final exam grade. When the incentive became academic, students became more diligent in completing the lessons and assessments as intended.

Formative Evaluation: Production

Four ME Graduate students volunteered to participate in our first external evaluation of the online CC lessons. I asked each of the students about 12 questions to get an idea of strengths and weaknesses in the text and image content, as well as the flow and function of the website.

From our interviews, we were given 41 suggestions to improve the lessons in various aspects. Sorting the suggestions into five categories (lesson-specific, quizzes, functionality, general content, and images) was helpful in determining priorities.

Eleven of the 41 suggestions were lesson-specific, some of which were simple fixes that I was able to make, and some of which Zaugg, the content-expert, was put in charge of determining the relevance of the suggestion and what to change, if anything. The same was the case for quiz suggestions and general content. Four of the suggestions were about the way the website functioned. These were taken into consideration based on the capabilities of the platform and programming languages that I was using to create the website. The most drastic change the resulted from the suggestions was a floating left sidebar that would move as the lessons were scrolled through. I also addressed suggestions regarding images by adding captions to each of the images, and improving the quality and placement of a few of the embedded pictures. The biggest challenge with some of the image suggestions came from a lack of resources. This is a piece that I would recommend for improvement in future iterations, as additional resources are made available.

The other form of external evaluation that took place prior to implementing the lessons was a learner analysis. I received a list of 20 ME undergraduate students and invited them each via email to participate in an online survey (i.e., learner analysis). Of the 20 students, I received responses from eight students. The responses were fairly common between the eight students with a few exceptions.

Seven of the eight students reported that their perception of the ME 471 course was to learn programming and computer skills, particularly using CAD, which would be useful in the

field of engineering. This was useful information because that is one of the main objectives of the course students would be taking in sync with the online CC lessons.

Each student was asked to indicate all of their preferred learning techniques from a list of five options (kinesthetic, auditory, reading, visual, or other). The responses to the questions about preferred learning techniques were insightful. All eight of the students reported that one of their preferred learning styles was kinesthetic and visual, while only three of the eight students reported reading as one of their preferences. Three respondents reported that one of their preferences was also auditory learning. This would be helpful in making suggestions to the client about the needs of the students in relation to how we might better present the learning material. Currently the online CC lessons are primarily text, which appears to conflict with the expressed learning preferences of most of the students.

The last highly pertinent information received through the learner analysis was the types of tools that students were most familiar with in an online environment. Seven of the eight students reported that they use Skype for online communication, and all eight students use email for online communication. Additionally, all eight of the students reported to have had a recent learning experience with some online tool, including internet-streamed videos, search engines for online research, and online social media sites. This was helpful in knowing that the students were all familiar with internet-based sites and tools, including two of the communication tools, email and Skype, that they would be asked to use to practice skills on their GVTs while completing the CC lessons.

Formative Evaluation: Implementation

As the students completed the lessons throughout the semester, Zaugg was in close contact with students and collected any technical challenges they were having with the lessons.

Most of the emails received from the students were in relation to confusion on the lesson assessments about particular questions. Each of the concerns was noted and addressed at the end of the semester, because the changes would alter the experience of the students who were later in completing the assessments.

An additional opportunity for an external evaluation came in the form of a contest during the implementation stage. At the end of August 2011, after all the changes prior to implementation had been finalized, we submitted our online CC lessons to the Immersive Learning Award (ILA) contest. The ILA is a contest supported by the Multimedia Production Division of the Association for Educational Communications and Technology (AECT). They were looking for graduate students and others to submit engaging interactive learning environments to their contest. In late September we received the results, which was useful in seeing a third-party perspective of the online lessons (see Appendix B). The categories in which they judge the lessons included image quality, audio quality, sequencing, interface, learning objectives, engagement and learning. Each category was worth 10 points of the total score. The two lowest scoring areas for our lessons were the image quality and audio quality.

One image that needed adjustment was the BYU logo in the header of the site. The image was pixilated because of the resolution I had set it at originally. This was a fairly simple image-editing fix, doubling the resolution to be 800 pixels tall and 800 pixels wide, while keeping the size of the image displayed the same. The other suggestion that was made in relation to the image quality was the size of the display of images within the lessons. We ultimately chose to disregard this suggestion, as the size of the images was chosen with the intention to keep the focus on the text rather than on the surrounding images.

The score received from the ILA feedback was 0 out of 10 on the audio quality. About half way through the developmental process I created prototypes of audio support, intending to give language support to the international students participating in the lessons. The client ultimately decided against this suggestion, as they did not feel that it was necessary for the lessons. The decision was not changed after implementing the lessons, so there was no audio added to the lessons. An alternative support for non-native-English speakers was implemented into the lessons instead. An undergraduate international BYU ME student was hired to help find words within the lessons that were difficult for him to understand. He was paid $100 from the NSF Grant funds to go through all 10 lessons, and we built in language support for these and other words that we felt might be difficult for non-native English-speaking students.

Projection Actuals

The maintenance of the site on the IP&T department server worked without any problems throughout the semester. None of the students reported to have had any troubles reaching the lessons or accessing the quizzes from their various locations with a variety of Internet connection speeds. The University, for use of students and faculty, covered the cost of the maintenance of the site on the IP&T server, as we originally planned. Additionally, all access needs of the stakeholders to the programming files and Qualtrics database has been attained for any future changes or sharing that they intend to do, and the expense associated with Qualtrics is covered by the University. Funding from the NSF grant provided an hourly wage for my work throughout the entire design and development process.

Evolution of the Design

The Cultural Competencies lessons can be found at http://byuipt.net/PGVT. To understand the functionality, flow and content outline of this design, it is recommended going to

the link. The ten lessons are packaged into one file titled “PGVT” hosted originally on the IP&T server. All editing and sharing rights are now with the ME department for their use and distribution. They will begin hosting, maintaining, and altering the lessons as they see fit in the future.

The first iteration of the online lessons only included a few of the currently viewed navigation features. Students currently have more options for navigating through the lessons than just moving forward and backward between pages. They now view small sections within each lesson rather than scrolling on one page through 5–10 longer sections within each lesson. The sidebar includes both the lesson titles and all of the subtopic titles for each lesson. This allows students to either navigate using the “next” and “previous” buttons, or they can use the side bar with all of the subtopics.

In the original design, the sidebar was stationary on the left side of the screen. In the evaluation conducted with the ME graduate students, it was suggested that the sidebar move, or “float,” with the scroll of each page. This change was also tested and approved by the stakeholders as an improvement from the first iteration. JavaScript had the best accordion that we could find with the resources available, so some changes were made to the accordion code to make it float, or slide as the page scrolled down.

Another key change that was made was language support for non-native-English speakers. This feature was added to each of the lessons where some of the words were not generally understood amount the non-native-English-speaking ME students. After receiving feedback from several students about their challenges with a few words within the lessons, we took those words as well as words chosen by a hired international student, and inserted short definitions that appear when the yellow-highlighted words are hovered over with the mouse on

the user's computer screen. One example can be found on the "Introduction to Globalization" page, lesson 1, http://byuipt.net/PGVT/index.php?path=/lessons/01/00.php&id=a_2. When students don't know the meaning of the yellow highlighted words, the choice for them to hover over the word and see the definition can save them time since they don't have to look up the word in a dictionary or search for its meaning online.

During the design and development process of creating the online CC lessons, I learned how valuable student feedback from potential users of the website is, and I learned how valuable audio and visual support for international students can be. Students from the BYU ME department were helpful on many occasions, finding small errors within the text and in the functionality of the lessons that were not found by the content expert and me. While some of the feedback they shared was not within the scope of the lessons or the resources available to us, it was important to know those boundaries, which then helped me to glean from the input given. Additionally, it was apparent from the learner analysis feedback during the production stage that the use of multimedia within the lessons would support both the native-English speaking students as well as the international students. Unfortunately, again because of resources and the priorities of the stakeholders, we were not able to provide the amount of multimedia in the lessons that I feel would have added to the richness of the students' experience with the lessons. In future iterations of similar learning environments, I would seek out more resources to build multimedia into all of the online CC lessons, based on student feedback given in the learner analysis mentioned previously.

Critique

My experience throughout the design and development process with the online CC lessons brought various types of insights. These included practical, theoretical, and design and development insights in a real world environment.

Practical Insights

When I was first introduced to this project, I was largely unaware of the task at hand and any formal way of going about meeting the needs expressed. I would not have survived even the beginning stages of the design process had I not been in regular communication with Dr. Davies, who became my advocate and support throughout the entire design and production process. I had not yet taken a formal course on instructional design but would later receive insights from an experienced designer, Dr. Wiley, and all the authors that he exposed me to through literature in the IP&T 564 course, Introduction to Instructional Design.

The order in which events took place was seemingly disadvantageous, but I don't know that I would reverse the order if I were to do it again. I felt a greater need to learn about Instructional Design (ID) through formal study, when I realized how much my understanding of ID lacked when I began working on the project team.

Theoretical Insights

A few of the authors from whom I gleaned valuable insights late in my design and development work include Skinner (1958), Gibbons (2009), and Mason and Bruning (2001). From Skinner's (1958) report on the "Teaching Machine," I became intrigued by an early vision of one who saw the need to increase efficiency in the world of education. While his machine is outdated, his ideas were groundbreaking. We are fortunate today to have available to us technologies that can be used to develop "machines" for students to engage in far deeper learning

and higher level thinking than Skinner's Teaching Machine. As such, I feel that the end product of the online CC lessons is likewise lacking in many ways. Technology resources available today make it possible for learning environments to be full of rich media and involve students in highly interactive learning. This is an area in which the online CC lessons are very weak.

In the lecture "Designing with design layers," Gibbons (2009) shared some principles of design that I found to be true in a very practical sense during my experience with this design and development project. He stated, "There isn't one flow chart because there isn't just one project… There are different constraints that are placed on the design…. making the design decisions in the same order doesn't make sense." When I was introduced to this design and development project, I was certain that there was a single method that would best fit the needs of the stakeholders, but this was not at the case in context of this design challenge. As we presented various platform options and discussed the details to their needs and goals, it became very clear that they were highly concerned about time and just getting the lessons in an online environment, accessible to students beginning in the fall. These needs, or priorities, did not exact "fit" into a particular flow chart. These were needs but in many ways they were constraints that would resurface many times as the project developed.

Mason and Bruning (2001), in their paper on feedback in computer-based instruction, gave me some backing that was supported by the stakeholders when we were making decisions about the lesson assessments. They completed a literature review on the types of feedback that can be used specifically in computer-based learning environments, which has unique differences from a face-to-face traditional learning environment. They looked at the following types of feedback: "knowledge-of-response, knowledge-of-correct-response, answer-until-correct, topic-contingent, response-contingent, bug-related, and attribute-isolation" (Mason & Bruning, 2001,

p. 2). They found that for high achievement students completing low-level tasks, immediate feedback with knowledge-of-correct-response and response contingent information is most effective (Mason & Bruning, 2001). I emphasize this piece of their findings because of the learners and content that the online CC lessons are designed for. It is my personal assumption that university-level mechanical engineering students are considered "high achieving," and the majority of the learners would be taking the CC lessons having little prior knowledge or experience with the content, cultural competencies, which is supported by the stakeholders understanding of the students' backgrounds at this point in their schooling. The test items chosen for the assessments were all written to test at a knowledge and understanding level, which would be classified as low-level tasks. Therefore, according to Mason and Bruning's findings, it was most appropriate to provide knowledge-of-correct-response with response contingent feedback with each assessment (2001). While this type of feedback was applicable in relation to this learning environment, it is not necessarily the best form of assessment and feedback for all online learning environments. I recommend a review of Mason and Bruning's research prior to an application of these principles.

Design and Development Insights

While an application of theories, even flow-charts and clean-cut models, is a nice idea, my experience was not this way at all. As a designer, it is vital to understand the needs of the client as well as the learners, keeping in mind that the clients, or those who are often the suppliers of the funding, are ultimately the decision-makers. Understanding theory with practical lenses was one of the most valuable realizations that Dr. Davies and others helped me to remember through the design and development process. Perhaps it is more important to know how to be flexible when working with and for people than it is to know the academics of design.

Design is ultimately centered on people: what they are trying to learn or teach, who the people are, what they are interested in, how they best learn or teach, and the constraints of the environment in which they will be learning or teaching.

Throughout the production process of developing the online CC lessons, I became keenly aware of weaknesses that I had in web development. My prior experience with web development was quite slim, however when I was given this opportunity to dive in and build something of value for the ME department, my motivation to figure it out helped me accomplish the task. The stakeholders' choices of platform-type and essential functionalities of the online lessons was not as technically challenging as I anticipated, but I was still able to learn and grow in my web-development skills. I learned through experience how to navigate code more efficiently, how to troubleshoot errors in HTML, PHP and CSS, and how to organize files and code so that future developers can take the source code of the online CC lessons and customize them to fit future needs. The most difficult piece of the development for me was implementing the sidebar. I quickly learned from a fellow graduate student that the types of code I was familiar with were not going to be sufficient to build the three-level navigation system that I needed to make the lessons flow smoothly. JavaScript was the language of choice that I was coached to use. Unfortunately because of time and skill constraints I was not able to understand JavaScript to the level that I would need to make further adjustments to the code or even make an informed choice to replace the code to overcome some of the minor functionality quirks that the sidebar currently has.

Working with a real client on a real tool that was implemented with real students to reach toward meaningful goals was highly valuable to my learning and growth as a designer. There is still a lot that I don't know about both design and development, and I look forward to more

experiences in future years that will continue to help me grow in my skills and understanding in both arenas.

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APPENDIX A: Cultural Competencies

Compiled by Holt Zaugg

A. CROSS-CULTURAL COMMUNICATION- Demonstrates knowledge and ability to communicate (speak, read, write, and listen) using a second language, international language and cultural communication rules, while positively representing one's own culture, people, company etc.

1. ***Second Language***: Demonstrates knowledge and ability to communicate (speak, read, write, and listen) using a second language.

a. Explains the need for and importance of a second language in cross-cultural interaction.
b. Demonstrates essential grammar, vocabulary, phrases in a second language.
c. Demonstrates the ability to communicate in a second language.
d. Continuously maintains and develops second language skills.

References (Deardorff, 2006, Downey, 2006, Lohmann, 2006, Parkinson, 2009)

2. ***International Language***: Demonstrates the knowledge and ability to communicate (speak, read, write, and listen) using an international language.

a. Explains an understanding of the need for and importance of communicating in an international language. (e.g., English, French etc.) in cross-cultural interaction.
b. Explains an understanding of how dialect, slang, colloquialism, and cadence affect context in an international language.
c. Demonstrates the ability to communicate in an international language.
d. Continuously maintains and develops international language skills.

References (Galloway, 2008)

3. ***Cultural Communication Rules***: Demonstrates knowledge and ability to appropriately apply cultural communication rules when communicating with people from different countries.

a. Explains an understanding of the effect of one's own and other cultural rules on verbal communication (e.g., formality, directness, etc.).
b. Demonstrates the ability to appropriately apply verbal communication rules in cross-cultural communication.
c. Explains an understanding of the effect of one's own and other cultural values on non-verbal communication (e.g., Body Language, Facial Expression etc.).
d. Demonstrates the ability to appropriately apply non-verbal communication rules in cross-cultural communication.

e. Explains an understanding of how communication varies in one's own and other cultures in different social contexts (e.g., word choice, manner of speech, idioms, appropriate humor, conversational taboos, appropriate body language etc.).
f. Demonstrates the ability to communicate cross-culturally in various social contexts.

References (Deardorff, 2006, Downey, 2006, Lohmann, 2006, Parkinson, 2009)

4. ***Interpersonal Representation***: Demonstrates the ability to positively represent one's own culture, people, company, product etc. in a foreign culture.

a. Explains an understanding of the importance of representing self, team, home nation and native culture in a foreign culture.
b. Explains an understanding of cultural guiding principles for interpersonal representation.
c. Demonstrates the ability to apply the principles of interpersonal representation in representing self, team, home nation and native culture in a foreign culture.

References (Deardorff, 2006)

5. ***Communication Technologies*** – Describe the availability and appropriate use of collaboration technologies in cross-cultural interactions.

a. Describes how collaboration technologies are used throughout the world.
b. Demonstrates the ability to communicate using collaboration technologies appropriately.
c. Describes the impact of communication technologies on virtual teams (i.e. establishing social presence or sharing knowledge)
d. Applies communication strategies via virtual technologies to establish and maintain interpersonal connections.
e. Applies communication strategies via appropriate virtual technologies to establish team identities and roles.
f. Identifies differences in virtual communication patterns and expectations.
g. Describes strategies to identify and implement appropriate communication tools to accomplish team goals.

B. CROSS-CULTURAL DISPOSITIONS - Understands and develops cross-cultural attributes (i.e. cultural appreciation, cognitive openness, emotional flexibility, cultural equality, global exploration, global citizenship).

1. ***Cultural Appreciation***: Demonstrates a disposition that appreciates and respects cultural differences (e.g., language, social rules, political systems, arts, music, etc.)

2. ***Cultural Openness***: Demonstrates a disposition that evaluates cultural differences from a perspective different from one's own cultural norms and takes advantage of the differences when appropriate.

3. ***Cultural Flexibility***: Demonstrates a disposition that tolerates and flexibly deals with cultural differences without emotionally disturbing others.

4. ***Cultural Equality***: Demonstrates a disposition that views all cultures without prejudice, stereotypes, and discrimination, and interacts with people from any culture as equals in social status (i.e. ethnocentrism).

5. ***Global Exploration***: Demonstrates a desire to learn about different cultures, world events, and social issues of the world.

6. ***Global Citizenship***: Demonstrates a desire to help or work with people from different countries to solve cross-cultural or global problems.

7. ***Contrasting Cultural Values*** – Demonstrates an understanding of continuums of cultural values that determine how people interact (power distance, individualism vs collectivism, masculinity vs femininity, uncertainty avoidance and long-term vs short term orientation).

References (Deardorff, 2006, Downey, 2006, Lohmann, 2006, Parkinson, 2009, Hunter, 2006, Lambert, 1998)

C. WORLD KNOWLEDGE - Demonstrates understanding of the world in terms of values, geography, religion, language, culture, political and economic systems, and current and historical world events.

1. *General Knowledge* - Demonstrates a general understanding of global:

a. history
b. events.
c. public policy
d. politics.
e. world organizations.
f. geography.
g. dominant religions.

References (Deardorff, 2006, Galloway, 2008, Hunter, 2006, Lambert, 1998, Lohmann, 2006)

2. *World Cultures* - Identifies, compares, and contrasts beliefs, values, perspectives, practices, and products of own culture with that of others.

a. Demonstrates an understanding of how native culture is perceived by other cultures.
b. Describes how native culture has adopted practices from another culture.
c. Explains the similarities and differences between cultures of the world.
d. Describe s how culture is a moderating factor in individual and group behavior.

References (Deardorff, 2006, Galloway, 2008, Hunter, 2006, Lohmann, 2006)

3. *Global Interrelations* - Describes concepts of sustainability and globalization.

a. Explains key dimensions of sustainability and individual responsibility.
b. Demonstrates an understanding of globalization and how foreign events have a local impact.

References (Galloway, 2008)

D. CROSS-CULTURAL TEAMS - Demonstrates the ability to work in an international team or group toward a common goal using strategies that encompass the team's cultural diversity.

1. ***Team Leadership*** – Demonstrates the leadership skills needed to guide an ethnically and culturally diverse team toward a common goal.

a. Demonstrates an understanding of how global companies approach cross-cultural leadership.
b. Demonstrates the ability to successfully lead a culturally diverse team.

References (Parkinson, 2009)

2. ***Conflict Resolution*** – Identifies team conflicts arising from ethnic differences and implements culturally sensitive strategies to resolve the conflict.

a. Demonstrates the ability to identify and describe problems arising from different cultural frames of reference.
b. Demonstrates the ability to resolve culturally-based conflicts using critical problem solving strategies in a culturally sensitive manner.
c. Explain how ethical practices differ among cultures.
d. Understand how global corporations approach ethical challenges resulting from cultural differences.

References (Deardorff, 2006, Lohmann, 2006, Parkinson, 2009)

3. ***Team Processes*** –Describe the influence of culture on:

a. structuring team processes
b. developing team objectives
c. establishing team rules
d. building trust among team members
e. work values and practices.

References (Deardorf 2006, Downey 2006)

4. ***Cross-cultural Team Experience*** – Demonstrate the ability to collaborate effectively with cross-cultural team members to accomplish a common goal.

References (Deardorf 2006, Downey 2006, Bielefeldt 2007, Hunter 2006)

E. ENGINEERING SPECIFIC CROSS-CULTURAL OUTCOMES – Demonstrates an understanding of the influence of culture on the engineering profession, engineering practices, product design and cross-cultural engineering collaboration.

1. *Cross-cultural Engineering Attitudes* – Demonstrates an appreciation, respect, and value of the engineering practices and contributions of another culture.

a. Demonstrates a predisposition to appreciate the engineering practices of foreign nations.
b. Explains how to value the engineering contributions from those of foreign nations/cultures.

References (Downey 2006)

2. *Cross-cultural Engineering Interaction*– Demonstrates the ability to successfully interact with engineers (or engineering students) from another culture.

a. Demonstrates the ability to successfully participate in a cross-cultural engineering team to complete a common goal.

References (Downey 2006, Parkinson 2009)

3. *Cultural Engineering Practices* – Specify how engineering practices differ among the cultures of the world.

a. Demonstrates an understanding of how culture affects the engineering design process.
b. Explains an understanding of the influence of culture on engineering standards and ethical practices.
c. Demonstrates an understanding of how culture affects problem solving in engineering.
d. Explains an understanding of the influence of culture on the use of manufacturing processes.

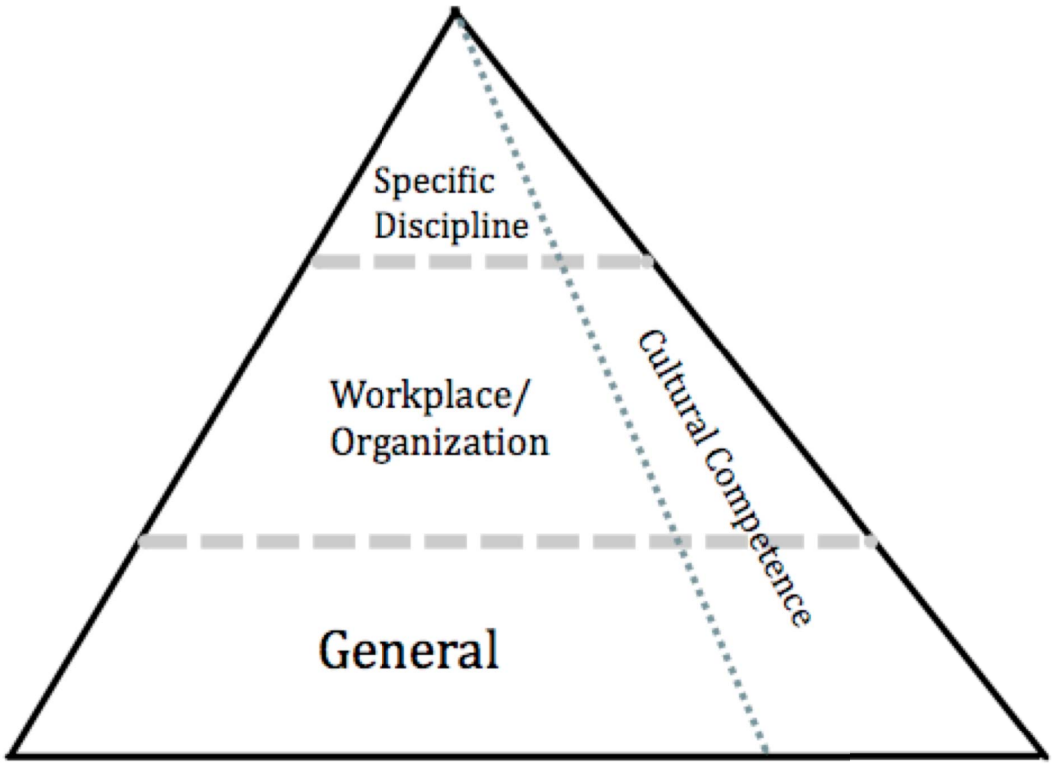
References (Downey 2006, Parkinson 2009)

4. *Global Engineering Occupations*– Describes the cultural and business context surrounding occupations in global engineering.

a. Demonstrates an understanding of how culture influences engineering work throughout the world.
b. Describes the historical and current state of the engineering profession throughout the world.
c. Explains and understanding of the principles of global businesses operating in multiple countries. (i.e. Supply Chain management, Intellectual property, liability and risk, etc.)
d. Explains how engineering occupations are incorporated into global business.

References (Downey 2006, Parkinson 2009)

5. *Culture-Centered Product Design* – Demonstrates an understanding of how culture influences product design.


Specific
Discipline
Workplace/
Organization
General
Cultural Competence

APPENDIX B: Immersive Learning Awards Evaluation

MPD/AECT: Immersive Learning Awards

Evaluation Criteria

Entrant Title: _Principles of Global Virtual Teams__ Entrant Name ___Holt Zaugg____

Category: LINEAR ___INTERACTIVE_X__

Multi-Media Fidelity:		
Image Quality – (Exposure, Focus, Framing, Color, Contrast, etc)	The quality of the images using in the website could be highly improved. The BYU seal is blurry and hard to read. Furthermore, the images of internal pages could be highly improved if the images are resized to the desired sized instead of shrinking them using the HTML image tag.	6
Audio Quality – (Clarity, Frequency spectrum, Timbre, Volume, etc)	There was no audio or video in the three reviewed lessons (lesson 2, lesson 3 and lesson 7). It is suggested to look at this channel of communication to deliver content and engage learners.	0
Sequencing – (Pacing, Continuity, Rhythm, Content Density, etc)	The content has been properly distributed across multiple pages making each page more readable. However, there does not seem to be a clear consistency in the different sections that composed a lesson, for instance, lesson 2 includes "Summary" and "Reflect and Practice" sections, lesson 7 does not include either and lesson9 includes a "Conclusions" section. More consistency across the different lessons would be advisable.	8
Interface -- (Clarity of Navigation, Layout, Look & Feel, Choice of Graphic Elements, Text, and Imagery, etc)	In general, the look and feel of the website is pleasant: the content section looks very clean and the text is quite readable. The dynamic scrollable menu is a plus since it allows users to access it at any point within the content. However, the menu seems to retain the number of options last displayed. This is a critical issue because after users have selected the "Introduction", it is just showing the first option across all different lessons, forcing users to scroll through each of the multiple options. While it's useful to color code different sections, probably it might have been better to use different colors for the "Reflections" and "Assessment" sections.	8

Pedagogical Fidelity:		
Learning Objectives – (Clarity, Appropriateness, Scope, Match to Learner, etc)	The learning objectives are properly aligned to the target audience. Indeed, the instructional content goes beyond the three instructional goals that you included in your proposal. It is assumed that the assessment included at the end of each lesson is properly measuring the lesson's learning objectives. However, the learning objectives are not consistently stated within the lessons: Lesson 2 and lesson 3 include a list of objectives whereas lesson 7 does not.	9
Engagement – (Documentation of Time-on-task, Learner Comments re: Immersion and focused attention, etc)	You have provided remarkable data on student satisfaction with the course outcomes. However, we were wondering whether there is any data regarding the amount of time in which students interacted with each of the pages and whether they visited all pages.	9
Learning – (Data comparing performance on non-immersive learning environments to those of the entry environment, Learner comments re: motivation and increased learning, etc)	Once again, you have provided noteworthy data on student's self perception of their learning and how they had the opportunity to put into practice what they had just learned by interacting with the students in Singapore. It seems that there is no data capturing how much knowledge students acquired in the lecture format versus the immersive learning environment.	8
	TOTAL:	**48/70**