AC 2011-422: WHEN YOU CAN'T HEAR ME NOW - NONVERBAL COMMUNICATION IN DISTANCE LEARNING

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When You Can't Hear Me Now – Nonverbal Communication in Distance Learning

Abstract

Globalization, a strong demand for continuing education and cost pressure on traditional university learning models are all contributing to the growth of distance learning across many educational programs, to include civil engineering. Fundamentally, distance learning encompasses students participating in a class without being physically present; this includes not only remote campuses, where the communication infrastructure is likely to be robust, but also students studying on exchange programs either domestically or abroad. Specifically at the Civil and Mechanical Engineering Department at the United States Military Academy (USMA), the study abroad program is trending towards a more robust program to send our students abroad. In the past five academic semesters, we have sent 370 students to 35 universities around the globe. As the program continues in its development, its popularity among the students continues to grow. Given the growth in demand for this program at USMA and elsewhere, the Department of Civil and Mechanical Engineering at USMA has been carefully examining how to best deliver quality instruction to these students.

The fundamental teaching model in our Department is well-expressed in the Excellence in Civil Engineering Education (ExCEEd) program, sponsored by the American Society of Civil Engineers (ASCE). The model includes six main elements for developing an effective learning environment: structured organization, engaging presentation, enthusiasm, positive rapport with students, frequent assessment of student learning, and appropriate use of technology. The primary question associated with distance learning is, "Can the ExCEEd teaching model work when the student isn't physically present?"

The author's primary interest in this paper is to look closely at non-verbal communication as it relates to the ExCEEd teaching model and distance learning. The authors are most interested in non-verbal communication because it is related to three of the six main elements in ExCEEd teaching model: engaging presentation, enthusiasm, and positive rapport with students. Additionally, the nature of distance learning will necessitate and evaluation of how a fourth element, the appropriate use of technology, is applied to various methods of teaching a distance learning course. Further, non-verbal communication, as represented by facial expressions and body language, can be 65% of the teacher's effectiveness in delivering a message. Given these circumstances, it is important to assess the impact of various distance learning environments on a teacher's ability to express non-verbal content such that the ExCEEd teaching model is still effective. A case study approach will be used to illustrate and examine challenges in this area and recommendations will be presented rely on the body of knowledge of non-verbal communications, the ExCEEd teaching model, and the realities of distance learning.

Introduction

As the world grows smaller through the rise of technology, opportunities for students to participate in classes while not physically present are growing dramatically. Distance learning opportunities are becoming an integral part of program offerings at most universities, and providing students access to classes through distance learning platforms affords students a wider variety of courses, increasing demand. Some students enroll in distance courses to study at night while maintaining full-time jobs. Some enroll in and attend a university's classes though they live well outside normal commuting distances. Additionally, some students choose to take a semester(s) to study abroad and still take classes required by their home institution, enabling them to graduate on time with their peers. In fact, today there are several universities whose entire existence is through the internet and distance learning-based programs. As the technology changes the classroom realm from physical to virtual, we must evaluate our teaching methods to determine if they are still viable – first, by looking at what we already know. We know from anthropologists, such as Albert Mehrabian and Ray Birdwhistell that "the verbal component of face-to-face conversation is less than 35 percent and that over 65 percent of communication is done non-verbally"[1,2]. When you consider all components of communication – verbal (word choice), vocal (intonation, pitch, and tempo), and nonverbal (all other pieces of communication)[3] – Mehrabian's study concludes that vocal and non-verbal communication together account for a staggering 93 percent of the total message communicated by other than verbal means[1]. The question that teachers of distant college students must ask given the clear drawbacks in teaching due to the inherent lack of nonverbal communication is, "Can I teach as effectively in a distance learning environment?" Although there are many different teaching models and techniques for teachers to follow, by focusing on the ASCE Excellence in Civil Engineering Education (ExCEEd) Model, an assessment of student performance can be made that will address that question. The remainder of the discussion proposes that teachers cannot teach as effectively to distant students. This proposal is based on the alternative hypothesis that the ExCEEd Model cannot be executed with equal effectiveness without the non-verbal communication that takes place during face-to-face interaction.

Discussion

One of the ongoing initiatives in Engineering Education is the ExCEEd program, which is sponsored by the American Society of Civil Engineering. The workshop where this program is taught to new faculty members occurs two times a year in various locations, and has been offered for twelve years. This weeklong workshop, which typically has 24 participants each time it is offered and is offered primarily to new faculty members with 3 years or less experience, relies on the participants embracing and developing their skills in the six main elements of the ExCEEd Model, pictured in Fig. 1, to establish them as the class leader and a role model. The six elements – structured organization, engaging presentation, enthusiasm, positive rapport with students, frequent assessment of student learning, and appropriate use of technology – are derived from Lowman's two-dimensional model of effective college teaching[4]. Lowman's two-dimensional model of teaching establishes a system for categorizing teachers based on their interpersonal rapport and intellectual excitement, as seen in Fig. 2. The scale rises through nine total classifications, from inadequate upward to the ideal teacher – the complete exemplar.

The ASCE "ExCEEd Model"

- Structured organization
  - Based on learning objectives
  - Appropriate to the subject matter
  - Varied, to appeal to different learning styles
- Engaging presentation
  - Clear written and verbal communication
  - High degree of contact with students
  - Physical models & demonstrations
- Enthusiasm
- Positive rapport with students
- Frequent assessment of student learning
  - Classroom assessment techniques
  - Out-of-class homework and projects
- Appropriate use of technology

Teacher As a Positive Role Model

Figure 1. ASCE ExCEEd Teaching model used in ASCE ExCEEd Teaching Workshops to describe the main elements of the model.

Lowman's first dimension the ability to generate intellectual excitement in the classroom, results from "the clarity of an instructor's presentations and their stimulating emotional impact on students"[5]. Lowman places heavier weighting on this dimension because without intellectual expertise, or clear conveyance of that expertise, the student will not successfully learn the material. Clear conveyance and excitement for the material is greatly enhanced through such non-verbal skills as body posture, facial expressions, or use of hands for emphasis. These three important communication methods cannot be employed through principally written media such as e-mail or discussion boards. The second dimension, interpersonal rapport, "deals with an instructor's awareness of … interpersonal phenomena and with his or her skill at communicating with students in ways that increase motivation, enjoyment, and independent learning"[5]. Inherently, one must be able to communicate effectively on multiple levels in order to build interpersonal rapport with the students. Since the six elements of the ExCEEd Model are derived from Lowman's two-dimensional model, it follows that the ExCEEd Model is equally reliant on communication. The authors believe non-verbal communication plays a crucial role in executing three of the elements in particular: engaging presentation, enthusiasm, and positive rapport with students.

Lowman's Two-Dimensional Model of Teaching

		INTERPERSONAL RAPPORT		
		Low	Moderate	High
INTELLECTUAL EXCITEMENT	High	6. Intellectual Authority	8. Exemplary Lecturer	9. Complete Exemplar
	Moderate	3. Adequate	5. Competent	7. Exemplary Facilitator
	Low	1.Inadequate	2. Marginal	4.Socratic

Figure 2. Lowman's two-dimensional categorization of teaching levels.[5]

The element of an engaging presentation derives from Lowman's dimension of intellectual excitement[4]. Delivering an engaging presentation begins with "the instructor's clear verbal and written communication"[4]. However, it does not end there. In order to truly engage the students, the instructor must be able to deliver the presentation by making use of other subtle tools at the disposal of the teacher, such as position in the classroom, gestures, and expression. These other subtleties convey increased importance for particular topics, or enable an instructor to insert physical demonstrations, drama, or suspense into a lesson. While one may think drama and suspense are better suited to the theater, having the ability to exploit those elements, particularly in engineering courses, through the use of non-verbal communication will improve student engagement. The second ExCEEd element requiring non-verbal communication, enthusiasm, also finds its roots in intellectual excitement. Enthusiasm involves "the simulation of positive emotion in students"[4]. An instructor who demonstrates a genuine passion for the lesson material is more likely to stimulate a reciprocal excitement from the students than one who is not passionate about their course. Similar to practical demonstrations with an engaging presentation, an enthusiastic instructor will find ways to add real-world applications to their enthusiasm. While this could certainly be a written vignette, the communication of the real-world applications is heightened by an instructor's ability to relay the information with the assistance of non-verbal cues. The final element that is extremely reliant on sharp communication skills is building positive rapport with students. This element is naturally derived from Lowman's dimension of interpersonal rapport. The teacher nurtures and develops this element through the course of the semester, or in some cases even longer if the student takes multiple courses from the same instructor. Positive rapport is established and reinforced at every interaction with the student, not just in the classroom. In a face-to-face environment, as opposed to distance learning, positive rapport is affected each time the student and teacher pass in the hallways, pass on the street, or see each other in non-classroom settings such as athletic events or extracurricular activities, such as ASCE club functions[4]. Often, the most powerful tools for building rapport with the students is how you approach them. For example; do you have a welcoming posture, do you greet them with a handshake and a smile, and do you display a warm and friendly demeanor? An instructor who often appears standoffish, avoids the student outside the classroom, hardly smiles, comes into the classroom at the last minute, or leaves as soon as they can may appear as "haughty, unapproachable, unconcerned, and unavailable"[4]. Three of the six elements of the ExCEEd Model are tied heavily into an instructor's ability to successfully communicate to the student using all means available, particularly their non-verbal communication skills. The absence of these tools in the distance learning environment means that even the gifted instructor would be severely handicapped and perhaps only hope to reach as high as a "competent instructor", as classified by Lowman's model.

In order to evaluate the alternative hypothesis that the ExCEEd Model cannot be executed with equal effectiveness without the non-verbal communication that takes place during face-to-face interaction, analysis of data from course end feedback, course end grades, and learning styles surveys is presented. The students taught by an instructor in the Department of Civil and Mechanical Engineering at the United States Military Academy (USMA) in the course Thermal-Fluids I compose both the control and experimental group. The control group students received face-to-face instruction at USMA in a traditional learning environment. The students taught through distance learning were the experimental group, though it should be carefully noted that this experiment entailed no changes whatsoever to the way in which this distance learning group was instructed, thus confining this study to post-course observation and data gathering only. The instructor is trained in teaching according to the ExCEEd Model, and employs that technique in his classes. The semester this experiment was executed was his third semester of teaching this course, and the second time he has taught a group of distance learners concurrent with the traditional students. The research goal of the experiment was to reject the null hypothesis:

> *The ExCEEd Model can be executed with equal effectiveness without the non-verbal communication that takes place during face-to-face interaction.*

The experimental group was composed of relatively high-performing students selected for either study abroad programs or service academy exchange programs. The students were located in the following places: the United States Air Force Academy in Colorado Springs, Colorado; the United States Naval Academy in Annapolis, Maryland; China; St. Cyr, in France; Austria; and Taiwan. To conduct this course, the instructor set up a blackboard-equivalent site through the Army Knowledge Online (AKO) site available to all Army personnel. Through this site, the instructor posted hard copies of course material distributed in class or through the standard class blackboard portal. Additionally, he posted webcasts of the course material. He used the Smart Technologies Notebook Program to record the lectures. The program transcribes what you draw on the tablet to a viewable version on the students' computers, and plays back audio recording of the lecture delivered as he drew on the tablet. Because the students had the opportunity to hear him talk through the lesson, the experimental group was able to benefit from the vocal component of communication, so the analysis of the experience for the experimental group is confined to the lack of non-verbal communication. In a few instances, the students in the experimental groups had additional questions for the instructor and received additional instruction through a variety of methods. Occasionally, the students still in the continental United States asked questions over the phone. One student still in the continental United States got a great deal of feedback through the use of text messaging. On one occasion, a student in China was able to set up a web conference to receive help through Gmail video conferencing. This was only a one-time occurrence though, as the students in China experienced connectivity problems (a persistent problem the authors have noticed with distance learners in China). Aside from these few variations, questions were dealt with using standard e-mail exchanges. Evaluations of the students – tests, quizzes, mid-term, and final examinations – were the same as the students in the control group. Each member of the experimental group had a proctor designated who would receive the test, quiz, or exam ahead of time. The experimental students each scheduled a time to take the test, quiz, or exam during the 48-hour period that the same evaluation was administered to the control students. The proctor administered the evaluation, then scanned the student's responses in and e-mailed them back to the instructor who printed them out and added them to the general population of students taking Thermal-Fluids. The experimental students were then graded by the same standards and at the same time as the remainder of all students taking the course that semester.

To reject the null hypothesis, the first comparison between the two groups is a simple analysis of the grades achieved by the students in both groups – based on the following scale: F = 0.00, D = 1.00, C- = 1.67, C = 2.00, C+ = 2.33, B- = 2.67, B = 3.00, B+ = 3.33, A- = 3.67, A = 4.00, A+ = 4.33. The incoming cumulative grade point average is compared to the final grade earned in the class by the students in each of the two groups. This provides rudimentary analysis of whether grades are an indicator of poor performance due to the conduct of the class.

To examine the students' experience in the class, and how it relates specifically to the ExCEEd Model, we look to the course end surveys as another method of comparison between the two groups of students. The standard questions used in the survey are listed in Table 1. The United States Military Academy (USMA) course-end feedback system is a series of questions, mainly making use of a Likert scale, with some short answer questions. For the purposes of this research, only the Likert scale-based questions are used. The Civil and Mechanical Engineering Department has used the United States Military Academy course-end feedback system for

Table 1: List of Questions from USMA Course-End Feedback System Used for Research

Question #	Question
1	This instructor encouraged students to be responsible for their own learning.
2	This instructor used effective techniques for learning, both in class and for out-of-class assignments.
3	My instructor cared about my learning in this course.
4	My instructor demonstrated respect for cadets as individuals.
5	My fellow students contributed to my learning in this course.
6	My motivation to learn and to continue learning has increased because of this course.
7	This instructor stimulated my thinking.
8	In this course, my critical thinking ability increased.
9	In this course, my instructor served as a professional role model for cadets.
10	My instructor demonstrated depth of knowledge in the subject matter.
11	My instructor demonstrated enthusiasm for teaching and for the subject matter.
12	My instructor had a structure or plan for every lesson's learning activities.
13	My instructor helped me to understand the importance and practical significance of this course.
14	My instructor used well-articulated learning objectives to guide my learning.
15	My instructor communicated effectively.
16	In this course, laboratory exercises contributed to my learning.
17	My instructor demonstrated positive expectations of the cadets in the class.
18	My instructor used visual images (pictures, demonstrations, models, diagrams, simulations, etc.) to enhance my learning.
19	My instructor gave me timely and accurate feedback on my learning progress.
20	In this course, the WPR's were fair and relevant. (WPR = Written Partial Review, also known as a mid-term examination)
21	Additional comments about the course or instructor
Scale: 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree	

decades, and it has been used to track trends in student learning and effectiveness of teaching. This system is used academy-wide, and receives a high rate of return for results. The academy uses questions 1-8 in Table 1 for all classes. The Department of Civil and Mechanical Engineering uses questions 9-20 in Table 1 for all classes it teaches. These questions are answered by students every semester for every class, so they were very familiar with the survey prior to submitting feedback. This lends reliability to the results because by their third year at USMA, they know going into the course that they will be asked to reflect on their experiences and have practiced doing this many times. The feedback is generated anonymously through a database with the students filling out the surveys at the end of the semester. The instructors may not access the results of the surveys until the system is closed to input and the grades are finalized. The instructors do not have access to the names associated with the feedback at any point. The students involved in the distance-learning program do not typically have the opportunity to fill out the survey. For those students, the experimental group, the survey was sent to them manually, completed by the cadets, and compiled. The names and associated results were not released to the instructor. The grades and results of the course-end feedback were analyzed for standard deviation and one-tailed z-test analysis. The results of this analysis provided the quantitative feedback for the research.

There are some intangible factors that this study did not have the capability to accurately analyze that might affect the student's ability to succeed in the distance-learning environment. For instance, the student's intrinsic motivation for learning might have a significant impact on their ability to succeed in the distance-learning environment, but that is a factor this study did not have the capability of measuring effectively. However, while this study does not account for their intrinsic motivation to learn, it does account for the students' possible predispositions for effective learning, a learning styles analysis was conducted for the distance-learning group. To further support rejecting the null hypothesis, the learning styles of the students in the experimental group were considered. The purpose of this analysis was to determine if the students in the experimental group were predisposed to learning styles that relied heavily on non-verbal communication, and were thus at a greater disadvantage. College students generally show a strong predisposition to those learning styles which rely heavily on non-verbal communication: sensing, active, and visual learning[6]. The experimental students took the North Carolina State Index of Learning Styles survey based on the Felder and Silverman Learning Styles Model[6]. The analysis of the quantitative results of the research, coupled with the qualitative understanding of the inherent need of the students for non-verbal communication, provide the basis for the results of the research.

Analysis

When considering the grades for the analysis, a comparison is presented graphically in Figure 3. To measure performance between the two groups, we look at the difference between the mean of the incoming cumulative grade point average for each student and the final grade the students attained in the class. For the control group, this is 3.242 – 3.222, or a delta of -0.02 points. This tells us that, on average, the control group performed slightly worse in this class than they

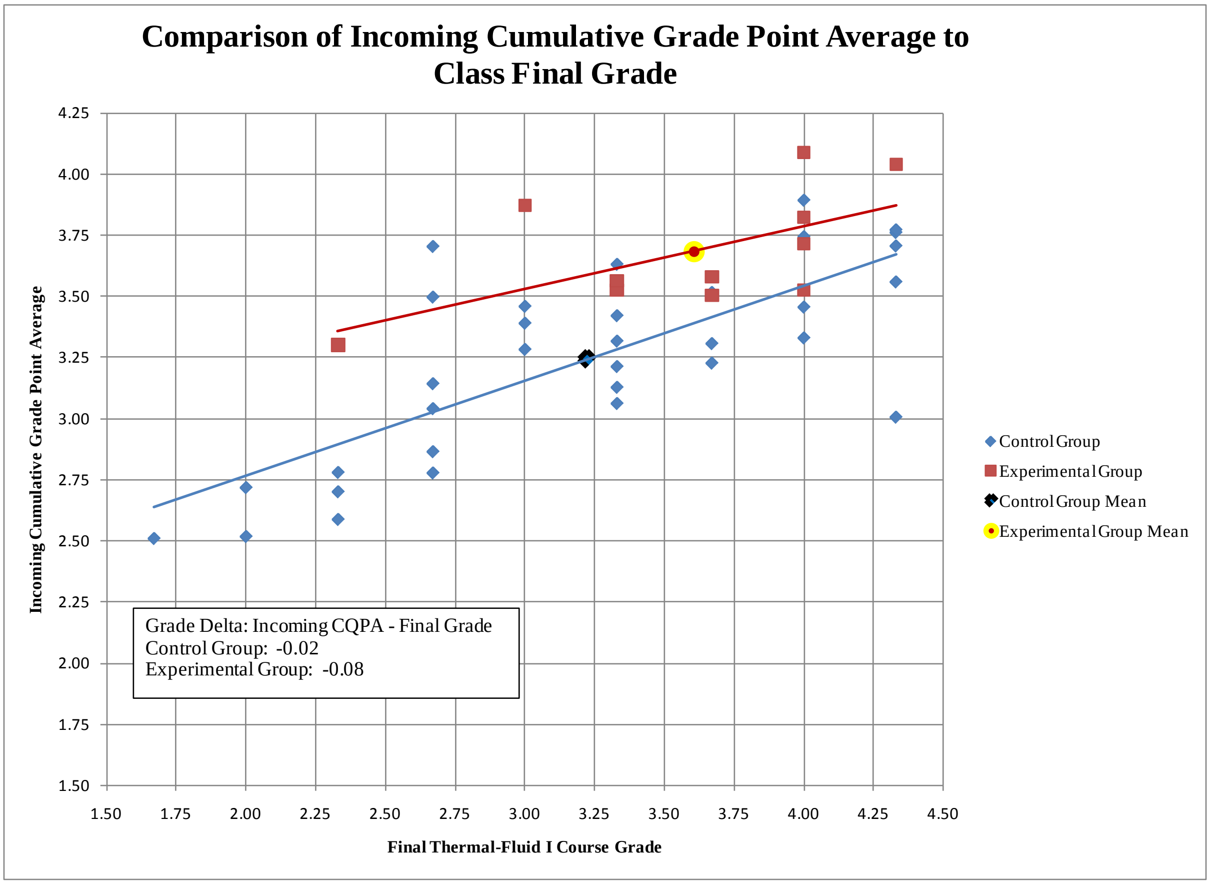

Figure 3. Comparison of Incoming Cumulative Grade Point Average to Final Class Grade

normally do. The delta for the experimental group is 3.685 – 3.605, or -0.08 points, which shows us that the experimental group also performed slightly worse in this course, on average, compared to their normal performance. However, we see from the deltas of the two groups, that the experimental group performed further below their typical level as compared to the control group. However, these results, based on the means of the average, imply no statistical significance to the difference in grades. This tells us that though the students may have been a bit disappointed, there is no statistical evidence to support the claims of the hypothesis.

The other measure for the comparative effectiveness of the control versus the experimental group

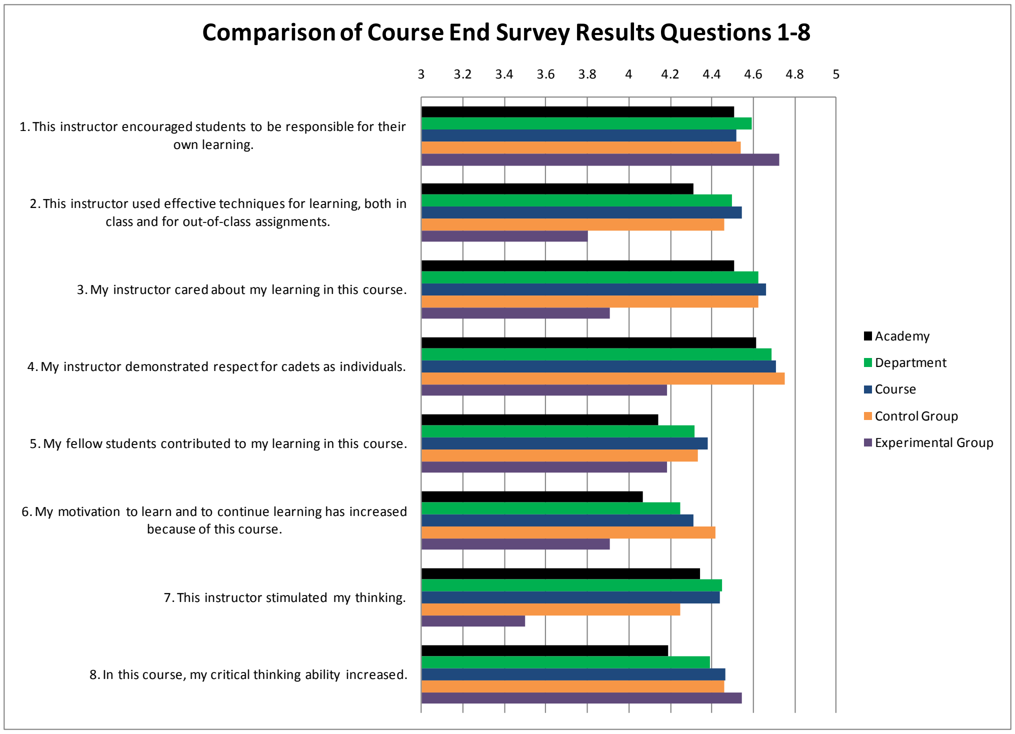

Figure 4. Comparison of Course End Survey Results Questions 1-8

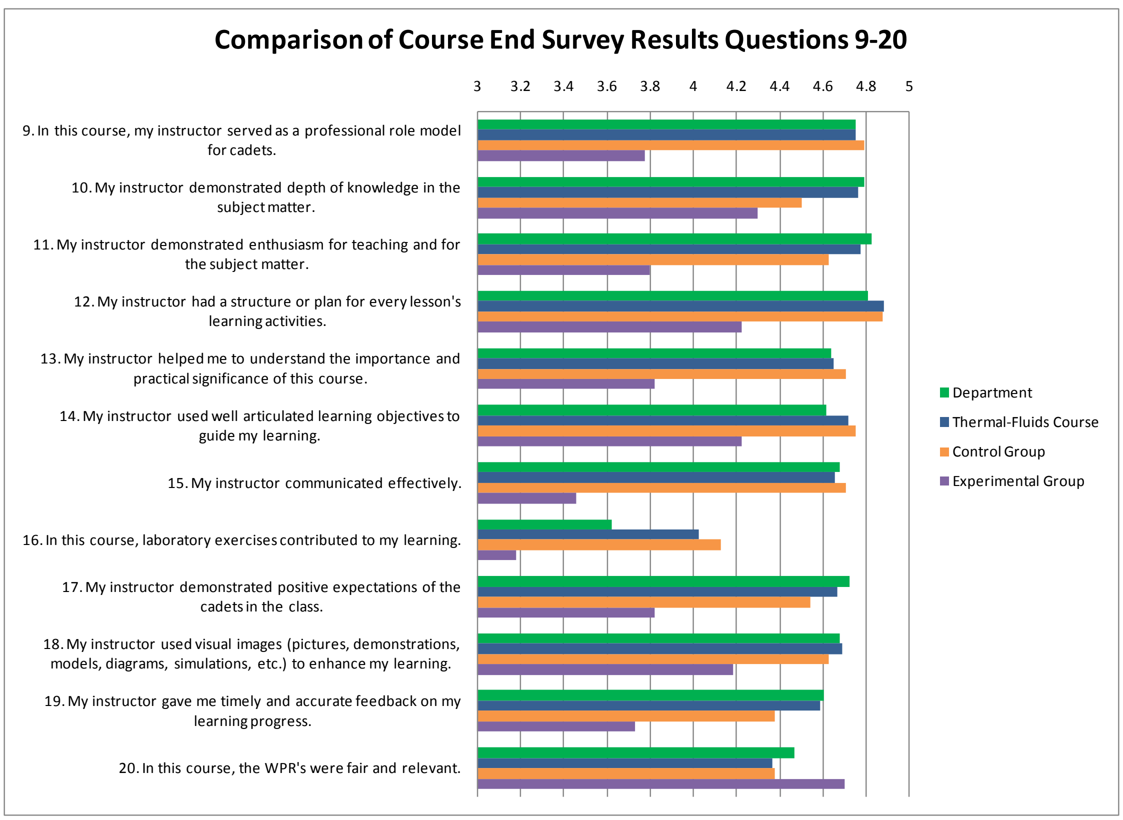

Figure 5. Comparison of Course End Survey Results Questions 9-20

is an analysis of the Course End Feedback data. Figures 4 and 5 provide a visual representation of the instructor's performance based on the course end feedback questions addressed in this research. However, to fully analyze the data collected in this research, a z-test comparison of selected questions that gave a clear picture of the instructor's ability to build interpersonal rapport and intellectual excitement was conducted. Of the questions listed in Table 1, the questions used in the analysis were 1-4, 7, 9-15, and 17-18. Of particular importance to the analysis was question 15 "My instructor communicated effectively," since that is most closely related to the hypothesis. In conducting the z-test analysis of the data, the aim is to reject the null hypothesis, which is again that the ExCEEd Model can be executed with equal effectiveness without the non-verbal communication that takes place during face-to-face interaction. A one-tailed analysis of the data was performed for rejection criteria. The z-values were calculated using the common equation:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_1}}} \qquad \text{(Equation 1)}$$

where $\bar{x}$ is the mean value of the data set, s is the standard deviation of the data set, and n is the population of the data set. Data set 1 contains the control group data, and data set 2 contains the experimental group's data. The minimum level of confidence the authors were willing to accept for rejecting the null hypothesis was 95%. Any confidence level below that was categorized as not rejecting the null hypothesis. Table 2 summarizes the rejection criteria for each of the questions. These data reject the null hypothesis with at least 95 percent confidence on all but six of the questions. Additionally, most of the questions that were rejected are not as critical for the rejection of the null hypothesis. For example, it is expected that the students would be encouraged to be responsible for their own learning, question 1, in a distance learning environment. The questions that lead most closely to building in Lowman's two-dimensions most strongly rejected the null hypothesis. At the highest levels of confidence, 98 and 99 percent, we see the rejection of the null hypothesis in the results of the statistical analysis of the data of some of the questions that typically give the strongest indicators of success for this instructor in the dimension of intellectual excitement – questions three, nine, and thirteen. Similarly, in the dimension of building interpersonal rapport, the analysis of the data with 98 and 99 percent confidence for questions nine and four allows us to reject the null hypothesis. Most importantly, the key to building both interpersonal rapport and intellectual excitement is the ability to communicate effectively. Question 15 clearly demonstrates a rejection of the null hypothesis based on collected data. In fact, question 15 rejected the null hypothesis with the highest z-value, and consequently the strongest level of confidence. Because the z-test analysis clearly rejects the null hypothesis based on the data collected, we see support for the alternative hypothesis emerge.

Table 2: Table of Z-Test Analysis of Course End Survey Data

QUESTIONS	Z-Values by question	REJECT/ NOT REJECT NULL HYPOTHESIS	CONFIDENCE LEVEL	ExCEEd Model Elements: Structured Organization	Engaging Presentation	Enthusiasm	Positive Rapport	Freaquent Assessment	Appropriate Technology Use
15. My instructor communicated effectively.	2.962	REJECT	99%		X	X	X	X	X
9. In this course, my instructor served as a professional role model for cadets.	2.711	REJECT	99%			X	X		
3. My instructor cared about my learning in this course.	2.586	REJECT	99%			X	X	X	
13. My instructor helped me to understand the importance and practical significance of this course.	2.409	REJECT	98%		X	X			
4. My instructor demonstrated respect for cadets as individuals.	2.331	REJECT	98%			X	X	X	
12. My instructor had a structure or plan for every lesson's learning activities.	2.281	REJECT	95%	X	X				X
17. My instructor demonstrated positive expectations of the cadets in the class.	2.265	REJECT	95%		X	X	X	X	
11. My instructor demonstrated enthusiasm for teaching and for the subject matter.	2.054	REJECT	95%	X	X	X			X
2. This instructor used effective techniques for learning, both in class and for out-of-class assignments.	1.955	NOT-REJECT	90%	X	X	X		X	X
14. My instructor used well articulated learning objectives to guide my learning.	1.770	NOT-REJECT	90%	X	X				X
18. My instructor used visual images (pictures, demonstrations, models, diagrams, simulations, etc.) to enhance my learning.	1.691	NOT-REJECT	90%	X	X				X
7. This instructor stimulated my thinking.	1.611	NOT-REJECT	80%		X	X			X
10. My instructor demonstrated depth of knowledge in the subject matter.	0.771	NOT-REJECT		X	X	X			
1. This instructor encouraged students to be responsible for their own learning.	-0.954	NOT-REJECT				X	X	X	

The alternative hypothesis is further supported by observing the predispositions of the students' learning styles. The students each took the learning styles survey based on Felder's Learning Styles Model. The experimental group's measured learning styles are summarized in Figure 6. We see from this figure that the students have strong dispositions for the learning styles that most heavily rely on non-verbal communication – sensing, active, and visual learning. Inspection of the figure reveals that while some of the students in the experimental group prefer learning through reflexive and intuitive means, the majority of the students involved in this study relied heavily on their ability to use sensing and active learning to absorb the material they were learning. Every student involved in this study had a predisposition to visual learning – most had a strong disposition to this style of learning. As there is a natural handicap to the use of sensing, active and visual learning in the distance learning environment, it follows that the experimental group was at a particular disadvantage in the class due to the nature of the environment.

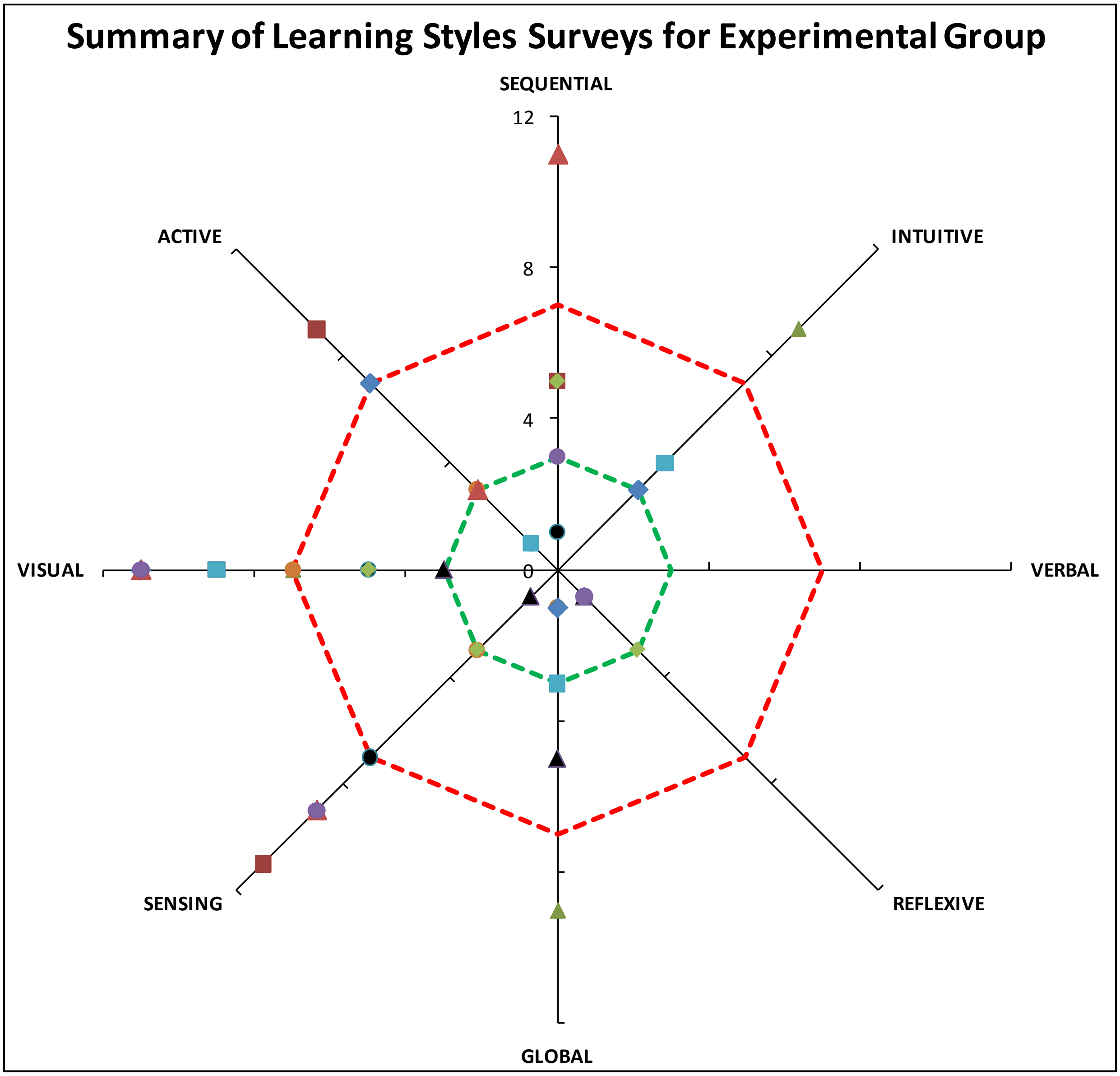

Figure 6. Summary of Learning Styles Surveys for Experimental Group.

Conclusion

Though the grades show a slightly diminished performance by the experimental students when considering just the difference in the incoming and achieved grades, there is not enough statistical evidence to support the alternative hypothesis. Additionally, poor performance alone does not prove the alternative hypothesis that this research set out to prove – that the ExCEEd Model cannot be executed with equal effectiveness without the non-verbal communication that takes place during face-to-face interaction.

However, the z-test analysis based on the end of course survey data clearly shows a diminished capacity of the instructor to develop intellectual excitement and interpersonal rapport with the students, which is necessary in executing the ExCEEd Model of teaching. This leaves the instructor with the expectation that they could likely only achieve a level of competence as an instructor – level five on Lowman's model. Instruction from a competent instructor is less than ideal, and lessens the ability of the students to learn and grow. While the onus for learning and performing is ultimately on the shoulders of the student, a good deal of this responsibility still falls on the instructor. If the student truly has a desire to learn and do well, as the incoming cumulative grade point average of the experimental group indicates, and the instructor is unable to perform at the "top of his/her game" due to the non-verbal constraints inherent in distance learning, then one can easily conjecture that distance learning is tying the hands of the students. The competent instructor can likely still provide a structured organization to the class, but clearly they will not have the ability to perform the other five elements of the ExCEEd Model – engaging presentation, enthusiasm, positive rapport with students, frequent assessment of student learning, and appropriate use of technology. An instructor who cannot successfully build intellectual excitement or interpersonal rapport cannot successfully execute the ExCEEd Model with equal effectiveness. The z-test analysis provides strong evidence to support the conjecture that the instructor's ability to develop interpersonal rapport and intellectual excitement was diminished with the experimental group. Thus, his ability to execute the ExCEEd Model with equal effectiveness was not possible.

Regarding the experimental students' predisposition to having active, sensing, and visual learning styles, these are learning styles that naturally lend themselves to the ExCEEd model of teaching. Using technology, having an engaging presentation, building positive rapport, and frequent assessment of student learning (particularly through the instructor's perception of the student's non-verbal cues) cater to the sensing, active, and visual learning styles. As is evidenced by the course end feedback survey, the instructor was again at a significant disadvantage in his ability to utilize these elements of the ExCEEd Model. The students' predisposition to learning by taking advantage of these elements of the ExCEEd Model clearly furthers the alternative hypothesis that the ExCEED Model cannot be executed as effectively in a distance learning environment.

In conclusion, when considered separately, none of this data supports or debunks the alternative hypothesis purported by this research. However, when considered collectively, one cannot ignore that the predispositions of the students, coupled with the handicaps to the instructor's ability to execute the ExCEEd Model based on the lack of non-verbal communication in a distance learning environment, supports the alternative hypothesis. The authors thus conclude that the ExCEEd Model cannot be executed with equal effectiveness in the absence of the non-verbal communication that takes place during face-to-face interaction.

References

1. Miller, P. W. (2005). *Body Language: An Illustrated Introduction for Teacher,* Patrick W. Miller and Associates, Munster,IN.
2. Pease, A.,and Pease, B. (2006). *The Definitive Book of Body Language*, Bantam Books, New York, NY.
3. Hartley, G, and Karinch, M. (2007). *I Can Read You Like a Book: How to Spot the Messages and Emotions People are Really Sending With Their Body Language*, Career Press, Franklin Lakes, NJ.
4. Estes, A. C., Welch, R. W., and Ressler, S. J. (2005). "Teaching Lessons Learned: The ExCEEd Teaching Model." *Journal of Professional Issues in Engineering Education and Practice*., 131(4), 218-222.
5. Lowman, J. (1995). *Mastering the Techniques of Teaching*, 2nd Edition, Jossey-Bass, San Francisco, CA.
6. Felder, R. M., Silverman, L. K. (1988). "Learning and Teaching Styles in Engineering Education." *Engineering Education*., 78(7), 674-681.