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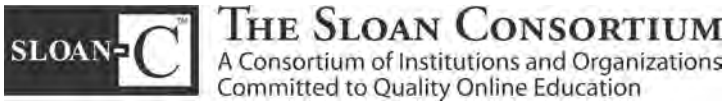

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USING ASYNCHRONOUS AUDIO FEEDBACK TO ENHANCE TEACHING PRESENCE AND STUDENTS' SENSE OF COMMUNITY

Philip Ice
Department of Middle, Secondary and K–12 Education
College of Education, University of North Carolina Charlotte

Reagan Curtis
Department of Technology, Learning, and Culture
College of Human Resources and Education, West Virginia University

Perry Phillips
Department of Curriculum & Instruction / Literacy Studies
College of Human Resources and Education, West Virginia University

John Wells
Department of Teaching and Learning
School of Education, Virginia Polytechnic Institute and State University (Virginia Tech)

ABSTRACT

This paper reports the findings of a case study in which audio feedback replaced text-based feedback in asynchronous courses. Previous research has demonstrated that participants in online courses can build effective learning communities through text based communication alone. Similarly, it has been demonstrated that instructors for online courses can adequately project immediacy behaviors using text-based communication. However, we believed that the inclusion of an auditory element might strengthen both the sense of community and the instructor's ability to affect more personalized communication with students. Over the course of one semester, students in this study received a mixture of asynchronous audio and text-based feedback. Our findings revealed extremely high student satisfaction with embedded asynchronous audio feedback as compared to asynchronous text only feedback. Four themes, which accounted for this preference, were culled out in an iterative, inductive analysis of interview data: 1. Audio feedback was perceived to be more effective than text-based feedback for conveying nuance; 2. Audio feedback was associated with feelings of increased involvement and enhanced learning community interactions; 3. Audio feedback was associated with increased retention of content; and 4. Audio feedback was associated with the perception that the instructor cared more about the student. Document analysis revealed that students were three times more likely to apply content for which audio commenting was provided in class projects than was the case for content for which text based commenting was provided. Audio commenting was also found to significantly increase the level at which students applied such content. Implications of this case study and directions for future research are addressed in the discussion and conclusions section of this paper.

KEYWORDS

Online Learning, Personalized Communication, Student Satisfaction, Embedded Asynchronous Audio Feedback, Nuance, Retention of Content, Instructor Caring

I. INTRODUCTION

As the number of online courses continues to expand, so must the ways in which instructors engage in active facilitation of learning among their students. This study focuses on one aspect of facilitation, the way in which we communicate and guide students in asynchronous learning networks (ALN) and how this process might be improved upon.

While the evolution of ALN has made it increasingly easier to involve remotely based students in two-way communications [1] and enable students to process more complex information [2], instructors are often required to adapt to new roles [3]. While several frameworks have been developed to explain the role of the instructor [3, 4, 5], a system first proposed by Berge [6] and later refined by others [7] proposes a four part model consisting of pedagogical, social, technical, and managerial dimensions, each with a varying number of roles. For purposes of this study, the social dimension and three roles (profession-inspirer, feedback-giver, and interaction-facilitator) within the pedagogical dimension are considered the most important. These are depicted in the following table which was derived from work by Liu and colleagues [2].

Dimensions	Roles	Description of Roles
Pedagogical	Profession-inspirer	Promote professional dialogue among online learners; relate personal experiences and cases to the discipline; point to professional organizations.
	Feedback-giver	Provide timely and high quality feedback; provide formative feedback for continuous learning engagement.
	Interaction-facilitator	Facilitate peer interaction in online discussion through a wide range of facilitation strategies.
Social	Social rapport builder	Build social rapport; establish online teams; build online learning community.

Table 1. Select Roles of Online Instructors

In the traditional face-to-face classroom setting, each of these roles would be dependent upon both verbal and non-verbal cues. In the online environment, however, the primary form of communication is via text and therefore devoid of traditional paralinguistic cues [2]. Arbaugh [8] suggests that the relative low richness of text-based communication may make interdependent, ambiguous tasks particularly challenging.

Critics of online learning, building on the low richness of text-based communication, contend that because interactions occur in a disembodied form, this lack of nuance leads to a loss of meaning [9, 10, 11, 12]. As such, it is argued that asynchronous learning is not sufficiently rich in the socially mediated practice that Vygotsky [13] described as necessary to construct knowledge. However, this narrow interpretation of Vygotsky discounts the ability of learners to conceptualize "being" as anything other than a physical construct.

The ability to project oneself through various media, termed social presence, was initially described by Short, Williams and Christie [14] who proposed that, as critics of asynchronous learning contend, the ability to project verbal and nonverbal information directly impacted the degree to which presence was perceived. However, Rourke, Anderson, Garrison and Archer [15] and Swan [16] argued that this may not be the case as learners in online courses appeared to build effective learning communities by projecting their personalities through text alone.

Lombard and Dutton [17] viewed this creation of a presence in online courses as the ability to project oneself into a virtual. In an extension of this concept, Laffey, Lin and Lin [18] described the social element of asynchronous communication evolving as learners come to view their interactions with tasks and tools as being a fluid, integrated process rather than as a series of tasks. They compared this process to a speaker interacting with others in a foreign language. The more fluent the speaker becomes with the new language the less difficult interactions become. Theoretically, this would mean that the technologies become part of the interaction itself and are therefore not viewed as objects upon which learners have to act to create virtual embodiments [19].

Gunawardena and Zittle [20] found that the sense of "being there" was established in the online environment through providing and interpreting emoticons as a replacement for nuance and nonverbal cues. Using a 14-item questionnaire, they found 60% of the variance in student satisfaction was attributable to perceptions of social comfort and presence. Rovai [21] explained that this type of satisfaction can occur when text based, socio-emotional-driven interactions promote a sense of connectedness among learners in asynchronous learning networks (ALN).

Richardson and Swan [22] used regression analyses to determine the relationship between perceived social presence and perceived learning. Analysis of data collected from 17 courses revealed that 46% of the variability in perceived learning could be predicted by student perceptions of social presence. However, the study also revealed that an even stronger relation ($R^2 = 0.53$) existed between perceived learning and overall satisfaction with the instructor. This finding indicated that satisfaction with the instructor was at least as important as was perceived social presence. Further, the authors found that a strong relation ($R^2 = 0.36$) existed between students' perceptions of social presence and satisfaction with the instructor. Based on these findings it was concluded that "students' perceptions of social presence were related to the perceptions of their instructors as having a satisfactory online presence in terms of amount of interaction and/or quality of that interaction."

Through factor analysis, Arbaugh [23] found instructor immediacy behaviors in online courses were a significant predictor of student learning. Based on Gorham's [24] verbal immediacy scale, Arbaugh defined immediacy behaviors as being comprised of two parts. The first, classroom demeanor, "reflected the instructor's use of personal examples, humor, and openness toward and encouragement of student ideas and discussion." The second, name recognition, referred to the "extent to which the instructor was addressed by name by the students and vice versa."

A. Instructional Design Features that Foster Community

Informed by the studies previously discussed, we have been improving on our design of ALN instruction to facilitate meaningful discourse and create dynamic learning environments. Specifically, in our courses over the past six semesters, we have attempted to incorporate recommendations found in the literature related to the projection of teaching presence through immediacy behaviors. Surveys of student satisfaction from these courses indicated that students were generally highly satisfied with our efforts and students' qualitative feedback, when provided, typically made us believe we were doing a good job of

creating a rich learning environment. However, even if social presence is strong, student may prefer even more interactive communication [25, 26], and we question whether greater interaction might also apply to the projection of teaching presence. Arbaugh [8] found media variety to be positively associated with perceived learning among students in web-based MBA courses. In a review of the literature, Liaw and Haung [27] suggested that presentation of web-based course content through a variety of media positively impacted learner experiences.

Ideally, we would have liked to have used an asynchronous videoconferencing mechanism similar to that envisioned by Watt, Walther and Nowak [28]. Extending work by Walther and Burgoon [29], Watt and colleagues wrote that such a system would take full advantage of both verbal and nonverbal cues thereby increasing copresence; "the sense that one is actively being perceived and that one is actively perceiving another [28]." However, based on previous student surveys we knew that approximately one third of our students were likely to be taking classes via dialup connections, making the use of streaming video impractical. Thus, the only feasible alternative available to us was the use of asynchronous audio.

Research on the use of stand alone audio in ALN, especially audio feedback, is rather limited. The study that provided us with the most insight as to how audio feedback might be perceived by students was conducted by Jelfs and Whitelock [30]. These researchers created a virtual environment in which various navigational techniques were used. All of the participants indicated in follow-up interviews that the preprogrammed auditory feedback was as important to their success and satisfaction with the environment as was ease of navigation. Significantly, these two factors were considered to be even more important than interactivity or previous experience.

B. Use of Audio Feedback

Use of audio commenting in the face-to-face classroom can be traced to at least 1982, when Olson [31] reported using the technique in English courses at a two year college. In a discussion of the technique, Olson opined that his students believed audio commenting reflected a sense of caring on the part of the instructor that extended beyond their written products. The ability to project through tone of voice, he argued, enabled the instructor "to be more supportive and caring."

Building on Olson's work, Mellen and Summers [32] provided students in an English course with tapes containing audio feedback and conducted surveys and interviews at the end of the semester. Results demonstrated that students were likely to view audio feedback as being positive regardless of the context. Additionally, 70% of students reported that they felt encouraged to revise their work as a result of receiving auditory feedback and 54% felt more confident about their writing. These findings provide strong, highly positive indicators of student perceptions regarding the use of audio feedback and point to its potential as a tool in asynchronous online courses.

In a study of student-student audio based interactions in ALN, Kim [33] found that students had generally positive perceptions of the medium, but that its use decreased motivation. However, audio did increase social presence, a finding that supported earlier research in which Reeves and Nass [34] concluded that human voice increased social presence. In a seeming contradiction, Bargeron and colleagues [34] found that students preferred to use text rather than audio in threaded discussions because they found it easier and quicker to read text messages than listen to audio.

However, the sample size in the study conducted by Bargeron and colleagues [35] was small with only 4 of the 6 total participants indicating a preference for text based feedback. We conducted a pilot study

asking 83 of our students to complete a survey regarding the relative time required to utilize text based versus audio feedback. We found that 28 students believed it took longer to listen to audio feedback than to read text-based feedback, 35 believed the time required was approximately the same, and 20 believed it took less time to listen to audio feedback. In addition, after answering questions about the time required to listen to audio feedback, 6 students emailed the instructor wishing to clarify their answers. The following is representative of the emails received:

> I just finished answering some questions about the time it took to listen to comments or read comments. My answer was that it took longer. However, I wanted to clarify that a little. It took longer because I replayed the comments a couple of times so I could really see what was being said as it related to my work and get more out of it. I don't do this when the comments are written because I don't think they are as good.

Based on these findings, we concluded that the difference in time required to listen to audio feedback versus reading text-based feedback was not a significant factor in deciding whether the technique should be used. In fact, based on the supplemental feedback, there was reason to believe that even though some students perceived audio feedback to be more time consuming, they still preferred it because they believed they got more out of it. Clearly, more research is needed in this area to explore students' perceptions related to each type of feedback.

The research clearly shows connections between perceived learning, perceptions of social presence, instructor satisfaction, and immediacy behaviors in building a sense of community among ALN learners. Yet to be established, however, is the extent to which auditory feedback might further enhance teaching presence and therefore build a stronger student sense of community.

II. METHOD

From spring 2004 through summer 2005, we served as instructors in seven asynchronous online courses. Despite being highly satisfied with the experiences and believing that our students had significant learning experiences, we wondered if we had done all we could to make our relationships with students as personal as possible given the constraints of the medium. While we disagree with those who view online learning as detached and impersonal [36, 37], we were concerned about our ability to adequately convey nuance in a manner similar to that which occurs in face-to-face classrooms. This concern prompted our research to better understand the nature of audio feedback in an asynchronous learning network. Specifically, in this study we sought to answer the following set of research questions (RQ):

- RQ 1: Between audio and text-based student feedback in ALN, which do students believe is a more effective means of interaction with their instructor?
- RQ 2: To what degree do students believe audio feedback is an effective replacement of instructor/student interaction that typically occurs in traditional face-to-face classes?
- RQ 3: How does the use of audio feedback impact the sense of community in ALN?
- RQ 4: In what manner is perceived learning impacted by the use of audio feedback?
- RQ 5: What relationship exists between the use of audio feedback and student satisfaction?

A. Instructional Setting

Curriculum and Instruction 687, Advanced Teaching Strategies, was the course through which this study was conducted. Prior to this study, C&I 687 had been offered completely online for three consecutive semesters.

Structurally, C&I 687 consisted of ten learning units in which students explored and evaluated advanced teaching concepts and strategies. In the first unit, students were introduced to the philosophical foundations of constructivist teaching and asked to evaluate a series of readings with respect to their personal experiences in the classroom. In seven of the remaining units, students were introduced to eight teaching strategies (concept attainment, inductive learning, cooperative learning, synectics, direct instruction, mnemonics and classroom discussion) through readings that addressed methodology, through text and video based case study analysis and through discussion postings in which students were asked to apply the various models to content area lesson plans of their choice. Students then evaluated each other's postings and refined lesson plan strategies based on the communal knowledge constructs that emerged.

One of the two remaining units was a mid-term assessment activity where students selected two video-based classroom vignettes and conducted an evaluative case study for which they identified the teaching strategies employed, explained the usage rationale and suggested how the teacher might have improved the manner in which their students acquired knowledge. The final unit consisted of two parts: part 1 consisted of six reflective activities in which students were asked to evaluate how praxis might be impacted by contemporary and emerging societal and technical issues; the second part of the final unit required groups of students to develop a series of thematic, interdisciplinary lesson plans in which strategies explored during the semester were utilized. These plans required that students use a minimum of three teaching strategies explored during the semester. After all projects were submitted, students were expected to evaluate plans submitted by other groups and suggest revisions.

The course was a major elective for both master's and doctoral level students in the Curriculum and Instruction program. The course had no prerequisites and was taken at various times during students' plan of study.

In previous years when this course was taught, feedback was provided to students in two ways. In the first, the instructor would interact with the students' text based postings on the discussion board using Socratic questioning to enhance and expand upon various threads that emerged. Additional group feedback was provided at the conclusion of each thread. In the second, the instructor would provide individualized text based feedback via email to students on each discussion topic or submission.

B. Use of Audio Commenting Within the Instructional Setting

In addition to utilizing approaches to text-based feedback from previous years, we incorporated audio commenting in this iteration of the course. When posting audio comments to the discussion board, in emails to the entire class, or to small groups, the instructors produced wav files using Audacity freeware. The files were then added to the discussion board or email as attachments.

In the case of individualized feedback, the instructors selected various discussion posts made by a student, copied them to a Word document, inserted comments and sent the document back to the student via course email. This type of individualized commenting was also used for the midterm case studies, final reflections and the group project.

We provided approximately half of the individualized feedback in a text-based format and the other half via audio. At the end of the course all students had received six documents in which text feedback was used and five in which audio feedback was used. To avoid the introduction of bias, prior to the beginning of the semester each assignment was given a number from one to 12. These numbers were then entered into excel and randomized. From this list, we assigned alternating text-based or audio feedback as the

modality that would be used.

On the discussion board, we engaged in Socratic questioning as in previous semesters. At the end of the semester, the discussion board contained a total of 1471 postings and replies. Of these, 203 were Socratic-type questions that we posed to students on an individual basis. In addition, we provided another 59 postings that took the form of group feedback: 31 of these were text-based and 28 used audio.

Technically, the audio feedback was produced by first copying select discussion board postings into a Word document or opening a Word document in which students had submitted individual assignments. The Word document was then converted into a PDF document using Adobe Acrobat Pro 7. Once in this format, the instructor used the Record Audio Comment tool within the Comment and Markup option. Depending on a host of factors, including length, number of topics discussed and quality of the work submitted, the instructor placed varying numbers of audio files within the document, as well as a summary statement at the end of each document. The audio feedback was spontaneous in nature, as it was intended to replicate the non-scripted verbal interactions that occur in F2F environments.

In the instances where students received text feedback, it was in the form of a PDF document using the Note Tool selected from the Comment and Markup option. Text comments were placed at various points throughout the document and at the end, in a fashion mirroring that used in the audio feedback. The same document format and comment placement strategies were used to ensure that any difference in perceptions of the commenting modality would not be influenced by these extraneous variables.

To determine what impact using audio commenting had on time required to provide feedback, we maintained a log of the amount of time required to provide both text-based and audio feedback. During the analysis of data, we also compared the volume of audio and text based feedback that was provided to students.

C. Participants

West Virginia University's Institutional Review Board approved the protocol for this study to ensure ethical treatment of all participants. For the semester in which this study occurred, enrollment consisted of 26 master's level students and 8 doctoral students. Of the 26 master's students, 17 were practicing teachers and 9 pre-service teachers. Geographically, 29 of the students who took the course were located in West Virginia, 3 were located in Maryland, 1 in Alabama and 1 was on military deployment in Djibouti.

An email was sent to all students during the last week of the course asking for volunteers to participate in post-course interviews. Seven doctoral students, 15 master's level practicing teachers and 5 master's level pre-service teachers volunteered to participate.

D. Design

A nested mixed methods design with both concurrent and sequential components was implemented [38]. We gave priority to the qualitative components nesting quantitative data within them in order to enrich our description of participants' perceptions related to audio feedback [39]. Three separate sets of data were originally planned for triangulation during data analysis and interpretation: end of course survey data, post-course interview data and final projects. Unsolicited qualitative feedback generated throughout the semester, though not originally part of the research design, was added as a data set because it

contained rich and compelling data that could not be ignored. The end of course survey data included both qualitative and quantitative components collected concurrently with the final project data. Interview data gathered sequentially allowed us to follow up on themes generated from the end of course survey results.

We selected a mixed methods research design for our work, and being guided by a "pragmatic approach" or paradigm [40] we sought to capitalize on the strengths of both quantitative and qualitative approaches to data collection. This clearly required following established criteria for generating high quality quantitative and qualitative data. While criteria for judging the quality of quantitative studies are well established, there is less agreement regarding what quality criteria are applicable to qualitative research [41, 42]. Searle [43] argued that triangulation of data sources aimed at enriching understanding through and of multiple perspectives should be the central criteria by which qualitative research is judged. Taking his point, we included multiple forms of qualitative data (survey, interview, and document), blended with quantitative (survey) and quantified (document) data, and analyzed these using strategies designed to achieve triangulation.

1. Unsolicited Feedback

During the semester, 14 students sent a total of 16 unsolicited emails to the instructor related to the use of audio feedback. The rich data in these emails provided early insight into how students perceived the modality, as well as technical difficulties that a small number of students were experiencing. The emails were coded and categorized based on thematic similarities that emerged in cross case analyses. Although this was not data originally designed into the study, this unanticipated feedback clearly added to our understanding of students' perceptions of audio feedback. Capitalizing on the emergent nature of qualitative inquiry, this data set was included as an extra point of validation in the triangulation process.

2. End of Course Survey Data

At the end of the course, students were asked to complete a survey to assess satisfaction and perceived learning. The survey consisted of 52 items. The first 50, derived from instruments previously developed by Spencer and Thompson [44, 45], addressed student satisfaction with course design, perceived learning and sense of community. Two additional items related specifically to the use of audio feedback were added: 1) a Likert-type scale item addressing student perceptions of the relative effectiveness of audio versus text-based feedback, and 2) an open-ended item soliciting additional comments relative to audio feedback. The Likert-type item was analyzed using descriptive statistics. Responses to the open ended item were coded and thematically categorized using cross case analysis. This analysis then informed the semi-structured post course interview protocols.

To guard against a novelty effect, as is often seen in student satisfaction with online courses [15, 46], we continued to collect data from other courses in which the instructors used audio feedback. This quantitative data consisted of responses to two questions. In the first, "I prefer audio feedback to text-based feedback," students were asked to respond on a five point Likert-type scale with choices ranging from Strongly Disagree to Strongly Agree. The second question asked students how many courses they had previously taken in which audio commenting was used (0, 1, 2, 3, or more than 3).

3. Post Course Semi-structured Individual Interviews

Of the 34 students enrolled in the course, 27 volunteered to participate in post course interviews. These semi-structured interviews were conducted during the two weeks following the end of the semester. During interviews, individual students were asked their impression of both the course and each type of feedback using an interview protocol guide (see Appendix A) developed following principles described

by Berg [47] and Patton [48]. Two interviewers were involved in the process to ensure consistency. In-depth probing of responses was conducted on an individualized basis to draw out more detailed data related to why students perceived audio feedback to be more or less effective, as well as how it may have altered their perceptions of what it meant to be a participant in an asynchronous learning network. Interviews lasted approximately 50 minutes and were audio taped using a portable mp3 recorder. After all interviews were complete, transcriptions were generated for coding. The transcribed interview texts were analyzed following suggestions by both Strauss [49] and Tesch [50] using an interpretive, iterative approach with emphasis placed on drawing out thematic strands. Because of the data richness, both within and cross case analyses were utilized to more fully represent what occurred at both the individual level and as part of a group dynamic.

To guard against a novelty effect, check for consistency in themes, and detect new themes, a total of 51 students were randomly selected from 17 courses in which the instructor had used audio commenting since the completion of the original study. These students were emailed a questionnaire (Appendix C) in which they were asked to reply to a series of open ended questions. The questionnaire was derived from the interview protocol used to conduct the post-course interviews (Appendix A). Using an iterative, interpretive process, themes were drawn out in the same manner used for transcribing the original interviews.

4. Final Project Document Analysis

The final project for this course required groups of students to develop a series of thematic, interdisciplinary lesson plans that utilized a minimum of three strategies explored during the semester. Document analysis of final projects was conducted by first coding for the types of strategies students chose to use for lesson plan design and then categorizing based on the type of instructor feedback (text versus audio) used when students studied these strategies earlier in the course. The incidences of the various categories were quantified and descriptive statistics calculated to explore how feedback modality might have impacted content usage.

The final projects were then recoded to determine the level of Bloom's taxonomy [51] applied to each strategy. In this process, the lesson plans students developed were decompressed and individual activities evaluated using a rubric derived from Slavin's [52] application of Bloom's taxonomy to pedagogy (see Appendix B). Coded documents were reviewed by two researchers to ensure consistency. The reviewers unanimously agreed on the coding. The results were presented using descriptive statistics to determine if audio feedback impacted the level at which content was used.

5. Triangulation

After analyzing each data set in the manner described above, open coding was used to isolate prevalent themes followed by negative case analysis to explore consistency across data sources [53]. First, the results of the quantitative end of course survey question were compared with the findings from the post course interviews and unsolicited feedback for additional confirmation. Next, the findings from analyzing the qualitative question in the end of course survey were crosschecked with the interview data and unsolicited feedback. The end of course survey did not address content retention and so could not be crosschecked with the document analysis. Usage frequency and level counts derived from document analysis were checked for consistency with interview data focused on content retention. The interpretive conclusions from triangulation analyses were then compared to what is known about corresponding elements in learning theory and social presence literature to develop grounded theory that could be applied to future research.

III. RESULTS OF THE STUDY

This study was originally designed with three data sources: end of course survey data, semi-structured interviews and document analysis. However, data rich material in the form of unsolicited feedback from students was included as we found it to lend significant insight into what students thought at the time they were actually receiving the audio feedback. In addition, these unsolicited emails allowed us to refine some of the potential probing areas in the interview guide. Results of analyzing each data source separately are provided below. Triangulation, observations and conclusions follow in section IV.

A. Unsolicited Feedback

Fourteen students in the course sent a total of 16 unsolicited emails regarding the use of audio feedback. In 14 of these, 11 of which were sent within three days of the initial use of audio feedback, students wrote to express a high degree of satisfaction with the modality. The remaining two emails were related to technical problems with getting the audio files to play. No unsolicited emails expressing negative sentiments about the use of audio were received.

The following is typical of the unsolicited emails:

> It is very rewarding and helpful to HEAR your comments. Now I understand more about what you are trying to say than I did with the last set of feedback we got. Thanks!

In an email received about three weeks after audio commenting was first used a student offered the following:

> We've had written comments twice and verbal comments twice now. Let me guess—this is someone's research project right? Let me just save you some time. The verbal feedback is much, much, much better than the written. I said the same thing when I talked to you on campus last month. So can you just send me the voice comments from here on out, say there is no comparison between the two at all and nix the written stuff? That's probably not going to happen, but I thought it was worth a shot!

B. End of Course Survey Data

The end of course survey (response rate = 91%) included two audio feedback specific items: one quantitative Likert-type item and one qualitative open-ended item. For the quantitative item, 26 of 31 respondents indicated that they believed audio feedback was more effective than written feedback. Four believed there was no difference between the two modalities and one responded with a N/A. The N/A response was explained in the qualitative item as described below.

When asked for additional comment related to the use of audio feedback, 11 students responded. Of these responses, 10 were highly positive and cited audio feedback as a primary reason for being satisfied with the course.

> I usually find online classes rather boring. That was not the case here. It was definitely because of the way the instructor communicated with us using the audio PDF's. That approach made me interested for the first time in what was happening in an online class. I didn't feel like I was just jumping through the hoops when I got to hear the comments on my work.

No students provided negative comments related to the audio feedback. The response not categorized as positive addressed technical problems, clarifying the single N/A response to the quantitative item.

> I would definitely take an online course again, but I hope I can get this audio thing worked out if that is the way we will get comments in other courses. Even after working with tech support I never could get the files to play on my home computer. I did get them to play at work though. Because of this issue I didn't believe I could answer the question on audio commenting in the way it was intended and therefore said it was not applicable.

After the course was over, this student contacted us regarding her technical problems. It was discovered that a broken sound card in her home computer was at fault.

The survey data collected from other courses to address a potential novelty effect resulted in a 68% response rate. Of the 312 respondents, the mean number of previous courses with audio commenting was 1.31 (SD = 1.29) with 99 students having at least two previous courses utilizing this feedback modality. Responses to "I prefer audio feedback to text-based feedback" averaged 4.46 (SD = 0.78) corresponding with halfway between strongly agree and agree. In fact, only 9 students out of 312 strongly disagreed or disagreed with the statement. Directly addressing any potential novelty effect, there was no significant relation between the number of courses students had experienced with audio commenting and their relative preference for that feedback method (Spearman $r_s = .07$, $n = 312$, *ns*).

C. Semi-Structured Interviews

Students indicated that they preferred audio feedback to written feedback in 25 of the 27 interviews. One student had no preference and one preferred written feedback. From the 25 students who preferred audio feedback, four general themes emerged: 1) increased ability to understand nuances that might be lost in written communication, 2) feeling more involved in the course, 3) improved retention of content and 4) a belief that the instructor cared more about the student's learning. The mean number of themes expressed per interviewee was 2.28 (SD = 0.79).

1. Ability to Understand Nuance

The most frequently expressed theme (n = 19) was the ability to detect nuance and inflection in the audio commenting. In general, students believed that verbal feedback gave them increased insight into what the instructor was attempting to convey and that it produced a more comfortable, less formal learning environment.

This perspective is best illustrated by one student who said:

> I have taken a couple of online classes and every time I would get these notes or critiques or comments back from the instructor and I would be wondering exactly what they were trying to say. I mean, I would understand what they were saying but not the way they were trying to say it. Sometimes you would wonder if they were agreeing with you or trying to figure out how to politely say you had it all wrong.
>
> Now, when I first heard the audio feedback I was like wow! I get what he is saying to me. It was all in your voice and I understood when you were saying something like well this is good, but……
>
> I understood then that you really liked what I was doing but were trying to tell me to add a little more, but in a good way. Now, in the first time we got feedback it was written and you said some things that were kind of the same but I thought you were really trying to bust me for not doing a good enough, you know, job. Then I looked at my grade and it was good so I couldn't understand exactly what you

were thinking.

Was my work not so good and you just gave me a decent grade? Or was it ok and I just didn't understand what [was being] said to me. When I heard you say something similar though the whole thing made sense.

One student, who had some online teaching experience, took an analytical approach to introspection as revealed by the following:

To answer what I think about this I need to tell you what I did. I've taught one online class for my department… well two if you count the one I am just finishing, so obviously I was fascinated when I got the first audio files along with my work. But I didn't want to just jump on it because it was something new. What I did was sit down and transcribe what you sent over and then I looked at it. I looked at it and listened to the files again and kept doing this for a while. What I realized was that its two completely different things.

I know you were saying the same things in your [audio files] and in what I transcribed, but the difference was you were saying them. When I looked at the transcription there was no stress placed on any of the words or sentences. Then I tried putting the stress there by adding in caps or exclamation marks and I wondered if I would have thought that you might have been yelling or something if I would have read it that way. What I figured out was that there is really no way that you could have gotten the same info across the same way.

This all made me think about the way my students have perceived me in courses when I write to them with comments. It's not the same is it? No, it's really not. We lose so much in the written word sometimes and I think maybe we haven't thought about that enough in our online teaching. [Online courses] are going to become ever more, uhm, you know, prevalent for all types of learners and I think we really need to figure out the best way to get our intent across. I think this is probably a really good first step. I know there are some things coming down the line that will make this look like we are taking baby steps, but they are steps I think we need to start taking so we can keep moving in the right direction. In a direction where we don't get dehumanized and our students don't lose what we are trying to get to them… or the way we are trying to get it to them.

2. Feelings of Increased Involvement

The belief that audio feedback increased feelings of being more involved and "a real part" of the class was the second most commonly expressed theme (n = 15). Though students often began their discussions of involvement in general terms, subsequent probing revealed that this perception was usually related to what they believed to be a lessening of social distance when audio was used.

The richest data related to this perception came from a student who cited her feeling of being more involved as the primary reason for preferring audio feedback. Her response was as follows:

Yes, I would have to say that audio [commenting] made all the difference in the world to me. I've taken several online classes here and at [another university] because they are so much more… uhm, easier for me to get to. The downside is that I have felt like I am the girl in the bubble. Some of the instructors have done these things like the biography postings and online groups that help you meet other students and get to know them; some haven't. But even where they have [used these types of activities] you still feel like you are at home in your own little bubble and you are telegraphing out to all these other bubbles that other people are sitting in. Then between all of you there is this cold wall

> type thing. It's the course, the technology, all of that stuff that makes the course. There is this barrier there.
>
> Now, some of that has went away a little when we did things like be in chats, but it's still all kind of unreal you know? Being an Art teacher and having done my undergrad at a [very liberal college] I suppose I've always been one to seek out some of that personal interaction. So, because of that I've always felt that these online classes are a little, you know, dehumanizing.
>
> That said, I get this file where you put in this audio and boom! It was all a big change for me you know? It was like that bubble started getting popped in all these different places and made me feel like you were reaching in there and touching me. I know that's probably kind of silly, but just your voice alone made me feel like it was a real class and not this big technology construct that was locking us into its parts.
>
> This really changed the way I viewed the whole online learning thing. I know we aren't looking at learning the way that Judy Jetson might be learning but this tells me that we are moving that way. We are starting to reach out to each other across our phone lines and I think that's really important you know? I wish we could be doing this with each other as well as just you sending us these clip things and all. Like when we did our group projects, if we could have talked to each other like this it would have been a whole Brave New World thing going on between us but in a really good way.
>
> Guys, keep doing this kind of stuff. Next semester and I'm done with my masters and I didn't know if I would every take another online class or not, but if I could see a class where this was going on between me and the instructor and me and the other [students] then I would be all about learning this way.

Another student who cited feelings of increased involvement was less eloquent in her initial response when she simply answered:

> The audio, well, I also like it because it makes me feel like a real part of the class. You don't feel like a number when you get that.

However, subsequent probing revealed much more about her perceptions:

> Here's the thing, we get all these written comments back and they are all really dense and dry. At least they seem dry. This goes back to what I meant about the inflection in the instructor's voice. When you get this written feedback it could be something where maybe the instructor has taught this course lots of times before and has all of these canned responses ready on a Word file and just cuts and pastes them into our work to save all [of their] time. I know that's probably not what's going on, at least I hope it's not, but sometimes you can feel that way. You feel you might have a robot responding to you.
>
> What's different though with the audio though is that you know that its not canned. It could even be the same comments, but the delivery makes you feel like you are part of this learning group and that makes it all good. It makes you want to be involved, because you have this involvement level that is going to be coming back at you.

3. Content Retention

For students (n = 12) who cited increased learning and content retention as reasons for preferring audio to written feedback, most (n = 9) related their preference to learning style. The following is typical of students in this category:

> I think the reason I like the comments made with the audio thing is that I learn better that way. Let's take when I'm in a lecture class. I look around and everyone takes all these notes but I set there and listen and record what's being said. Then when I'm studying I listen to the recording over again. I just retain better that way. With this feedback its just an extension of that; the audio I retain the first time, the written I might read four or five times.

For the remaining three students who cited increased retention with audio feedback, the following is representative:

> I like this [audio feedback] because I am listening to what you are saying and scanning what I wrote. I can see what you are talking about and it clicks that way. Now, granted, I might have to listen to it and read it two or three times because doing both at once makes it all not stick as well, but in the end it works better than if both parts had been written only.

Interestingly, no students expressed a dislike for audio feedback because of learning styles. However, four did express views similar to the following:

> What I find… well odd, is that I've taken learning style inventories and I know that I am very, very visual. Based on that you would think that I wouldn't like this type of feedback at all. I know that I should be liking the written comments much more, but that wasn't the case. I can read comments once and I remember. Here I was listening twice, sometimes three times to what you said to make sense of it all. However, it goes back to what we talked about earlier about feeling like I was part of the class, a real part. That offset by far the whole learning styles issue. I guess its like when we are in the classroom, we feel like the teacher is telling us something and bringing us into a discussion so we don't expect them to write it too. Maybe that's what's going on here. Maybe because you made me feel more like I was part of the class I didn't feel like I necessarily needed everything presented in the way that I learn the best.

4. Instructor Caring

The final theme expressed by students (n = 10) was related to the degree they perceived the instructor to care about their learning when audio versus written feedback was provided. In most instances (n = 8), this perception was closely associated with nuance and feelings of involvement as eloquently expressed by one student when she said:

> The final thing is about the way I think the audio shows that you cared about us. It's not really something that's out there by itself though so I need to talk about the whole picture if that's alright with you?
>
> I started talking about all of this by talking about feeling the tone of your voice and knowing more about what you were trying to say than when I got just the words on paper… err rather on screen… well whatever. We can start there and then when I got to understand what you were saying it gave me some idea of who you were and that made me want to be more involved. Then when I started feeling really involved and all it made me feel like you really cared about what was going on. That's a warm fuzzy I haven't gotten with online classes before.

A similar sentiment, though expressed quite differently, was provided by another student who said:

> You took the time to try out this new audio file thing and actually communicate with us. Earlier I told you how I thought that it was way better than just reading words that might be misunderstood. That's true and so is the part when I said it made those connections that brought the class together. But what I left out is that it also showed that you were interested in our, in us learning what was going on. When you take the time to establish something that's this complex it shows you want us to really be a class and not just a group of individuals all doing something similar. I know teaching is pretty thankless, but I do want you to know that I appreciate what went on this semester. I can't really say that I've said that about any of my other online classes, but you talking to me, I mean really talking to me, and everything that was built up from that, made me feel that way here.

From the 51 questionnaires (100% return rate) sent to students in 17 other courses where audio feedback was used in order to address any potential novelty effect, the same themes emerged with slightly different weighting than in the original study. No new themes were revealed. The prevalence of themes is presented in the following table:

Theme	Prevalence
Ability to Understand Nuance	42
Feelings of Increased Involvement	26
Content Retention	27
Instructor Caring	32

Table 2. Prevalence of Themes in Follow-Up Questionnaires

D. Document Analysis

Final projects were analyzed in terms of relative usage of strategies for which audio or text feedback was provided. Two measures were used in this process to assess both frequency and level of use.

The assignment required students to use a minimum of three strategies that had been covered during the semester in completing their final project. The mean number of strategies used across five groups was 4.2 (SD = 1.09). The number of strategies incorporated into final projects after having received audio versus written feedback is provided in Table 3.

	Total Number of Strategies	Strategies for Which Audio Feedback Was Received	Strategies for Which Written Feedback Was Received
Group 1	4	3	1
Group 2	4	4	0
Group 3	3	1	2
Group 4	4	3	1
Group 5	6	4	2

Table 3. Comparison of Strategies Used in Final Projects by Feedback Type Received

Coding of documents revealed that students were far more likely to apply higher order thinking and problem solving skills (Synthesis and Evaluation in Bloom's Taxonomy) to content for which they had

received audio feedback. Table 4 depicts the level at which strategies were applied in final projects disaggregated by the type of feedback received for those strategies.

	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Written	1	2	1	1	0	1
Audio	1	1	2	0	5	6

Table 4. Comparison of Level of Application by Feedback Type Received

E. Comparison Time Requirements and Quantity of Feedback for Audio vs. Text

During the course of the semester, 204 documents containing text-based feedback and 170 containing audio feedback were generated. The mean feedback volume for text feedback was 129.75 words (SD = 57.43) and 331.39 (SD = 89.31) for audio. The mean time required for the instructor to provide feedback, was 13.43 minutes (SD = 4.53) for text-based feedback and 3.81 minutes (SD = 0.76) for audio. The time required to read the documents prior to / during commenting did not differ significantly as a function of the feedback modality used. The mean time for reading the documents when text-based feedback was used was 14.13 minutes (SD = 5.45) and 13.94 minutes (SD = 5.74) when audio feedback was used. The average file size for audio feedback was 258 kb / min (SD = 23.21).

IV. DISCUSSION AND CONCLUSIONS

Our investigations revealed an overwhelming student preference for asynchronous audio feedback as compared to traditional text based feedback, with no negative perceptions of the technique. The fact that over one third of students cited the use of audio feedback as a key factor they would use in selecting future online courses is significant. When these findings are combined with data comparing the use of knowledge constructed using audio feedback and the level at which that knowledge was applied, we believe asynchronous audio commenting merits serious consideration in the development and delivery of future courses.

Though students can project themselves and their emotions through text based communication [15, 16, 20, 21], two thirds of students (n = 19) in this study cited ability to understand nuance as reason for preferring audio to text feedback. This finding is important because it extends upon Richardson and Swan's [22] social presence research, in which a strong relation ($R^2 = 0.36$) was found to exist between students' perceptions of social presence and satisfaction with the instructor. In addition, it is likely that an enhanced ability to detect nuance impacts student perceptions of the instructor's use of humor, and openness toward and encouragement of student ideas and discussion; key immediacy behaviors cited by Arbaugh [23].

The second most commonly expressed theme, increased feelings of involvement, is important because it reinforces the sense of community and perception of "being there." In terms of how audio commenting decreased social distance for students, the best example can be found in words offered by one student:

> It was like that bubble started getting popped in all these different places and made me feel like you were reaching in there and touching me.

We consider the role audio feedback played in developing this type of interpersonal relationship with students in our asynchronous courses to be a compelling enough reason for its continued use even if no

other positive factors had been discovered.

Findings related to perceptions of increased caring on the part of the instructor, a theme that was frequently tied to nuance and increased involvement, confirm opinions held by Olsen [31] from his use of the technique in the traditional classroom. Though students were hesitant to explore this theme in great detail during the initial interviews, it was apparent that it was of considerable importance and increased overall satisfaction with the course and the instructor. The significant increase in the percentage of students expressing this theme in follow-up questionnaires in subsequent courses is worth noting. We believe that audio feedback should be considered a means by which to increase positive perceptions of the quality of instructor interactions and, by extension, social presence in ALN.

While the preceding three themes support our contention that asynchronous audio feedback increased teaching presence and decreased social distance, it may be even more important to examine the positive impact the technique had on perceived learning. Though slightly less than half of all respondents, in both the original and follow-up interviews, indicated that they retained information and were able to synthesize instructor comments better when they received audio feedback, document analysis in the original study indicated that the impact may have been even greater.

Random assignment was used to determine whether audio or text feedback was utilized for each topic and our analysis revealed no differences in difficulty for topics assigned to each type of feedback. Even given that control, information for which audio feedback was provided was used approximately 350% more frequently than information for which text based feedback was provided. With respect to level of application, students applied content for which audio feedback was provided at the two highest levels of Bloom's Taxonomy in slightly more than 70% of the cases. In contrast, content for which text based feedback was provided was only explored at similar levels in less than 20% of cases (see Table 2). Not only did students retain material better when they received audio commenting on it, but they applied that content in more cognitively complex ways.

These findings indicate that audio feedback enhanced learning for our students; though much more research needs to be conducted to determine how generalizable these finding may be across subject matter, instructors, and institutional contexts. Since the completion of this study, other early adopters in our College have experimented with audio feedback following the techniques we employed. The quantitative, qualitative and anecdotal evidence has been overwhelmingly positive. Over 450 students in courses taught by these instructors have now received audio feedback. According to these instructors, approximately one third of their students have submitted unsolicited feedback expressing a strong preference for this technique over text based feedback. No negative feedback has been received.

From the instructors' perspective, the ability to reduce the time required to provide feedback by approximately 75% was a compelling reason to adopt the technique. However, it is important to note that this reduction in time was coupled with a 255% increase in the quantity of feedback provided. While increases in quantity of feedback delivered with less demand on instructors' time is a strong reason to use the technique, evidence that it also increased retention and understanding of content at deeper levels makes it hard to argue *against* using audio commenting at this point. Still, more research is needed to determine potential differences in the types of feedback provided when text-based and audio feedback are used, and the precise mechanisms that facilitate increases in student learning.

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VI. AUTHOR BIOGRAPHIES

Philip Ice is Clinical Assistant Professor in the College of Education's Department of Middle, Secondary and K–12 Education at the University of North Carolina Charlotte. His research interests include immediacy behaviors, pedagogy and multimedia applications in ALN. Philip is especially interested in the intersection of these elements as they relate to the Community of Inquiry model.

Reagan Curtis is an Assistant Professor of Educational Psychology in the College of Human Resources and Education's Department of Technology, Learning and Culture at West Virginia University. A research and evaluation methodologist, his research agenda is diverse including online course development and delivery, cognitive development in mathematics, and gender issues in science learning among other areas.

Perry Phillips is an Associate Professor in the College of Human Resources and Education's Department of Curriculum & Instruction/Literacy Studies at West Virginia University. He received his doctorate in Curriculum and Instruction with a specialization in social studies education. His current research interests include teaching presence and pedagogy in ALN.

John Wells is an Associate professor of Technology Education in the School of Education at Virginia Polytechnic and State University. His line of research has been in two distinct fields: Instructional Technology Integration and Problem-Based Interdisciplinary Science and Technology Methods. John's current research interests are aimed at better understanding the intersection of learning theory and interdisciplinary STEM (science/technology/engineering/mathematics) instructional practices. Prior to Virginia Tech he was an associate professor at West Virginia University (WVU) where he served as Director of the *Trek 21: Educating Teachers As Agents Of Technological Change* PT3 (US Department of Education) project, the *Technology Education Biotechnology Curriculum Project* (NASA), and Director of the *Teaching and Learning Technologies Center* of the College of Human Resources & Education at WVU. While faculty at WVU he developed and taught graduate courses related to the application of computer-mediated communication in education, web-based instructional design, transportation systems, appropriate technology, housing and shelter design, and community development.

VII. APPENDIX A

Interview Protocol Guide

Good morning/afternoon/evening. The goal of this study is to examine some of your observations related to the course you have just completed, C&I 687, and the auditory feedback mechanisms that were used. The information generated by the study will be used in a research project that is designed to benefit both students and faculty with respect to the use of this medium. With your permission, I would like to audiotape this interview.

Before we begin, I would like to notify you of the following:

- Your participation is entirely voluntary. You may halt the interview at any time and/or choose not to answer certain questions.
- Your responses will remain anonymous. Complete confidentiality will be maintained. At no time will your identity be revealed either by the procedures of the study or during reporting of the results.
- No negative consequence will result for choosing not to participate.

Please feel free to tell us what you really think and feel; this will be the most helpful in trying to find out how to improve things for students and faculty members in the future.

Thank you for your participation in this research.

[Note code number and start recording.]

1. What was your overall perception of C&I 687?
   (probe for each one: 1. likes and dislikes 2. time required to complete assignments)

2. How did the course compare with traditional courses you have taken?
   (probe for: 1. activity types 2. interaction)

3. How did the course compare with other online courses you have taken (if any)?
   (probe for differences as needed)

4. How effective, in your experience, is online learning as opposed to f2f?
   (probe for: 1. quality of discussion 2. quality of products 3. quality of interaction 4. other concerns)

5. What did you think of the types of feedback used in the course?
   (probe for individual versus group responses and auditory versus written media)

6. When you think about the auditory feedback that was used, how would you describe your reaction to the instructor comments as opposed to written feedback?
   (probe as needed)

7. Do you think that auditory feedback is more or less personal than written feedback?

(probe as needed)

8. Other than what we have discussed, what did you like or dislike about auditory feedback?

(probe as needed)

9. Are there any ways in which you believe that audio feedback impacted your ability to construct knowledge in this course?

(probe as needed)

10. That is all I have. Is there anything else you would like to add?

Thank you for participating.

VIII. APPENDIX B

Final Project Rubric

Knowledge: Students explain the step-wise procedures for delivering instruction using a specific teaching strategy. Syntax is in the appropriate order; however, there is no elaboration on the methodology employed.

Comprehension: Students expand on the syntax of various teaching strategies by describing the model, as it is applied to their lesson plans, by explaining key concepts, predicting outcomes or identifying key issues that influence student learning.

Application: Students clearly apply their knowledge of teaching strategies to the content area; defined as content pedagogy.

Analysis: Students break down lesson plans into component parts and analyze the strategies employed. As an example a student would match the syntax of a given teaching strategy to the goals and objectives of activity.

Synthesis: Students apply prior knowledge from content and curriculum studies to the teaching strategy. Indicators will include inclusion of modifications to the primary teaching strategy that require the inclusion of innovative designs or combining multiple strategies into a single construct.

Evaluation: Students include, in their lesson plans, discussion elements in which judgments are made and justified by the inclusion of a set of criteria. Terminology such as compare, summarize, decide and asses are likely to be present in such discussions.

IX. APPENDIX C

Student Satisfaction Questionnaire

The goal of this study is to examine some of your observations related to the course you have just completed and the auditory feedback mechanisms that were used. The information generated by the study

will be used in a research project that is designed to benefit both students and faculty with respect to the use of this medium.

Before you complete the survey please be aware of the following:

- Your participation is entirely voluntary. You may choose to answer or not answer any or all questions.
- Your responses will remain anonymous. Complete confidentiality will be maintained. At no time will your identity be revealed either by the procedures of the study or during reporting of the results.
- No negative consequence will result for choosing not to participate.

Please feel free to tell us what you really think and feel; this will be the most helpful in trying to find out how to improve things for students and faculty members in the future.

Thank you, in advance, for participating in this study.

1. What was your overall perception of (course name and number here)? Please describe what you liked and disliked about the course.

2. How did the course compare with traditional courses you have taken? When answering this question think about the types of activities, interaction with the instructor and interaction with fellow students.

3. How did the course compare with other online courses you have taken (if any)? Please elaborate a little on differences (either positive or negative).

4. How effective, in your experience, is online learning as opposed to f2f? If, in your opinion, the following are applicable, please elaborate: 1. Quality of discussion. 2. Quality of learning. 3. Quality of interaction. 4. Any other issues you care to discuss.

5. What did you think of the types of feedback used in the course?

6. When you think about the auditory feedback that was used, how would you describe your reaction to the instructor comments as opposed to written feedback you may have received in this course or previous courses?

7. Do you think that auditory feedback is more or less personal than written feedback? Why?

8. Other than what we have discussed, what did you like or dislike about auditory feedback?

9. Do you have any other comments about the course or the instructor?

When you have completed the survey please save it as a Word document and email it to (insert email drop here). Thank you once again, for agreeing to complete this survey.

ONLINE VS. BLENDED LEARNING: DIFFERENCES IN INSTRUCTIONAL OUTCOMES AND LEARNER SATISFACTION

Doo Hun Lim
University of Tennessee
Human Resource Development

Michael L. Morris
University of Tennessee
Human Resource Development

Virginia W. Kupritz
University of Tennessee
Communication Studies

ABSTRACT

This study investigates differences in instructional and learner factors between two groups of learners exposed to online only and blended delivery formats, respectively, in an effort to compare learning outcomes and other instructional variables between online and blended delivery methods. Findings indicated that no significant differences existed in learning outcomes; however, significant differences existed in several instructional and learner factors between the two delivery format groups. Discussions about improving online or blended delivery method are presented based upon the research findings.

KEY WORDS

Online Learning, Blended Learning, Learning Outcomes, Comparative Study

I. INTRODUCTION

Advances in network and communication technologies have shifted the way we deliver instruction to learners in remote locations. Owing to web enhanced communication systems and newer formats of media, various innovative instructional methods have provided learning solutions meeting the diverse needs of instructors and learners in schools and private organizations. A major concern in adopting the new technologies is whether or not educators utilize new technologies for the convenience and efficiency in the delivery of educational content [1]. Newer ways to blend traditional instruction with technology mediated instructional methods have emerged in an effort to meet the diverse needs of learner satisfaction and improve their learning levels. Several research studies claimed the positive effect of blended learning for teaching and learning [2].

While researchers have previously investigated the differences in learning outcomes and other instructional conditions between face-to-face instruction and online instruction formats, few studies have compared online and blended learning methods that examine differences in learning outcomes or explored

mediating mechanisms that may influence learning. More colleges and private sector companies are adopting online or blended learning formats for the delivery of their courses and training programs. Identifying how the two delivery formats are different in their effectiveness for learners' learning and satisfaction has become an important research topic for instructors and instructional designers to better address the teaching and learning issues residing in both delivery formats.

II. LITERATURE REVIEW

The origin of online instruction is distance education. Morabito, Sack, and Bhate [3] determined that the growth of distance education evolved over four generations: (a) printed instruction, (b) early technology in broadcasting systems, (c) online instruction, and (d) web-based teleconferencing. Online instruction is defined as any form of learning and/or teaching that takes place via computer network [4]. The advancement of online instruction has opened a new era in distance education and contributed to the expansion of the educational opportunities by reaching people in various geographical locations thereby allowing learners global access to education [5]. Several researchers have advocated the use of online instruction for instructional effectiveness and enriched faculty and program development [6]. Online instruction addresses the issue of time and place constraints on delivering learning experiences to distant learners and allows flexible learning modes so students can control their learning path, pace, and contingencies of instruction [7]. For private sector organizations, one of the most significant benefits of online instruction has been just-in-time delivery of training when employees need learning to effectively address performance problems in the workplace [8]. In spite of the many promising features of online instruction, certain pitfalls of online instruction have been identified regarding its limited capability to engage learners in learning events unless the learners were self-motivated, were active learners [9], and possessed strong organizational skills in their learning habits [10]. Learners also report the lack of a sense of belonging or community during online learning that prevents the development of shared feelings and emotions between learners and instructors. Researchers have found that these variables are some of the most important factors influencing learner satisfaction and learning transfer effectiveness [11]. Fontaine [12] argues that delivering vivid learning experiences to online learners requires creating a sense of presence, a feeling of immediacy, and a broad awareness of the real and vivid learning environment.

Blended instruction has recently received increased usage among academic institutions and private companies that have many opportunities associated with time and place [13, 14]. The major thrust of blended instruction is to overcome the shortcomings of online instruction and utilize various instructional sequencing and delivery strategies to enhance learner satisfaction while also achieving increased learning outcomes. Among the many definitions available, three representative definitions of blended instruction include: (a) a learning method with more than one delivery mode is being used to optimize learning outcomes and reduced cost associated with program delivery [15], (b) any mix of instructor-led training methods with technology-based learning [2], and (c) the mix of traditional and interactive-rich forms of classroom training with any of the innovative technologies such as multimedia, CD-ROM, video streaming, virtual classroom, email/conference calls, and online animation/video streaming technology [16].

Singh and Reed [15] have proposed six combinations of blended instruction regarding specific patterns of blended learning typologies: (a) offline and online learning, (b) self-paced, live, and collaborative learning, (c) structured and unstructured learning, (d) custom content with off-the-shelf content, (e) work and learning, and (f) ingredients blending synchronous physical formats, synchronous online formats, and self-paced, asynchronous formats. Reasons for using blended instruction include: improved pedagogy, easy access to knowledge, more interaction among learners, personal presence, cost effectiveness, and ease of revision of learning content [17].

The extensive review of related literature about online and blended instruction validated the usefulness and effectiveness of each learning delivery format in relation to learner satisfaction and learning outcomes. Few studies, however, have empirically tested how the learners in each delivery format are different in terms of learning, instructional satisfaction, and learning involvement and motivation. Additionally, few studies have been conducted to identify the differences in learners' learning application between online and blended learning environment. Here, the term 'application of learning' refers to the degree to which learners use and apply learned knowledge and skills to their current studies or to current jobs and tasks. Considering the compelling need to identify evidence of learning effectiveness in both public and private sector organizations, evaluating learning application outcomes becomes a critical issue for researchers in an educational discipline.

III. PURPOSE AND METHODOLOGY

A. Purpose

The purpose of this research study was to identify the differences in instructional and learner factors, students' learning, and application of learning between two groups of undergraduate students who took a program evaluation course through an online only or blended delivery format at a southeastern university. The research questions for this study asked:

Do learners in online and blended delivery format show significant differences in learning and learning application before and after the course?

What are the perceived differences in instructional satisfaction, learning, and application of learning between the learners in blended and online delivery format?

What are the reasons facilitating or inhibiting the learners' learning and learning application in blended and online delivery group?

B. Sample

A group of undergraduate students was asked to participate in this study to assess learning outcomes based on the learner and instructional variables. The subjects for the study included 125 students (39 male and 86 female) who took a program evaluation course at the University of Tennessee. Most of the students were majoring in Human Resource Development at the university. Among the 125 students, 59 students took the course through online delivery format and 69 through blended delivery format using classroom and online instruction. Regarding the students' age, 87 (67%) students were between 18–19, 27 (21%) students were between 20–29, 6 (5%) students were between 30–39, and 5 (4%) students were 40 or above. For the students' distance learning experience, 99 (80%) students replied they had taken at least one distance learning course prior to the course. Regarding employment status, 30 students were fulltime students, 59 students had part-time jobs, and 36 students had fulltime jobs.

C. Instrument and Procedure

The study utilized a multi-method approach that combined closed-ended and open-ended questions in an online questionnaire. Linking quantitative and qualitative data in this way enabled confirmation and corroboration through triangulation, provided richer detail, and helped to initiate new lines of thinking [18, 19]. The questionnaire was developed to obtain the learners' perceived degree of learning, learning application, and instructional quality of the course. The questions for both the open-ended and closed-ended parts of the questionnaire were written in a language that was familiar to the learners using terminology taught in the course.

The closed-ended part of the questionnaire used a five point Likert-type scale to measure the perceived degree of learning (1 “do not understand” to 5 “completely understand”) and the perceived degree of learning application (1 “none” to 5 “frequently use”) for the eighteen learning objectives of the course taught throughout the semester. The study utilized a test set to assess actual learning gain before and after each semester. Overall, a reliability alpha was .95 for the learning, .93 for the learning application, and .70 for the test respectively. To collect the pre- and post- survey data, the students were asked to participate in the surveys conducted online at the beginning and at the end of each semester. The data collection was conducted for 8 semesters between 2001 and 2005.

The open-ended part of the questionnaire asked questions about the reasons for high or low perceived learning and learning application if each learner responded their perceived learning and learning application of any learning objective at 1 or 2 in the rating scale. The open-ended part of the questionnaire followed the closed-ended part of the questionnaire. The open-ended part of the questionnaire also asked the learners’ satisfaction with instructional factors such as instructor, learning activities, group work, learning support, and suggestions to improve the course. The researchers believed the open-ended questions in the survey strengthened the study by investigating in-depth information of the learners’ insight about the course delivery.

D. Data Analysis

1. Quantitative Analysis

Basic descriptive statistics were used to analyze the test scores and the perceived degree of learning, application of learning, and instructional quality responded by the learners. Paired t-tests were used to compare population mean scores for the learning gain before and after the course. We also used ANOVA to assess the differences in dependent variables between the comparison groups.

2. Qualitative Analysis

The investigators conducted domain analyses employing content analysis procedures [20]. These analyses involved sorting through the open-ended responses and identifying themes and patterns that characterized the reasons that promoted or hindered the learners’ learning and application for the two different delivery formats. After content analysis, cumulative frequencies and percentages for similar types and attributes identified in the domain categories were calculated to determine how often similar types were elicited. This allowed the investigators to include those terms elicited most frequently and to gain a better understanding about the distribution of beliefs across domain categories. Linking qualitative and quantitative data in this manner helps investigators see the trends in the data more easily and rapidly by looking at distributions [19]. Domain categories and tentative assertions were reviewed by study participants who gave feedback. Peer researchers examined the tentative assertions as well and gave constructive comments. Conducting member checks and peer examination in this manner helped the researchers enhance authenticity and trustworthiness of the findings [21].

E. Context of the Course

The course was developed to teach curriculum content on learner and program evaluation for HRD undergraduate students. The course was delivered totally online for two years, and then, through a blended delivery format for another two years utilizing classroom instruction and online delivery methods. Regarding the online learner group, the instructor developed thirteen online learning modules and the workload of one module was equivalent to that of one week’s classroom instruction. Four sub-learning sections comprised one learning module. Learning modules provided subject content in learner

and program evaluation and various types of media such as texts, graphics, tables, audio, and video clips were used to effectively deliver the learning content to the online learners. Several interactive learning activities including online discussions, case study analyses, and online tests and surveys were utilized within the modules to provide the learners with opportunities to apply learned content during learning. All learners were asked to attend the first and last class meeting for course orientation and group project presentation respectively. All learners were also asked to complete individual projects to apply learned content; projects can later be used as personal portfolios in program evaluation for future job searches.

Regarding the blended learner group, half of the instruction was conducted in class and half was delivered through online delivery. Learners were required to attend weekly classroom instruction in which the instructor provided presentation on each week's major course content. After each week's classroom instruction, the learners were required to complete online learning modules to reinforce their classroom learning. The online learning module of the course included various learning activities such as review of more related learning content, links to learning resources, group discussions, and application of learning content through assignments and group and individual projects.

IV. FINDINGS

A. Differences in Learning and Perceived Learning Application

The results indicated that learners experienced a significant increase in perceived and actual learning. Further, both online and blended learning groups reported a significant increase in their perceived and actual learning (see Table 1). An ANOVA was also conducted to assess differences in the learners' perceived and actual learning, perceived learning retention, and perceived learning application with mean scores for the different delivery groups. The results indicated that delivery format groups did not reveal any differences for the dependent variables in course outcomes.

Table 1. Difference in Learning Before and After the Course Based on Delivery Format

Delivery Format	N	Pre/Post Perceived Learning Mean (SD)	Effect Size	Sig.	N	Pre/Post Test Mean (SD)	Effect Size	Sig.
Online	59	3.01 (.65) 3.72 (.58)	.487	<.001	55	8.14 (2.03) 11.20 (3.48)	.504	<.001
Blended	66	3.14 (.65) 3.84 (.52)	.503	<.001	66	8.35 (2.27) 11.14 (3.60)	.408	<.001
All	125	3.08 (.65) 3.78 (.55)	.495	<.001	120	8.26 (2.13) 11.26 (3.55)	.449	<.001

B. Differences in Instructional and Learner Variables

Some meaningful differences occurred regarding the differences in instructional and learner factors based on the two delivery formats. First, learners in the online delivery format had a significantly higher mean score for instructional difficulty level than those in blended delivery format. Second, learners in online delivery format experienced significantly higher workload for their study than those in blended delivery format. In contrast, learners in online delivery format felt significantly less learning support during study than their counterpart learners in blended delivery format. Table 2 presents the mean scores, standard error scores, and *p* values of the instructional and learner factors.

Table 2. Differences in Instructional and Learner Factors Based on Delivery Format

Variables	Delivery Format	N	Mean	SD	Effect Size	ANOVA *p* value
Difficulty Level	Online	58	3.57	.82	.063	.005
	Blended	66	3.09	1.02		
Study Workload	Online	58	3.95	.62	.150	<.001
	Blended	66	3.32	.86		
Learning Support	Online	59	3.37	.99	.084	.001
	Blended	66	3.89	.74		

C. Reasons for High or Low Learning and Application

Learner responses to the survey questions identified the most influential reasons supporting and hindering learning and application. The reasons given for instructional effectiveness were identified as the most influential factors for learning (online 49.5%, blended 52.4%, all 51%). From the various reasons under the instructional effectiveness category, "clear and concise learning content" was found to be the most important reason for high learning for both groups while "review and repetition of learning" was identified more frequently by the blended learner group (17 responses) than the online learner group (4 responses).

Regarding the reasons for low perceived learning, instructional ineffectiveness was also found to be the most important category negatively influencing the learners' learning as a whole. Under the instructional ineffectiveness category, some specific reasons quoted by the learners are: "I really didn't completely understand these," "I need more examples to comprehend these concepts," and "Lesson was too complex for me to understand." Other important categories that appeared to negatively influence learning include "lack of understanding," "lack of interest," and "not related to my work." Tables 3 and 4 report the verbatim categories given for high and low perceived learning along with the frequencies and percentages for these reasons.

Table 3. Reasons for High Learning by Delivery Format

Reason Category	Online (%)	Blended (%)	All (%)
Instructional effectiveness	47 (49.5)	66 (52.4)	113 (51.1)
Previous learning	15 (15.8)	18 (14.3)	33 (14.9)
Related to my current or future jobs	12 (12.6)	15 (11.9)	27 (12.2)
High interests in the learning content	8 (8.4)	10 (7.9)	18 (8.1)
Opportunity to practice learning	6 (6.3)	6 (4.8)	12 (5.4)
Personal learning effectiveness	5 (5.3)	6 (4.8)	11 (5.0)
Personal motivation for learning	2 (2.1)	5 (4.0)	7 (3.2)
Total	95	126	221

Table 4. Reasons for Low Learning by Delivery Format

Reason Category	Online (%)	Blended (%)	All (%)
Instructional ineffectiveness	22 (39.3)	19 (46.3)	41 (42.3)

Lack of understanding	13 (23.2)	6 (14.6)	19 (19.6)
Lack of interest in the learning content	11 (19.6)	5 (12.2)	16 (16.5)
Not related to my work	4 (7.1)	5 (12.2)	9 (9.3)
Lack of personal effort	2 (3.6)	3 (7.3)	5 (5.2)
Personal dislike of online instruction method	3 (8.1)	0 (0.0)	3 (3.1)
Lack of opportunity to use learning	0 (0.0)	3 (7.3)	3 (3.1)
Interruptions during learning	1 (1.8)	0 (0.0)	1 (1.0)
Total	56	41	97

Some categories seemed to influence the learner's perceived application of learning positively or negatively. Verbatim responses listed in Tables 5 and 6 indicate that the most important categories positively influencing learners' perceived learning application include "opportunity to use learning," "applicable to my work," and "personal interest to use learning." The most important categories negatively influencing learning application were identified as "lack of understanding," "not related to my job," "not enough opportunity to use during class," "lack of opportunity to use in my job," and "lack of motivation to apply." One interesting finding between the two comparison groups is the difference in two specific responses in "opportunity to use learning" for high perceived learning application. Learners in the blended delivery group responded more frequently to "use learning during class activities, assignments, and for other classes or personal situations" than the learners in online delivery group.

Table 5. Reasons for High Application by Delivery Format

Reason Category	Online (%)	Blended (%)	All (%)
Opportunity to use learning	37 (49.3)	59 (56.2)	96 (53.3)
- To use in learning activities and assignments	19	38	57
- To use for other classes and personal situations	6	11	17
- To use in my job	8	8	16
- To review learning through quizzes	4	2	6
Applicable learning content to my work or career	18 (24.0)	17 (16.2)	35 (19.4)
Personal interest	9 (12.0)	15 (14.3)	24 (13.3)
Experience from previous learning	4 (5.3)	5 (4.8)	9 (5.0)
Personal interest	3 (4.0)	4 (3.8)	7 (3.9)
Personal motivation to apply	3 (4.0)	3 (2.9)	6 (3.3)
Because of repetition and emphasis of information	1 (1.3)	2 (1.9)	3 (1.7)
Total	75	105	180

Table 6. Reasons for Low Application by Delivery Format

Reason Category	Online (%)	Blended (%)	All (%)
Lack of understanding of learning content	12 (28.6)	10 (28.6)	22 (28.6)
Not related or applicable to my job	9 (21.4)	4 (11.4)	13 (16.9)
Not enough opportunity to use during class	7 (16.7)	5 (14.3)	12 (15.6)
Lack of opportunity to use learning in my job	4 (9.5)	6 (17.1)	10 (13.0)

Lack of motivation to apply	5 (11.9)	4 (11.4)	9 (11.7)
Learning activities were not related	2 (4.8)	1 (2.9)	3 (3.9)
Lack of clear instruction for application	1 (2.4)	2 (5.7)	3 (3.9)
Not stressed to apply	0 (0.0)	3 (8.6)	3 (3.9)
Too much content to apply for a given time	2 (4.8)	0 (0.0)	2 (2.6)
Total	42	35	77

Learners in both groups indicated similar responses regarding the instructional activities perceived as helpful for learning. Among all instructional activities used for the course, learners in both groups perceived group/individual projects as the most important learning activity followed by discussion activities, class assignments, review/pre/post tests, case studies, multimedia cases and scenarios, lecture, and online learning modules. Table 7 reports the verbatim responses and the frequency and percentage of each learning activity for both learner groups.

Table 7. Helpful Instructional Activities by Delivery Format

	Online (%)	Blended (%)	Total (%)
Group or individual project	29 (25.4)	47 (28.5)	76 (27.2)
Learning and discussion activities	20 (17.5)	27 (16.4)	47 (16.8)
Class assignments	20 (17.5)	21 (12.7)	41 (14.7)
Review and pre/post tests	14 (12.3)	23 (13.9)	37 (13.3)
Case studies	9 (7.9)	10 (6.1)	19 (6.8)
Multimedia cases and scenarios	10 (8.8)	8 (4.8)	18 (6.5)
Lecture	4 (3.5)	9 (5.5)	13 (4.7)
Online learning modules	2 (1.8)	1 (6.1)	12 (4.3)
Examples	0 (0.0)	4 (2.4)	4 (1.4)
Instructional feedbacks	1 (0.9)	3 (1.8)	4 (1.4)
Online chats	3 (2.6)	0 (0.0)	3 (1.1)
Reading materials	1 (0.9)	2 (1.2)	3 (1.1)
Peer reviews	1 (0.9)	1 (0.6)	2 (0.7)
Total	114	165	279

V. DISCUSSION AND IMPLICATIONS

A. Effect of Delivery Format on Learning and Application

Data analysis revealed that the two learner groups in online and blended delivery formats did not show any significant differences in the mean scores for perceived and actual learning and perceived and actual learning retention, while all learners, regardless of the delivery options, indicated a significant increase in perceived and actual learning before and after the course. This finding resembles similar findings from previous studies that compared learning outcomes of traditional classroom with those of distance education [22, 23, 24, 25]. Also, the study findings replicate similar findings that have suggested there is no significant difference in learning application between the traditional classroom instruction and distance education delivery format [22, 26]. From this finding, the researchers could conclude that instructional delivery format may not affect learners' learning or application of learning to a significant degree.

B. Instructional Factors and Conditions Affecting Learning and Application

The study revealed several meaningful findings when the researchers conducted further analyses to detect the differences that may exist between the two delivery formats. First, the learners in online delivery group reported more workload than those in blended delivery group while they claimed less learning support than the learners in blended delivery group during their learning. This finding draws some implications for the importance of the learners' psychological state in blended and online learning environment especially since learners may feel unsupported and experience an increased workload if they lack the sense of presence or belonging [27]. From a practical perspective, the findings suggest that an important consideration in designing online or blended instruction is to include instructional activities and collaboration opportunities that enhance the learners' emotional engagement with peers and instructors. The present study recommends several instructional strategies to satisfy learners' sense of presence and belonging during online or blended learning including: (a) providing immediate feedback on learners' questions and timely technical support; (b) asking short questions checking the understanding of major learning content at frequent intervals during instruction; (c) sending learners' learning progress report on a regular base to promote learners' motivation for learning achievement; and (d) using humor so the learners feel emotionally refreshed and engaged [22].

Second, the blended delivery format seems to provide clearer instructions to learners rather than using the online delivery format alone. In this study, the online learners experienced more challenges and obstacles in achieving similar learning levels than the learners in blended delivery group. They also provided relatively more claims for their lack of understanding as their reasons for low learning than the blended delivery learner group. This finding suggests that blended delivery methods may provide clearer and learner centered instructions than online only delivery method. The issue of instructional clarity in delivering online instruction has been reported from other studies [22, 26]. To resolve this issue, instructors or instructional designers of online instruction are advised to adjust the level of instructional content and apply instructional variation to meet the varying learning levels of online learners.

Certain instructional activities were considered more important than others in this study regarding instructional activities and methods used for both delivery formats. For example, group and individual projects, discussion activities, and class assignments were noted as the most effective learning activities for the learners' learning as a whole. This finding has implications for the importance of learning application for greater learner satisfaction and increased learning regardless of the different instructional formats. That is, learners seemed to value those learning activities that they could apply learned knowledge and skills to personal situations more than merely understanding instructed learning content in both online and blended learning environment. To promote more application of learning during blended or online instruction several instructional strategies are deemed effective. Those strategies include: (a) making learning content "applicable" as suggested by Baldwin and Ford [28]; (b) utilizing reflective activities that assist learners to apply their learning to personal situations during instruction [29]; and (c) embedding a structured learning process composed of a step-by-step guided practice after a segment of instruction, followed-up by individual practice to reinforce the guided practice, and independent practice through class assignments to master learned content in different application context [22].

VI. FUTURE STUDY AND LIMITATIONS

This study contributes several meaningful findings to the educational knowledge base regarding how to design blended or online instruction to better address learners' satisfaction and learning outcomes. Furthermore, this study sought to address the issues of learning application in online and blended learning

environment, which is directly connected to the issue of learning effectiveness in today's organizations. As noted from other research, the nature of the open-ended questions in a survey format may not produce the rich, thick description that is characteristic of one-on-one interviews; however, including open-ended questions helped strengthen the study by delving further into student insight.

Even though this study revealed several meaningful research findings, the study findings are limited to online and blended learning environments occurring in college settings. To further generalize these findings, future studies using a broader population including private sector organizations are strongly recommended. Regarding the issues related to what constitutes blended instruction, this study utilized one type of blending mix of instructional method using classroom and online instruction. For generalization, future studies are needed to verify how other types of instructional blending influence learning and learning application.

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VII. ABOUT THE AUTHORS

Doo Hun Lim is an Assistant Professor of Human Resource Development Program at the University of Tennessee.

Michael L. Morris is an Associate Professor of Human Resource Development Program at the University of Tennessee.

Virginia W. Kupritz is an Associate Professor of Communication Studies at the University of Tennessee.

IX. APPENDIX: QUESTIONNAIRE

Course Exit Survey

The purpose of this questionnaire is to assess students' competency level and instructional quality of this course. Your participation in this study is voluntary. The data will be stored securely and will be used for the research purpose only. It is expected to take less than 15 minutes to complete this survey. Submission of this form constitutes your consent to participate. Please answer the following questions to the best of your knowledge.

Gender: Male ( ) Female ( )

Student Learning and Application

The following question items will assess your learning and application of the course objectives. *For the application items*, rate your perceived degree of application of the learning through the class activities, such as learning activities, assignments, quizzes, group project, individual project, and case studies. Or you can refer the application to your personal occasions, such as application to other classes, jobs, tasks, or personal lives.

Learning **Scale**

For each of the following items, I _____.

1 2 3 4 5

don't understand at all <----------> completely understand

Application **Scale**

During the class, I could _____ the following items to certain situations.

1 2 3 4 5

not apply at all <----------> frequently apply

1. Describe the difference between performance and competency. L: 1----2----3----4----5
   A: 1----2----3----4----5
2. Describe the general process of performance management. L: 1----2----3----4----5
   A: 1----2----3----4----5
3. Determine appropriate steps to conduct performance measurement. L: 1----2----3----4----5
   A: 1----2----3----4----5
4. Develop performance objectives. L: 1----2----3----4----5
   A: 1----2----3----4----5
5. Develop the table of specification to generate instructional objectives. L: 1----2----3----4----5
   A: 1----2----3----4----5
6. Develop performance measurement instruments, such as test, survey, interview and observation guide. L: 1----2----3----4----5
   A: 1----2----3----4----5
7. Evaluate performance measurement instruments to check validity and reliability. L: 1----2----3----4----5
   A: 1----2----3----4----5
8. Describe when to use basic statistics such as mean, median, mode, standard deviation, and t-test. L: 1----2----3----4----5
   A: 1----2----3----4----5
9. Differentiate training from non-training needs. L: 1----2----3----4----5
   A: 1----2----3----4----5
10. Clarify the difference between evaluation and research. L: 1----2----3----4----5
    A: 1----2----3----4----5
11. Describe the importance of evaluation for program L: 1----2----3----4----5

enhancement and performance improvement.	A: 1----2----3----4----5
12. Describe when and why to use summative and formative evaluation.	L: 1----2----3----4----5 A: 1----2----3----4----5
13. Identify key steps to conduct an evaluation.	L: 1----2----3----4----5 A: 1----2----3----4----5
14. Develop an evaluation plan.	L: 1----2----3----4----5 A: 1----2----3----4----5
15. Describe major categories of the evaluation standards.	L: 1----2----3----4----5 A: 1----2----3----4----5
16. Describe when to use each level of the four-level evaluations proposed by Kirkpatrick.	L: 1----2----3----4----5 A: 1----2----3----4----5
17. Describe barriers and success factors of training transfer in organizations.	L: 1----2----3----4----5 A: 1----2----3----4----5
18. Describe major components of return on investment (ROI) evaluation.	L: 1----2----3----4----5 A: 1----2----3----4----5

To answer questions 19 through 22, take a quick review of your responses from question 1 through 18 in this section.

19. What are the reasons for **high learning** if you checked any question item from 1 through 18 at either 4 or 5 of the learning scale?

Reason 1:

Reason 2:

Reason 3:

20. What are the reasons for **low learning** if you checked any question item from 1 through 18 at either 1 or 2 of the learning scale?

Reason 1:

Reason 2:

Reason 3:

21. What are the reasons for **high application** if you checked any question item from 1 through 18 at either 4 or 5 of the application scale?

Reason 1:

Reason 2:

Reason 3:

22. What are the reasons for **low application** if you checked any question item from 1 through 18 at either 1 or 2 of the application scale?

Reason 1:

Reason 2:

Reason 3:

Instructional Design Factors

The following question items will assess the quality of the instructional design of the HRD455 course. Please answer each question according to the illustrated scale.

Course Outcomes and Student Effort/Involvement

For the following question items **1 through 8**, rate your perception about the course quality compared to other courses.

1	2	3	4	5
Much less	Less	About the same	More	Much more

1. My learning increased in this course.	1----2----3----4----5
2. I made progress toward achieving course objectives.	1----2----3----4----5
3. My interest in the subject area has increased.	1----2----3----4----5
4. This course helped me to think independently about the subject matter.	1----2----3----4----5
5. This course actively involved me in what I was learning.	1----2----3----4----5
6. I studied and put effort into this course.	1----2----3----4----5
7. I was prepared for each class (such as reading assignments).	1----2----3----4----5
8. I was challenged by this course.	1----2----3----4----5

Faculty and Student Interaction (9–12) / Instructional Quality (13–18) / Exams (19–22)

For the following question items **9 through 18**, rate your perception about the course quality according to the following scale.

1	2	3	4	5
Ineffective	Somewhat effective	Moderately effective	Effective	Very effective

9. The instructor's helpfulness and responsiveness to students 1----2----3----4----5

10. The instructor's concern for student progress 1----2----3----4----5

11. The availability of extra help for this class 1----2----3----4----5

12. The instructor's willingness to listen to student questions and opinions 1----2----3----4----5

13. The instructor's use of examples or illustrations during the instruction 1----2----3----4----5

14. The instructor's use of challenging questions during the instruction 1----2----3----4----5

15. The instructor's command of the subject matter 1----2----3----4----5

16. The instructor's ability to make clear and understandable presentations of information 1----2----3----4----5

17. The instructor's way of summarizing or emphasizing important points during instruction 1----2----3----4----5

18. The instructor's use of web technologies as aids in instruction 1----2----3----4----5

19. The information about how you would be graded 1----2----3----4----5

20. The clarity of quiz questions 1----2----3----4----5

21. The quiz's coverage of important aspects of that week's class 1----2----3----4----5

22. The helpfulness of assignments and class projects in understanding the main content of the class 1----2----3----4----5

23. The level of difficulty of this course

1Not difficult	2 Somewhat difficult	3 Moderately difficult	4 Difficult	5 Very difficult

Work Load

24. The general work load for this course in relation to other courses of equal credit

1	2	3	4	5	6
Much lighter	Lighter	About the same	Heavier	Much heavier	N/A

*N/A - Not applicable

25. The length of the study time for this course in relation to other courses of equal credit

1	2	3	4	5	6
Much shorter	Shorter	About the same	Longer	Much longer	N/A

26. The assignments for this course in relation to other online courses of equal credit

1	2	3	4	5	6
Much lighter	Lighter	About the same	Heavier	Much heavier	N/A

27. The assignments for this course in relation to other classroom courses of equal credit

1	2	3	4	5
Much lighter	Lighter	About the same	Heavier	Much heavier

28. What is your average study time for one learning module (in minutes)?

Student Support

29. How effective was the student support for the following items?

Graduate Teaching Assistant

1	2	3	4	5
Ineffective	<----------		---------->	Very effective

Feedback for Learning Activities

1	2	3	4	5
Ineffective	<----------		---------->	Very effective

Responsiveness to Study Questions

1	2	3	4	5
Not fast	<----------		---------->	Very fast

Technical Support

1	2	3	4	5
Ineffective	<----------		---------->	Very effective

BLENDED LEARNING IN HIGH TECH MANUFACTURING: A CASE STUDY OF COST BENEFITS AND PRODUCTION EFFICIENCY

Veena Mahesh, Ph.D. and Craig Woll, Ph. D.
Intel Corporation

ABSTRACT

The complexity of equipment and cost of training are increasing annually for high tech semiconductor manufacturing. The article describes the process and methodology adopted by a team at Intel Corporation to convert a 12-day class on equipment training into a blended solution consisting of a 5-day Classroom experience, a 3-hour Web Based Training (WBT), and a Managed Preventive Maintenance (MPM) for On-the-Job Training (OJT). The results of the implementation demonstrated a 60% reduction of technician time away from the factory, benefits cost ratio of 2.27, and an ROI of 157%. Based on the results of evaluation, the authors concluded that blended learning is a viable and cost effective solution to provide support for equipment training at Intel from the perspective of the lead time to proficiency, ROI, and cost benefit analyses.

KEYWORDS

Blended Learning, Equipment Training, Costs and Benefits, ROI, Proficiency, Kirkpatrick, Semiconductor

I. INTRODUCTION

Increasing competition in the global semiconductor manufacturing industry is leading companies to look for every possible way to increase tool utilization time, decrease operating expenses, and eliminate defects in production. Many of these problems can be solved through the improvement of human performance. This performance is often improved via learning interventions. These learning interventions can potentially cause two distinct problems. The first is an increase in the technician time away from the factory. The second is an increase in the production tool downtime for training activities. The use of blended learning techniques at Intel has led to the reduction in tech time away from factory and the reduction of production tool downtime for training by 60% or more.

Decreasing ramp and technology life cycles have made it imperative for Intel to ensure that technicians are not away from the factory for extended periods of time. The separation of the technician from the factory for the purpose of training leads to increases in costs for coverage and may increase the technician to tool ratios to compensate for the time away. Removing the learning event from the workplace also denatures the true environment of tool configuration and maintenance tasks that are being taught. This denaturing can create barriers to transfer of knowledge. When knowledge is not properly transferred the opportunity for error increases, leading to an increase in tool downtime for repair and an increase in defects along the production line.

Some learning events occur right on the factory floor utilizing the existing infrastructure as a means of reducing the cost of the training and decreasing the level of denaturing. This training requires the

complete dedication of a tool for a predetermined time, decreasing the tool utilization rate. On constrained toolsets this translates into a reduction in total product throughput in the factory. In addition, performing intrusive tasks on the tools creates an opportunity to introduce defects into the system by performing unnecessary maintenance on a healthy tool.

These factors combined with the lack of availability of supplier instructors for overlapping class offerings at multiple sites have been constraints. The high cost of travel, technician time away from the factory, inadequate training materials and extensive training tool down-time have all been identified as gaps in meeting manufacturing technician training needs. Additionally, most equipment training is delivered in the instructor led model and does not leverage technology based learning or enable collaboration across geographies among peers.

II. BACKGROUND AND OVERVIEW

According to a survey of learning professionals across the U.S. and U.K. by Balance Learning, blended learning accounts for 16.1% of all training in the U.S. and 77%of all U.S. organizations currently use blended learning [1]. Blended learning is popular today, but the concept has been around for decades. To most of us, blended learning is a mixture of e-Learning with classroom training. Today's blended learning models are based on years of experience but apply new technologies and delivery options [2]. A blended learning solution typically includes any possible combination of a wide range of learning delivery media designed to solve specific business problems such as face to face classrooms, web based courseware, live virtual classrooms, onsite labs, job aids, Electronic Performance Support Systems, mentoring programs, communities of practice and portals. Driscoll [3] expands that concept to cover not just delivery methods (virtual classroom, self paced leaning), but also combinations of pedagogical approaches (for example, constructivism, behaviorism and cognitivism) and instructional technologies (web-based learning and synchronous distance learning) to produce optimal learning outcomes.

While training typically consists of traditional delivery methods (classrooms, labs, lectures, demonstration, self-study, seminars, conferences, job aids, presentations), blended learning involves interactive learning activities (discussion, simulation, role-playing, experimental, mentoring, interactivity, case studies, games, support). Blended learning goes beyond good and basic training to a more systematic education that promotes ongoing learning [4]. Driscoll [3] urges proponents of blended learning to combine instructional technology with actual job tasks in order to create a harmonious effect of learning and working. Blended learning paths help evolve organizations to the highest stage of executing their stated learning management strategies through the evolutionary stages of organizational learning [5].

The definition we have adopted at Intel is oriented with an integrated view of formal and informal learning. The approach we are adopting typically includes any possible combination of a wide range of learning delivery media designed to solve specific business problems such as classroom, web based courseware, live virtual classrooms, onsite labs, job aids, games, simulations, Electronic Performance Support Systems, mentoring programs, communities of practice, portals and communication. This approach has been used at Intel for several types of training including the e-Basics curriculum and a program to provide training to Intel's worldwide workforce and resellers [6, 7].

From a philosophical perspective of learning theories, the theory that best embodies the beliefs embedded in the Intel Blended Learning (IBL) program is the theory of connectivism [8] which states that "Learning is a process that occurs within nebulous environments of shifting core elements—not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves

(within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing" [8]. Based on this theory, it is of utmost importance to connect specialized nodes or information sources while nurturing and maintaining connections to facilitate continual learning.

Learning is a process or "an ongoing experience involving the delivery of learning events across time and space" according to Bielawski and Metcalf [9]. The authors also point out that in most situations, it is difficult to distinguish where learning leaves off and where performance support begins and how knowledge management ties into these solutions. Thus, the goal of blended learning at Intel is combine all these approaches successfully so that formal learning activities are integrated with actual on-the-job activities to accomplish a specific learning goal. Another advantage of blended approaches is increased flexibility for learners enabling them to complete self-paced units at their convenience. Designers of the learning experience also find increased flexibility in implementing blended models because they are able to fit the skills being taught to the audience learning them.

Recent literature shows that blended learning is the most suitable for and the most popular among companies that are trying to reduce performer time away from jobs. The disadvantage of following an exclusively instructor-led approach is that it can cause employees to miss work and demand that they travel to classroom sessions. Blended learning models result in cost savings since employees spend less time in the classroom [7, 10] and also helps reduce time to certification. At Intel, the blended implementation of e-Basics curriculum resulted in cost savings of $12 million in about 15 months primarily due to students spending less time away from the job and due to reduced resources allocated towards in-class sessions including instructor time, facilities, etc. [7] This paper describes another blended learning implementation at Intel that also resulted in significant cost savings.

Blended learning if designed well, takes advantage of the assets of both instructor-led training and e-learning. It can be designed to enable greater interaction, social negotiation, and teamwork among students. Virtual classes, online learning environments, electronic conferences, instructor led classes and virtual dialogic learning communities where the "process of changing thoughts, ideas and information" is taking place [11, p.16] not only help students to explain their interpretations and listen to others' understandings, even when space and time separate them, they also enable students to communicate and receive feedback from the teacher [12]. According to Vygotsky [13], all learning is inherently social and learners benefit most from social interactions concerning tasks that they perform in collaboration with more knowledgeable or more experienced individuals.

A number of studies and reports indicate that a blend of learning methods or a hybrid model is better than any single modality of delivery on its own, regardless of content [1, 2]. The Thomson NETg Job Impact Study [14] also showed that blending of any type increases mastery on a task:

> Regardless of the specific instructional components used, a well-defined blended learning solution designed around scenario-based exercises heightens overall on-the-job performance (speed and accuracy) over non-blended learning [14].

While the impact of blended models on learning mastery and accuracy are important, the real value of blended learning lies in its potential to create learning experiences that can provide the right learning at the right time and in the right place for each and every individual while helping learners connect across global boundaries, cultures and time zones [15].

III. CASE SYNOPSIS

Intel utilizes thousands of manufacturing technicians to operate and maintain its factories. To minimize product defects, each technician works in one of the cleanest environments in the world. Intel and other semiconductor manufacturers limit the particulates released in the factory environment by gowning each technician in clean room attire with goggles and other gear as necessary.

Many of the manufacturing technicians are responsible for operating, performing preventative maintenance, and troubleshooting equipment. The performance of these tasks requires Intel to focus on hiring technicians with some core technical competencies. These core competencies of the manufacturing technicians vary by site and by geographic location. There are some challenges associated with delivery of blended solutions across a large variety of geographic locations. Each location has a different mix of manufacturing technicians. At some sites there are many knowledgeable and experienced technicians available. In other geographic locations there are very few technicians with the base knowledge and experience to successfully participate in the course. In all cases the experienced technician's time is a precious commodity that cannot be wasted. Instructional designers at Intel have to consider the time, experience, and formal education of the technicians because they directly impact course content, design, and delivery.

Each factory is equipped differently and access to a personal computer for training on the factory floor is limited in some sites. This makes delivery of blended learning solutions a challenge. As more and more of these and other courses are delivered electronically within the factory a more robust delivery system will be necessary. For the present, Intel has the capability to deliver blended solutions across all geographic locations using a combination of self-paced web modules, instructor led training and skills practice modules.

The equipment that is identified for blended solutions often has a high percentage of utilization. Tool downtime for training is limited as the tool is needed for production. The scheduling of a course must coincide with known tool time availability for the sake of training.

IV. SOLUTION DESCRIPTION

Students needed to acquire various components of knowledge and skill pertaining to specific equipment used for semiconductor manufacturing. Content was determined to consist of elements that fit into the cognitive and psychomotor domains. Upon taking into account training conditions, delivery environment and resource availability (people, infrastructure capabilities, dollars) and most importantly, target audience characteristics, we determined that the best solution would be a blended format using simulations, scenarios, and interactivities for higher retention rates. The key was to provide experiential learning so that our technicians could learn knowledge and skills through experience and hands-on approaches.

The blended learning approach we outlined is a performer-centric learning model that is focused on enabling technicians to accomplish learning goals within the context of the factory using a combination of solutions including experiential learning and self-paced learning, as well as collaborative and instructor led models. The program team implemented four different courses for Fabrication (Fab), Sort and Assembly-test audiences in the domain of factory equipment training. The team took the 12-day instructor led course in class and on the equipment and performed analysis on it. The course content is centered on the components, usage, and maintenance of equipment (or semiconductor manufacturing tool) known as 'testers' which are an integral part of the semiconductor manufacturing process. The content for the

course is mostly provided by and owned by the supplier of the tool. Based on a detailed content analysis in partnership with the supplier, we were able to convert the 12-day class into a blended solution consisting of the elements shown in Figure 1.

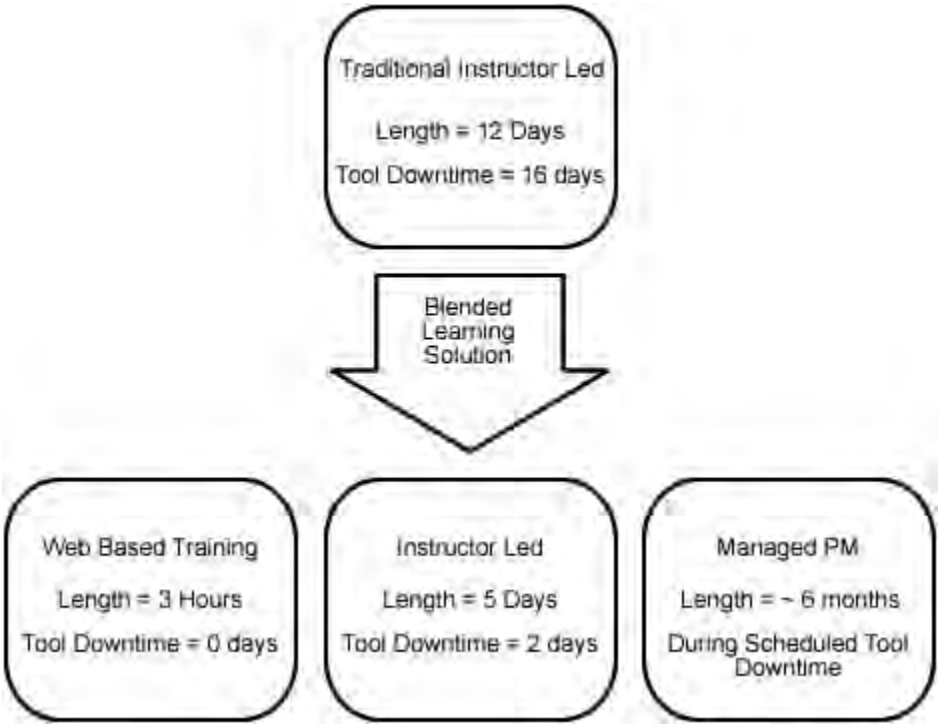

Figure 1. Graphical Representation of Traditional and Blended Solution Components

The blended course enables learners to obtain job-relevant basic cognitive objectives through the self-paced web-based module. The solution blend was comprised of web-based and traditional classroom and web based delivery combined with a proven on-the-job Training (OJT) method entitled Managed Preventative Maintenance (MPM). Figure 2 outlines the delivery components and the skills and knowledge addressed by each intervention.

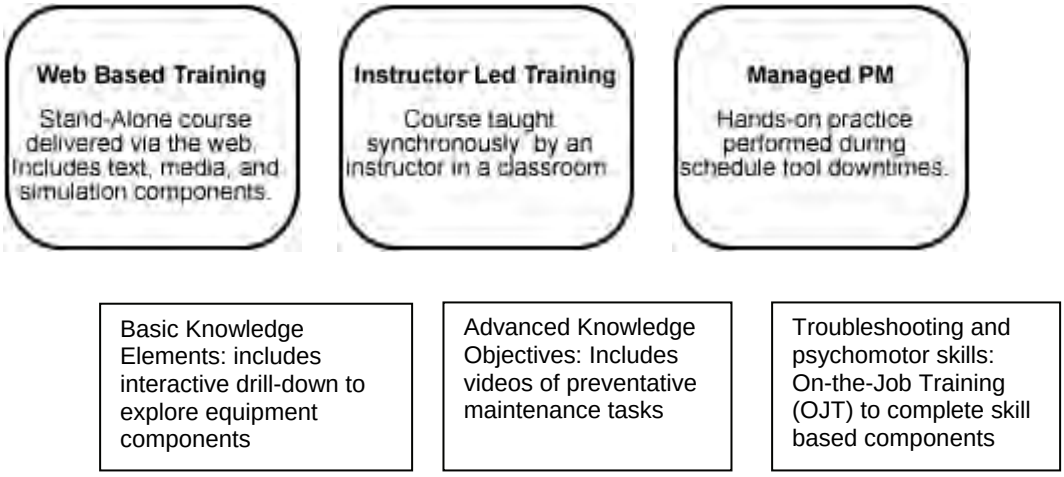

Figure 2. Delivery Components and the Skills and Knowledge Addressed By Each Intervention of the Blended Solution

The initial 12-day course required 16 days of tool downtime. Ten days were used for training over a two week timeframe. The tools stayed down on the weekend for 2 days and then required 2 days to come back into production. In the blended learning approach we were able to put the more intrusive tasks into Managed Preventative Maintenance (MPM), preventing the need to bring the tool down more than 2 days. The MPM utilizes existing tool downtime intermittently over a six month period to train without a noticeable increase in tool downtime for instruction.

The blended solution required students to come in with pre-requisite knowledge of tester tools. The IBL team developed a Web Based Training (WBT) course that included an interactive Virtual Precision Measuring unit (VPMU) module that allows students to apply the knowledge about basic testers using a working simulator of the tester unit. This VPMU was built entirely on a flash platform. The solution goes beyond basic page-turning functionality by enabling learners to apply the knowledge they have learned in the WBT through a software simulation of a Virtual Precision Measurement Unit (VPMU). The simulation includes an interface of the digital test equipment that allows students to manipulate knobs and set values of various parameters and then enables them to simulate the test as it would run on the factory floor. The simulation provides students with real-time feedback on the test, informs them which components of the test failed, enables them to reset parameters, refers to the web-based course and then continuously applies their knowledge until they have learned the correct parameters and values needed to perform various tests. The WBT is now being used for training new personnel on the fundamentals of tester operation for the Fabrication, Sort and Assembly Test areas of the semiconductor manufacturing process. This course is also a prerequisite to the blended learning course described above.

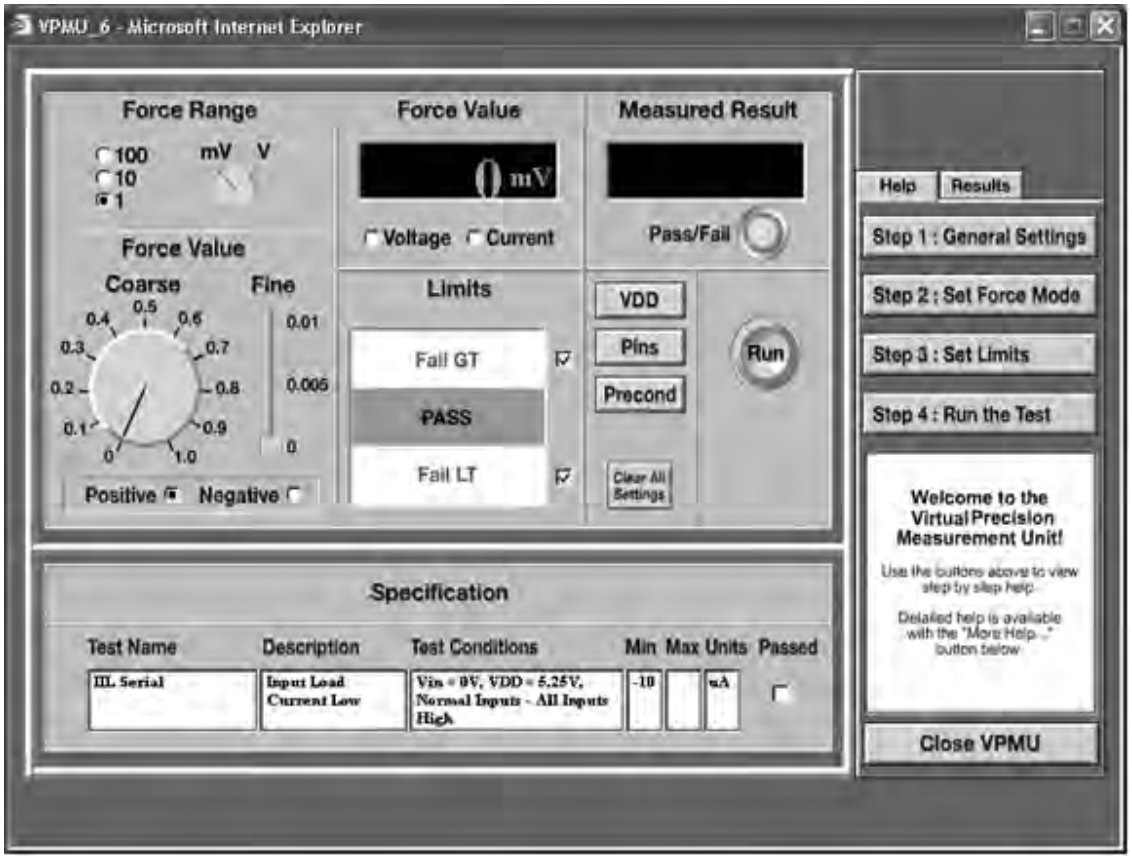

Figure 3. Screen Shot of the Interactive Virtual Precision Measuring Instrument Used in the Pre-requisite Course for the WBT

The Web Based Training is the first component of the blended course. Students are expected to complete this self-paced module to gain the basic knowledge components about the various parts of the tester equipment. The WBT delivery consisted of mainly text and images and contained a knowledge check at the end of the course. Students are also allowed to test out of the WBT if they already had basic knowledge about the functioning of the tester unit; this allowed experienced technicians to complete this module without the drudgery of going through the WBT.

The next module in the blended solution is the instructor led class which covered the advanced knowledge and critical skills needed for operating the tester. This session allowed students to actively engage with the instructor and other students in a face-to-face setting and practice critical skills in a hands-on manner on real equipment available as part of the learning setting. This instructor led portion of the class was also followed by a knowledge check to ensure that learning goals were met.

The Managed PM component of the blended solution has a focus on a hands-on approach for critical equipment maintenance skills. The MPM approach is an in-house approach focused on measuring quality, independence and efficiency with which the technicians can increase their knowledge and productivity while on the job. MPM uses a structured delivery mechanism through hands-on practice for training on a specific piece of equipment and enables technicians to individually demonstrate critical skills needed to work on the equipment in a concentrated learning environment. MPM helps reduce production tool down-time for training by leveraging previously scheduled equipment down time for skills practice resulting in a flexible and cost-effective solution.

The blended approach, particularly MPM, enables us to proliferate key knowledge and skills and develop people with Deep Smarts [16]; people who do work with good quality and exercise good judgment in everything they do. This type of worker is essential to the working of a good company and they possess experience-based deep knowledge of a specific area of the company’s business. Blended learning leads to the transfer of Deep Smarts (not just knowledge and skills). According to Leonard and Swap [16], the most efficient way to transfer Deep Smarts is through the use of knowledge coaches or experts who were motivated to share some of their deep smarts with protégés. Knowledge coaches provide guided experience to trainees enrolled in the MPM session which involves learning by doing, with immediate feedback loops. This approach creates deep understanding and allows the technician to gain knowledge they need as tied to specific contexts with tacit dimensions. The guided learning activities happen on the job, so the business situations are real and relevant to today's problems.

In speaking about blended learning, an important distinction has to be made between blended curricula and blended courses. Blended curricula involve different elements of the curriculum delivered using diverse delivery methods; this model has been around for decades. The blended course approach involves delivering a single course using hybrid delivery methods and therefore involves the need for tight instructional alignment and coordination. The program we are referring to in this article was responsible for implementing a blended course and not a blended curriculum.

V. DEVELOPMENT APPROACH

The blended learning courses developed by IBL leveraged existing content provided by suppliers of equipment to Intel for both courses by entering into a legal agreement with the suppliers. Additional content that was part of a course developed by Intel were also included where possible. The team also used an in-house tool that converts content from template to a web based toolset to build the web based modules. Both these strategies allowed the team to develop and deliver the blended learning solution efficiently.

New business processes associated with administering and delivering each component of the blended solution were introduced and added a layer of complexity to the course implementation. Without these new processes the delivery and tracking of the blended solutions would be impossible. Although these methods of deployment, especially for the MPM solution, were completely manual in the initial implementation of the course, future implementations will explore the possibility of increased automation in the delivery and tracking of course completions.

The entire IBL solution has been created and deployed using standard Intel systems. Table 1 outlines the various technical elements of the blended solution along with details on roles involved in development as well as the deployment strategy for the solution.

Blended Solution Component	Technology Element	Purpose	Stakeholder Roles	Deployment Strategy
Web Based Training (WBT)	Content Capture Template (MS Word)	Capture content within predefined template using word processor	IBL team – design and develop SME – Review design and development	Not Applicable
	Graphics, Interactive Macromedia Flash elements	Create visual elements for WBT module and embed within Web Authoring Toolset	Media Developer	Not Applicable
	Web Authoring Toolset (Created in-house)	Intel web authoring tool exports to HTML, JavaScript, and Flash	IBL team – design and develop SME – Review design and development	Online Learning Network (OLN) framework; one of Intel's internal systems for delivering WBTs via intranet
Classroom Experience	Intel Standard classroom template	Create instructional material	IBL team – design and develop SME – Review design and development	Intel University standard classroom delivery (scheduled classroom training)
	Intel Standard classroom template	Maintain and update the product as needed	Central corporate training group equipment training product owners	Intel University standard classroom delivery (scheduled classroom training)
	Internal registration process	Work through the Intel University course restricted registration process	Site training coordinators and technical training officers	Not Applicable
Managed PM	MS Word template	Create instructional material	IBL team – design and develop document SME – Review tasks for accuracy	One on one coaching with expert technician

Table 1. Summary of Technical Elements of Blended Solution, Roles Involved in Development and Deployment Strategy

The development of the blended course required overall coordination and collaboration across the various teams that were involved. Aside from basic project management, the development effort required close monitoring from an instructional design perspective to ensure complete alignment across the various components of the blended solution.

VI. MEASUREMENT OVERVIEW

The participants of this course included students from a wide variety of backgrounds and cultures. The target audience for the blended learning solutions has been equipment technicians in our factories in the Fabrication, Sort and Assembly/Test worlds. While the initial projects and the implementation have been focused on this audience, the approach and methodology are flexible enough to be applied toward any audience. The approach for the team has been focused on the need for the solution to be relevant to manufacturing technicians on the factory floor. The entire solution has been tailored to suit the equipment technician audience.

The Assembly/Test and Sort audiences have unique needs as far as learning style and language. Assembly technicians are culturally more inclined to learning within groups whereas Fab audiences are more suited to the individual self-paced learning style. The blended learning approach is flexible enough to be applicable to either of these audiences. The analysis phase of the approach ensures that solution selection is tailored to suit audience characteristics.

A. Kirkpatrick/Phillips Evaluation Model

The blended learning solution utilized a variety of evaluation levels to ensure that the solution was usable and relevant to the target audience. A summary of the levels of evaluation for each component of the blended solution is outlined in Table 2.

Kirkpatrick Level 1 evaluations give information about the satisfaction of trainees with the training they receive, whereas, Level 2 evaluations provide information as to whether the students learned the course content outlined in the objectives of the course sufficiently to close the knowledge gap that was addressed [17].

Component	Kirkpatrick Level	Pre-test	Post-test	Performance Assessment
Web-Based Training	1			
	2	X	X	
Classroom	1			
	2	X	X	
Managed Preventative Maintenance	3			X
Overall Blended Solution	4			

Table 2. Summary of Kirkpatrick's Levels of Evaluation for Each Component of the Blended Solution

The Level 3 evaluation attempts to answer the question "Are the newly acquired skills, knowledge, or attitude being used in the everyday environment of the learner?" It most often represents the truest assessment of a program's effectiveness. Measuring at this level is difficult, and thus requires important decisions in terms of when to evaluate, how often to evaluate, and how to evaluate. Although it takes a greater effort to collect Level 3 data than it does to collect data during training, its value is important to the training department and organization. Behavior data at this level usually provides insight into the transfer of learning from the classroom to the work environment and the barriers encountered when attempting to implement the new techniques learned in the program.

Interviews were scheduled and conducted when an individual finished the Managed PM portion of the course. The individuals were first requested to complete an online survey of questions and then participate

in the interview. For the interviews, the interviewers arranged to meet the participants either in a virtual or a face-to-face setting. In case of a virtual setting, the interviewer attempted to conduct the interview using a shared virtual environment so that participants could review the transcriptions of the interviewer and approve the capture of data. This data was then used for further qualitative analysis.

Evaluation of results at level 4 typically involves monitoring organizational improvement through work output and quality improvement, whereas at level 5, it is focused on cost savings and comparison of monetary benefits against costs. Jack Philips played a key role in extending Kirkpatrick's four levels of evaluation and defining the ROI model in detail [18]. The IBL program collected data and performed a detailed level 4/5 analysis to obtain a cost/benefit ratio. The cost/benefit ratio is calculated by dividing the sum of the savings by the sum of the costs. The sum of the savings is calculated by comparing the difference in costs in the traditional method versus the blended learning method. The sum of the costs includes developer, project manager, and subject matter expert, and resources costs.

B. IBL Methodology

The Intel Blended Learning Program team has developed a methodology (see Figure 4) that includes process steps, quality criteria, design guidelines, templates and training models for use in future blended learning implementations. We plan on enabling suppliers with these guidelines and tools to develop and deliver training to Intel manufacturing technicians and supplier technicians. This methodology will also be available to Intel training groups who need to develop blended training solutions. The methodology that includes design guidelines and training models for use in future blended learning implementations is being developed and will be updated as a "living" process by the Intel Blended Learning Program team.

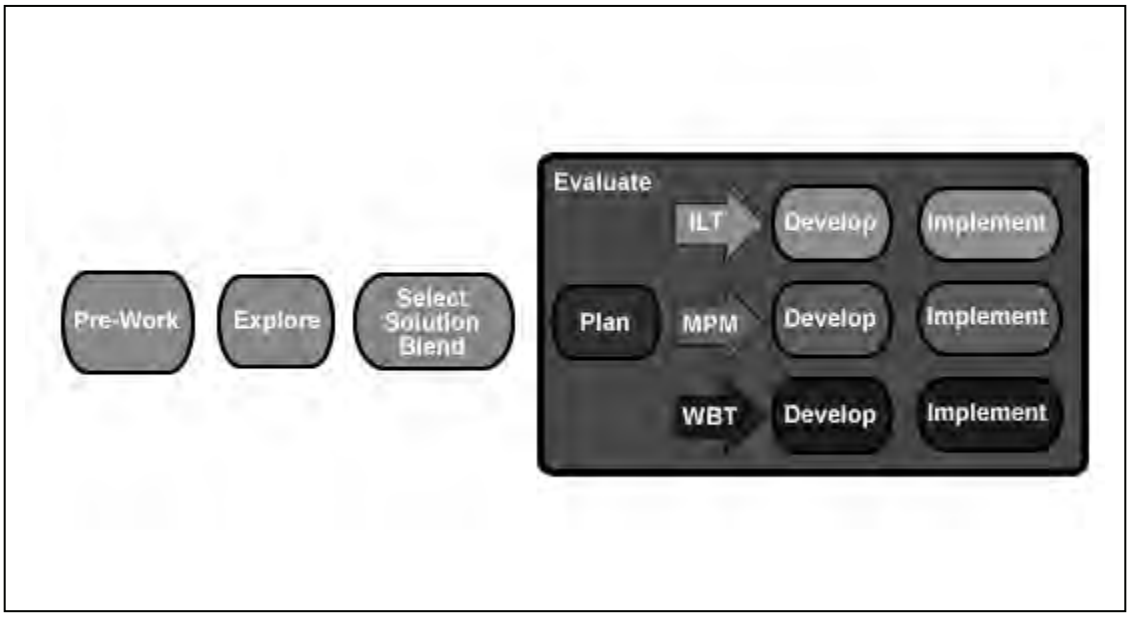

Figure 4: Intel Blended Learning Development Methodology

The vision is to enable this methodology to become a standard in the semiconductor industry thereby enabling our suppliers to deliver standard training using a blended approach for all toolsets. The methodology is being designed in a flexible manner so as to enable the inclusion of new components to the delivery model or the adaptation of the blended approach to include both formal and informal learning strategies.

VII. MEASUREMENT RESULTS

Data analysis consisted of a variety of different approaches for each part of the blended solution. The overall data consisted of both quantitative and qualitative data.

Component	Kirkpatrick Level	Results
Web Based Training (WBT)	Level 1	WBT was at least as effective as a traditional approach (70%) Questions relative to the course design and content all received very positive feedback (80% and above) Level of difficulty of the course was just right (83%)
	Level 2	93% average score on Post-Test
Classroom	Level 1	Training was equal to and potentially better than the traditionally delivered training Need for more time working hands-on with the tool during the instructor led component.
	Level 2	81% average score across sites; improvement of +31% at one site and +55% at another
Managed PM	Level 3 Survey/Interview	Qualitative analysis showed an overall positive response to the blended solution over the traditional delivery method
Overall Solution	Level 4	60% reduction in equipment downtime for training. 157% ROI Benefits Cost Ratio of 2.27

Table 3. Summary of Measurement Results for Components of Blended Solution

A. Web Based Training

The web based training component of the blended solution included an end of course survey to measure student reaction to the course. The responses were tabulated in Table 3 and the results show that despite the use of new technologies and instructional methods across global sites, the students felt comfortable utilizing the web based training element of the blended solution. In addition, each web based training course contained a pre- and post-test to measure the acquisition of knowledge as a result of the intervention administered. The web based training pre- and post-test were generated from a pool of questions related to the overall course objectives and content delivered. The passing requirement for the web based component was set at 70%.

B. Classroom

The instructor led training aspect of the blended solution was reduced from the traditional format by 60%. There was considerable interest in the impact of the reduction on learner satisfaction with the course. The data gathered in the end of course survey and the pre- and post-test are also summarized in Table 3.

C. Managed PM Solution

The Managed PM solution involved a completely unique deployment approach that involved students over an extended period of time; in order to obtain a detailed understanding of student experiences and seek to obtain an understanding of how students applied the knowledge they had gained, it became apparent that we would need to employ a qualitative approach for data gathering and analysis. We used a qualitative approach which seeks to understand how actions and roles influence participation and engagement within the hands-on OJT framework. Data analysis involved the collection of three different types of qualitative data: field notes, interview transcripts and other incidental data.

Data analysis involved the use of a qualitative analysis software program called QSR nVivo to develop categories and code the data. Interviews with students were transcribed and coded for analysis. Once coding was done, searches were performed using a variety of operators.

The qualitative analysis showed the following positive and negative results:

Positive

Good opportunity to do more applied troubleshooting

Flexibility to implement the learning after the training

Course generally meets expectations

Participants said they were more able to perform troubleshooting and solve problems on their own after taking this course

Participants were able to achieve the stated objectives

Helped in the development of skill levels

Having an internal instructor helped facilitate good communication during learning

Facilitated gaining certification and confidence

Good to know where to go for a support line during the training

Negative

There was overlap between the MPM tasks and the maintenance tasks

Needs more immediate assessment of knowledge and skills before moving into the practice environment

Some confusion between the two different toolsets

Lack of hands-on

D. Level 4/5 Evaluation Blended Learning Solution

The business impact and return on investment (ROI) for the blended solution were calculated by dividing the total savings per year from tuition costs, technician time away from factory, and instructor costs by the development costs, including developers, project managers and subject matter experts. The results showed that there was a 60% reduction in equipment downtime for training. There was a 157% ROI and a Benefits Cost Ratio of 2.27. In addition there was no apparent difference in student reaction between the blended learning methods compared to supplier delivered, instructor led training.

VIII. FINDINGS AND IMPLICATIONS

A. Effectiveness and Benefits

An advantage of the blended learning approach is that learning is spread out over a longer period of time which better prepares the student for hands-on application and working on the tool. Time spent learning on the machine is more effective because learners already have a mental model (tool concepts, machine operation, task practice, and vocabulary) to build on. Students also stated that they had increased confidence during tool hands-on sessions and that they felt better prepared as a result of the blended approach.

Manufacturing process and the standardization of that process across various Intel sites is encapsulated

within a key philosophy titled “Copy Exactly.” Intel can credit “Copy Exactly” with enabling the company to bring factories online quickly with high-volume practices already in place, hence, decreasing time to market and increasing yields. “Copy Exactly” solves the problem of getting production facilities up to speed quickly by duplicating everything from the development plant to the volume-manufacturing plant. In particular, it means ensuring that the process devised at the development facility is fine tuned not just for performance and reliability, but for high-volume production as well. Today, the following parameters are copied exactly from the development plant to the high volume manufacturing plant: the process flow, equipment set, suppliers, plumbing, manufacturing clean room, and training methodologies.

One of the key benefits noted through the implementation of the blended course described above is that the design of the course is suitable for labor models across a wide variety of Intel sites and geographies resulting in maintaining the “Copy Exactly” philosophy. The implementation of the course also resulted in increased partnership among the dispersed factories in areas of share training tool sets and instructor resources.

Web-based training is no different from other means of training when it comes to the need for continued feedback and guidance through environmental cues, job aids, performance support, mentors, and experts; but web-based training has the advantage in that it's easier to post a question to an expert by email and get an answer than to find an expert in person; thus, learning is more flexible. Also, learners are a valuable source of the information needed to refine and improve an educational environment. Questions and comments that come to the learner while on the job can be fed back into the instructional development process in a structured manner. This creates a loop that can fuel the continuous development and improvement process. Providing incentives isn't difficult. People who contribute chunks of information deemed valuable to peers will receive recognition doing so. Learners who take on a valued teaching role become more committed learners.

Web-based learning modules enable learners to practice vocabulary and key tasks through simulations without instructor or machine. Rich media helps break down the language barrier common to the Assembly/Test audience. Real-time access to the technician/expert/instructor in different geographical locations has been proven as a fringe benefit. Each blended learning, instructor-led training intervention takes into account the two-way and interactive communication via conversation with the students instead of only a one-way lecture. The instructor/expert is a facilitator instead of a lecturer. During the Managed PM process the equipment expert/student real-time interaction accomplishes coaching and practice. The overall result is faster delivery of time sensitive training, updating the workforce quickly and frequently.

Everybody is familiar with the structures, techniques, and methods of traditional instructor-led, classroom training, and Web based training. Full use of the combination of learning styles and meeting business needs of the organization at the point of use demands different structures, techniques, and methods; however, blended learning isn't merely a delivery mechanism - it has the power to transform the learning experience. Instead of discrete courses that students used to attend at an equipment supplier site, they can now access a continuum of courses, group learning environments, simple job aids, performance support and learning on-demand using the blended approach.

Standard instructional design principles were applied in the development of these learning solutions. The web-based learning and virtual simulation modules were available for students to practice with as many times as they need, providing a flexible and efficient way of learning.

1. Reducing Technician Time Away From Factory (TTAF) and Tool Down Time

There were two impacts that the IBL solution addressed: a lack of certified technicians to perform equipment maintenance, and the cost of corresponding equipment downtime. The program was able to show 30% reduction in travel costs. When implemented in partnership with factory resources and equipment suppliers, blended learning has helped mitigate the costs associated with technician time away from the factory and tool downtime for training while enabling the reduction of Technician Time Away from Factory (TTAF) by over 50%. The Managed PM solution resulted in a 30% increase in availability of production tools through reduction of tool usage for training. This enabled increased availability of technician time for problem solving. Creation of the IBL solution resulted in resolution to both the impacts identified above while ensuring a quality solution resulting in significant cost-savings for Intel.

The blended learning solution was able to reduce the time required to bring a manufacturing tool down for a predetermined amount of time for training through implementation of the MPM solution. The result was an additional 11 days of tool up-time each time the course was implemented. Additional up-time translates into increased total product throughput. This was particularly significant because the tester tool that was considered for the program was a constraint tool for the Sort manufacturing process.

2. Demonstrated Return On Investment (ROI)

A detailed ROI analysis on the program revealed an ROI roughly a 157% return with an excellent benefits-cost ratio of 2.27. The training developed by the IBL team also resulted in a 50% reduction of training throughput time. Bersin [2] cautions us to think of blended learning as a tool to improve performance, and not as a tool to reduce costs. This perspective was more than validated by our blended learning implementation. Even though we did see significant reductions in cost, the improvement in performance are far more significant overall.

B. Challenges and Risks in Implementing Blended Learning at Intel

Some of the challenges and risks in implementing a global blended learning initiative in a large multi-national corporation include disparate business processes, cultural differences, language barriers, and the ability to gather reliable evaluation data. Customizing the implementation to overcome these factors was one of the main challenges we faced. Separate business process flows were defined for each site that had varying business processes and systems, while translation and other localization techniques were utilized to overcome language-based issues. Localization was employed mainly for WBT content and level 3 evaluation. Despite the employment of localization, we learned that cultural learning styles may interfere with designed learning strategies. For example, we had designed the WBT module for completing key knowledge components to be implemented using a self-paced approach; however, we learned that in Asia, the delivery method included an instructor presenting the WBT content in a classroom format with translations incorporated to help alleviate issues with comprehension of English as a second language.

To overcome some of the barriers associated with a global implementation of blended learning interventions, we had to put several changed management practices in place. We found that the course administration systems and business processes available within Intel had not been designed to effectively support a blended learning solution. As a result, we had to introduce separate course codes for each IBL module to enable tracking at the individual element of the blend. Further, logistical overhead included non-standard business processes across global sites specifically for technical solutions pertaining to certification and tracking. These technical infrastructure gaps discovered during pilots will be plugged with the implementation of an enterprise-wide learning management system. Implementation of the Managed PM solution in particular required obtaining buy-off from a variety of key stakeholder groups

and the articulation of some key changes to responsibilities for key roles such as site training coordinators.

Evaluation of the blended solution also presented a new set of complexities during the implementation of the blended solution. The evaluation method was complicated by the fact that data had to be gathered from multiple interventions in a variety of different formats (due to the fact that systems used for delivery of the solution elements were different). Business process for collecting evaluation data is different for each intervention.

IX. CONCLUSIONS AND RECOMMENDATIONS

Overall, the impact data indicated that blended learning is a viable and cost effective solution to provide support for equipment training at Intel from the perspective of the ROI and cost benefit analyses. While it was no surprise that the effectiveness results for the WBT element of the blended solution were aligned with the scores for other traditional stand-alone WBTs, the major findings were centered on the student reaction data. Even though students had to go through a complex set of interventions in the blended solution, it was surprising to note that there were no apparent differences in student reaction between the blended learning method compared to the traditional monolithic training module. Blended learning in this case showed significant results in acceptance, comprehension, and return on investment. It is likely that results from future blended learning solutions will deviate some from current results based on situational factors, although it is not expected that these deviations will be significantly greater or less than the current results. Further analysis of blended learning solutions will be necessary to determine the variation across projects. The preliminary data on other courses to date at Intel show very similar results.

Clearly, a hands-on approach to learning was a huge favorite among technicians. The Managed PM module provides a structured framework for OJT without tool constraints and was an effective method of promoting experiential learning (learning by doing). In fact, our findings from the Level 3 analysis of the MPM module indicate that this learning by doing method is one of the key factors for retention of learning. MPM is a key element for BL, but we learned that implementing MPM without a good technical infrastructure can be inefficient as well as labor and time intensive.

An excellent technology infrastructure alone cannot make a blended learning solution effective, but ensuring that technology such as a Learning Management System (LMS) is available to track the completion of each and every component of the blended solution is very important. An LMS will also be useful in tracking whether pre-requisites are met prior to enrolment in the program. It is very important to realize that very few LMS systems have the ability to track all elements of a blended solution. For example, in our pilot implementation, we were able to track the completion of the web based and instructor led components of the program within standard learning systems within our company; however, the Managed PM program was entirely rolled out using a manual system for tracking student progress and only the final completion was tracked through a manual entry into our overall certification system. This implementation model was extremely labor intensive and required a lot of detailed planning and process support through a variety of different roles from partner organizations. Each site that implemented the program provided local implementation owners to ensure the smooth conduct of program, ownership of tracking and reporting of student progress and coordination of student training with preventative maintenance schedules within the factory for the MPM component. While we were able to implement the program in this manner, we are now considering developing an automated system to help ease the support needed for this element of the program.

Designing blended learning for global audiences requires that designers examine the solution from all aspects, specifically the environmental, cultural and audience characteristics aspects and not just the pedagogical. Although our program was designed for the Sort manufacturing sites which are primarily located within the United States, our program was implemented globally within our Assembly-Test sites as well, due to the fact that they were also using the same tester tool and had a need for the program. As a result of this change, we encountered some site specific issues during our program implementation. Several of the learners at our Asian sites, particularly in China, were not very familiar with English and consequently this resulted in difficulties with deploying this complex program at those sites. We recommend exploring options for localization of learning content for international sites. This will need to be a separate effort funded appropriately to avoid site level implementation issues.

Implementing a successful blended learning solution requires that designers pay attention to simple logistical challenges that students might face. For example, we had designed our program so that each component of the blended solution was delivered at a different physical location. The student could complete the e-learning solution at a standalone computer or on their laptop. One key lesson we learned was that infrastructure capabilities at various sites was somewhat varied particularly in the area of speed of network access for web based components. In the future, we plan on enabling learning labs to make it easy for learners to attend and complete the technology based elements of the solution without having to worry about technical specification and configuration. It is also critical to design the program in such a way that sequencing of instructional modules, if any, is implemented correctly. This requires excellent documentation, communication and management to ensure that students complete the components of the blended solution in the specified order, so as to obtain the benefits of the intended design of the learning solution.

Another key to the success of the program was the work that went into the plan, launch, marketing and evaluation of the program. Support from management and site coordinators to facilitate and drive the program was critical for adoption of this new approach.

In our experience, the success of the blended course depended on the overall emphasis of standard instructional approaches, which were based on problem identification for defining the approach to blending, instructional development and evaluation techniques. Several team members had a strong background in instructional design and we also had successful partnerships with content experts, which contributed to the successful implementation of our program.

X. SUMMARY

The complexity of equipment and cost of training are both increasing annually for high tech semiconductor manufacturing. In addition, there is a demand that the lead times to proficiency decrease to support rapid product introductions as global competition increases. To meet the new demands requires an evolution from traditional learning to blended learning. Blended learning involves interactive learning activities (discussion, simulation, role-playing, experimental, mentoring, interactivity, case studies, games, support). Blended learning goes beyond good and basic training to a more systematic education that promotes ongoing learning [4].

Intel Corporation also feels the pressure to decrease costs while improving the quality of the learning experience in terms of lead time and proficiency. Based on a detailed content analysis in partnership with the supplier, we were able to convert the 12 day class into a blended solution consisting of a 5 day Classroom, a 3 hour Web Based Training (WBT), and a Managed Preventive Maintenance (MPM) for

On-the-Job Training (OJT). The results of the blended learning implementation demonstrated a 60% reduction of technician time away from the factory, benefits cost ratio of 2.27, and an ROI of 157%. Based on the results, blended learning is a viable and cost effective solution to provide support for equipment training at Intel from the perspective of the lead time to proficiency, ROI, and cost benefit analyses.

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XII. ABOUT THE AUTHORS

Veena Mahesh is a Senior Knowledge Strategist in the Knowledge Enablement program for the Technology Manufacturing Group (TMG), of Intel Corporation. She received her PhD in Educational Technology from Arizona State University. Her work supports strategic efforts to improve utilization and transfer of knowledge, the development of effective methods and technology to enable key business processes and the improvement of knowledge management and learning practices across TMG.

Craig Woll is a Senior Learning Technologist for Intel Corporation. He received his PhD in Instructional Technology from Utah State University. He works with internal and external customers to develop strategic learning packages to meet Intel's strategic objectives.

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WHY DO HIGHER-EDUCATION INSTITUTIONS PURSUE ONLINE EDUCATION?

Stephen Schiffman
Babson College and Franklin W. Olin College of Engineering

Karen Vignare
Michigan State University

Christine Geith
Michigan State University

ABSTRACT
Using a unique item included for the first time in the Sloan Consortium's 2006 national survey of online learning, the authors analyze the reasons why higher-education institutions engage in online learning. Nine reasons are explored from contributing to extension efforts to returning a surplus. Eight of the nine reasons are found to vary in importance depending on the type of institution. Significant differences were found for associate-level institutions, for-profit institutions and large-enrollment institutions. The authors examine the findings for access and quality themes.

KEYWORDS
Online Education, Business Models, Business Strategy, Institutional Mission, Organizational Context, Organizational Goals, Access, Quality, Revenue

I. INTRODUCTION

A. Background

The rapid growth of online learning has created a complex organizational landscape in higher education [1]. A review of the literature by the authors [2] uncovered a lack of research into this new organizational landscape for online learning. There are case studies, suggested taxonomies, and surveys of some business practices. However, the authors could not identify any quantitative studies focused on the business models or business strategies for online learning used in U.S. degree-granting institutions.

To apply successful business models, strategies and practices from other institutions requires knowledge of the similarities and differences in their organizational contexts for online learning. For example, are they able to hire and fire faculty directly? Do they have the authority to create new curricula? What is their market? What is their cost structure? Readily available institutional information, such as type of institution, enrollment level, Carnegie classification and enrollment in online learning does not provide insight into the contextual factors that affect the business issues of online education.

No "markers" yet exist to differentiate and categorize the various online learning contexts across institutions. This is the goal of the authors' research and the focus of this first of two articles sharing the findings of their national quantitative study.

B. Previous Research

The authors' research during the past three years has provided initial insight into the context question. Research has included exploratory interviews [3], case studies [4], feedback from seminars and workshops [5, 6, 7, 8], literature review and initial survey work [2].

An exploratory study of fifty people at eleven not-for-profit higher-education institutions by Schiffman [3] identified a number of current business concerns among innovators and early-adopters of online learning in U.S. institutions. The concerns included revenue distribution and generation, compensation, planning, course and degree regulation, marketing, student services, sources of capital, cost management and product development. These business issues were concerns even among institutions with a track record of successful growth in online enrollments. These issues and the differing organizational characteristics were further explored in a series of two Sloan Consortium workshops including nine case studies [4, 5].

Initial exploratory survey work with 110 institutions by Vignare, Geith and Schiffman [2] concluded that how an online learning unit is funded and how close it is to the academic core appears to have impacts on the level of control or influence it has over certain business-related and quality functions of online learning. This conclusion reinforced the relationship between business issues and organizational context.

In the previous findings [2, 3], standard organizational data did not fully explain the differences among contexts. Carnegie Classification did not entirely explain the different institutional missions and motivations for online learning. Also, the type of institutional control—profit or non-profit—did not fully explain the differences. Contextual factors such as enrollment trends, faculty demographics, and local economic climate also played a role in shaping the online learning organizations studied.

One aspect of organizational context put forth by Miller and Schiffman [9] speculated that institutions began their online learning programs with the intention to either extend access to degree programs to new off-campus students, or to improve the quality of existing programs. They also speculated that the way online learning was organized within any given institution would depend to some degree on which goal—access or quality—the institution was pursuing.

C. Two Key Variables

The findings from the authors' research suggested focusing attention on two key variables to explore on a national level: (1) an institution's reasons for engaging in online learning; and (2) how institutions have organized their online learning initiatives. These two variables appear to hold the most promise for making sense out of the wide variety of organizational contexts for online learning. Two questions were prepared for inclusion in the 2006 Sloan Consortium National Survey of Online Learning, the most respected national survey of online education in the United States. This paper focuses on the results of the first variable listed above: the reasons for engaging in online learning. A second paper will focus on the results of the second variable.

II. METHODOLOGY

A. Sample

Responses were drawn from the 2,251 institutional responses to the 2006 Sloan Consortium Survey, *Making the Grade* [10] which went to every chief academic officer in the United States. For this analysis,

the authors only wanted to include institutions which engage in online learning; therefore, only those institutions which replied to question five, indicating that currently they were offering online learning programs, were included in this analysis. An additional cut of the data was done to make sure those institutions who answered question five also gave responses to the two questions added by the authors. Of the total 2,251 respondents to the 2006 survey, 738 (33.2%) are currently engaged in offering online learning programs and responded to both questions posed by the authors.

B. Survey Question

Using their previous research, including the internal and external drivers for online learning identified by Schiffman [3] and four items that were tested in the exploratory survey [2], the authors developed a list of common reasons for engaging in online learning. Nine reasons were selected to be included in question eight of the 2006 Sloan Consortium survey (Table 1). The survey respondents were asked to choose any of the nine responses and indicate their agreement to each response using a Likert Scale. Multiple responses were allowed.

Table 1. Question Eight From 2006 Sloan Consortium Survey

8. **My institution is engaged in online learning to:** ***Please select the most appropriate response for each item. Please skip to the next question if your school does not have any online offerings.***							
	1 Strongly Disagree	**2**	**3**	**4 Neutral**	**5**	**6**	**7 Strongly Agree**
Return a surplus to the institution							
Contribute to the extension efforts							
Contribute to traditional on-campus student retention							
Increase the diversity of student body							
Enhance value of university brand							
Increase the speed to graduation for traditional on-campus students							
Reduce or contain costs							
Provide pedagogic improvements							
Get students from new geographic regions or new markets of students							

C. Data Analysis

Responses to the 2006 Sloan Consortium survey [10] were linked to institutional descriptive data via the Integrated Postsecondary Education Data System, enabling analysis at several levels of granularity. For each of the nine possible reasons, data were analyzed in three different ways:

1. By three types of institutional control:
    a. Public
    b. Private not-for-profit

   c. Private for-profit
2. By five Carnegie classifications:
   a. Doctoral/Research
   b. Master's
   c. Bachelors
   d. Associate
   e. Specialties
3. By five categories of enrollment size:
   a. Large (Greater than 15,000)
   b. Medium to large (7,500 to 14,001)
   c. Medium (3,001 to 7,499)
   d. Small to medium (1,501 to 2,999)
   e. Small (Less than 1,500)

The standard tests used were an initial ANOVA to look for statistical differences while using Levene's test of homogeneity. If Levene showed a significant difference then nonparametric tests were performed. When Levene indicated the data sets were homogeneous despite what seem like large sample size differences, ad hoc tests of Tukey and Bonferroni were performed to determine pairwise statistical differences. Furthermore, even if Levene was not statistically different (i.e. normal) non-parametric tests were still performed to confirm the statistical differences found in previous tests.

III. FINDINGS

Table 2 shows the percent of all survey respondents who either agreed or strongly agreed in the agree column and those who answered disagreed or strongly disagreed with a particular statement. Table 2 shows, in descending order of agreement, the statements from question eight on the survey.

Table 2. Agreement with Reasons for Engaging in Online Learning

Reason	% Agree	% Disagree
Get new students	57.0	5.1
Contribute to extension efforts	46.0	6.9
Enhance brand	32.2	11.3
On-campus student retention	31.6	11.3
Provide pedagogic improvements	28.7	8.7
Increase student diversity	23.8	12.0
Return a surplus to institution	20.9	24.8
Increase student speed to graduation	20.4	17.1
Reduce or contain costs	12.8	23.0

Results of the statistical analysis are summarized below. The findings and associated statistical tests are in Appendix A.

Get new students: There is no statistically significant difference in responses by control, types of degree, or enrollment size. Based on several tests, no differences could be found among the Likert Scale rankings of agreement.

Contribute to extension efforts: There is a statistically significant difference by type of institutional control. Statistical tests show that public institutions agree with this more as a reason for being involved in online learning compared with privates or for-profits. The pair-wise analysis upholds a strong statistical difference between public and for-profits. There is a statistically significant difference at the third decimal place which rounds up to .05 between Public and Private not for-profit.

Enhance brand: Analysis shows a statistically significant difference by institutional control. Data indicate that for-profits agree with this statement more than privates or publics. The initial ANOVA upheld a statistical difference but the post ad-hoc tests resulted in a statistical difference for only for-profits versus publics. A nonparametric test did uphold statistical differences among public and private, for-profit and private, and not for-profit and private for profit.

On-campus student retention: The only statistically significant difference is among the Carnegie classifications and data show that associate institutions agree with this more than other Carnegie classifications.

Provide pedagogic improvements: The only statistically significant difference exists among the Carnegie classifications. The data shows that associate institutions agree with this more than other Carnegie classifications but are only statistically significant compared to specialized institutions.

Increase student diversity: The only statistically significant difference exists among the Carnegie classifications and type of institutional control. The data show that associate institutions agree with this more than other Carnegie classifications. Associates are statistically different from Masters, Baccalaureate and Specialized institutions. The data also show the private not-for-profit disagree with this reason more than the others and that increasing diversity is statistically different for private not-for-profit versus both public and private for-profit.

Return a surplus to institution: The only statistically significant difference is that private institutions, both for-profit and not-for-profit, agree with this statement more than public institutions. It is noteworthy that because public institutions represent a larger group in the sample, their responses shifted the percentage of agreement to a negative rating.

Increase student speed to graduation: There is a statistically significant difference by enrollment size and by Carnegie classifications. The data indicates that institutions with larger enrollments agree with this statement compared to institutions with smaller enrollments. However, only institutions with enrollments under 1,500; between 3,000 and 7,499; between 7,500 and 14,999; and over 15,000, are statistically different. The exception to the general principle that institutions with larger enrollments agree more with this statement, are institutions with enrollment between 1,500 and 2,999; and between 3,000 and 7,499. Associate institutions agree with this more than other types of Carnegie classifications and are significantly different from masters, baccalaureate and specialized institutions. Baccalaureate institutions disagree more with this statement than other institutions and are significantly different in their response from doctoral, masters, associates and specialized institutions.

Reduce or contain costs: Analysis indicates statistically significant difference by control and by types of Carnegie classification. Data shows that for-profits agree with this more compared with publics or private not-for-profits, but only private not-for-profit and for-profits are statistically different. Associates rank their agreement as higher than other institution types. Associate institutions are statistically different from baccalaureate and masters institutions. More respondents disagreed with this statement than agreed.

IV. LIMITATIONS

Survey bias exists from only including institutions that have commenced online learning. However, it is critical to start with engaged institutions to look for differences in reasons for offering online learning and to ultimately be able to provide insight to institutions considering offering online learning. In addition, because there are multiple independent variables within the data, the statistical analysis presented may still have multiple collinearity effects.

V. DISCUSSION

The single reason, across all types of respondents, to engage in online learning with which the majority (57%) of institutions agreed was "Get students from new geographic regions or new markets of students." The number two reason, with which nearly half (46%) of respondents agreed, was "Contribute to extension efforts." The other seven reasons were selected by a minority of respondents (32.2%–12.8%). There were, however, interesting differences when examining types of institutional control, types of institution and enrollment levels.

A. Differences by Type of Institutional Control

Based on their past research, the authors expected to find that the type of institutional control would make a difference in the ranking of reasons for engaging in online learning. According to the survey, for-profit institutions agreed with "enhancing the brand," "returning a surplus to the institution" and "reducing or maintaining costs" as more important reasons than did public or private institutions.

Survey results also indicate that public institutions agreed with "contributing to extension efforts" as more important when compared to for-profit or private institutions. Publics also ranked "returning a surplus to the institution" as less important compared to for-profit or private institutions.

These results contradict an earlier survey by the authors [2] where "returning a surplus to the institution" was one of the top two "very important" reasons for engaging in online learning. The authors argue that the terms "extension" and "new students," could imply new revenue in the context of public institutions whose missions are to have an impact in communities. The terms "extension" and "new students" may be more acceptable to publics than agreeing with "returning a surplus." "Enhancing the brand," "returning a surplus" and "reducing and maintaining costs" are familiar terms in the context of for-profit institutions.

The authors also speculate, based on their experience, that the reason more respondents disagreed than agreed with two other money-related reasons (return a surplus and reduce or maintain costs) may be more a reflection of the level of institutional results in those areas, as opposed to reasons for engagement.

One other difference exists among institutional control types. The private not-for-profit institution disagrees more than public and private for-profit that online learning can help increase the diversity of student body.

B. Differences by Carnegie Classification

A significant finding is that compared to bachelor and doctoral institutions, associate institutions place more importance in their agreement on several of the nine reasons: "retention for on-campus students," "pedagogical improvements," "speed to graduation," "diversity of student body" and "reducing or maintaining costs." While associate institutions agree more with statements, it is critical to juxtapose these findings with the facts that as a group these institutions have higher online learning enrollments and have been offering online longer than many other institutions. Associate institutions continue to enroll more online learning students than all other types of Carnegie classifications [10, 11, 12, 13]. Allen and Seaman 2006 [10] data show 50% (1,547,522) of the 3.1 million students enrolled in the Fall of 2005 were in associate institutions. In other words, Associates could have more experience since they enroll more students.

C. Differences by Enrollment

Survey results indicate only one significant difference by enrollment size. Institutions with enrollments greater than 7,500 agree "increasing student speed to graduation" is a more important reason for engaging in online learning compared to institutions with smaller enrollments.

D. Quality and Access Perspectives

Another way to examine the reasons for engaging in online learning is to view the reasons through the lenses of access and quality [9]. Each of the nine possible responses to the survey question could be interpreted as either an "access" motive or a "quality" motive. The authors believe that most people would agree that the responses "get new students" and "contribute to extension efforts" are "access" goals; and that "provide pedagogic improvements", "improve on-campus student retention", "increase students diversity" and even "increase student speed to graduation" are "quality" goals. The remaining three responses relating to brand or money and were not as easily categorized, but the authors chose to interpret them as "quality" goals because they reflect ubiquitous characteristics of "high quality" institutions such as being financially healthy and well-known.

The following table is a restatement of Table 2, with an extra column added showing the authors' interpretation as to whether each response is an access or quality goal. Through the lenses of access and quality, data seem to imply that institutions more generally agree that they are pursuing online education as means to extend access rather than to improve quality.

Table 3. Access and Quality Goals

Reason	% Agree	% Disagree	A/Q
Get new students	57.0	5.1	A
Contribute to extension efforts	46.0	6.9	A
Enhance brand	32.2	11.3	Q
On-campus student retention	31.6	11.3	Q
Provide pedagogic improvements	28.7	8.7	Q
Increase student diversity	23.8	12.0	Q
Return a surplus to institution	20.9	24.8	Q

Increase student speed to graduation	20.4	17.1	Q
Reduce or contain costs	12.8	23.0	Q

VI. CONCLUSION

Getting students from new geographic regions or new markets of students is the top reason for engaging in online learning according to respondents to the 2006 Sloan Consortium national survey of online learning. Eight other reasons were also surveyed with public institutions favoring "contribute to extension efforts" and for-profit institutions favoring "enhancing the brand," "returning a surplus to the institution" and "reducing or containing cots." Associate institutions favored a number of quality-related reasons including retention, pedagogic improvements and student diversity.

These findings are the first quantitative national data focused on reasons for engaging in online learning across all institutional types of control, Carnegie classifications and enrollment levels. As such, they begin to fill a gap in the literature and shed some light on the various organizational contexts for online learning.

This is the first in a series of articles analyzed the reasons for engaging in online learning. The authors conclude from the results that in general, access-related reasons are more prevalent than quality-related reasons in 2006. The second article in the series analyzes responses to "how are you organized for online learning" and will provide insights into the relationship between the reasons and the organizational implementations of online learning.

VII. SUGGESTIONS FOR FUTURE RESEARCH

Several findings point to the need for additional research. How much might the terms "contribute to extension efforts" and "get new students" be obscuring potential revenue-related reasons for engaging in online learning? Understanding the full meanings of the terms may help identify meaningful similarities in business issues and practices between public and for-profit contexts.

Another area to examine is to what extent the nine reasons are "life cycle" dependent. Are associate institutions more focused on quality because they have been offering online education longer than other types of institutions, or are they focused on quality due to the characteristics of their faculty or student body? Did associate institutions start out with an access reason that evolved into a quality reason? Will other types of institutions begin to view online education as a means to improve the quality of education once their access goals have been reached? Is there a critical success point (also referred to as a "tipping point") where institutions' reasons for offering online education change? Answers to these questions can only be answered by collecting data on the reasons for engaging in online learning over time.

VIII. ABOUT THE AUTHORS

Dr. Stephen Schiffman is currently Associate Professor of Entrepreneurship at both Babson College and the Franklin W. Olin College of Engineering. At Babson, Steve was dean of the undergraduate program for 8 years while a new undergraduate business curriculum was developed and launched in the fall of 1996. In 1997, the Pew Charitable Trusts recognized this effort by selecting Babson for a Pew Leadership Award for renewal of undergraduate education. Steve holds a Ph.D. in mathematics from Dartmouth College as well as an M.S. in management from Sloan School, MIT. He has taught at the University of

Colorado and Colorado College, and, prior to joining Babson College, he worked at Digital Equipment Corporation.

Karen Vignare currently serves as the Director of MSU Global Ventures at Michigan State University. In that role, Karen is responsible for creating online entrepreneurial approaches for extending both noncredit and credit programs at MSU. She was the Sr. Research Analyst for the Online Learning Department at the Rochester Institute of Technology. Karen was a full-time faculty member at SUNY-Alfred State in the marketing, retail, and computer technology fields. She also served as a vice president and political economist for a Wall Street financial firm. She publishes regularly on various topics in online learning. She has an MBA from the University of Rochester's William Simon School of Business and a BS from Frostburg State University in political science and economics. She is currently attending doctoral classes at Nova Southeastern University.

Dr. Christine Geith is Assistant Provost and Executive Director of Michigan State University's MSU Global, the university's entrepreneurial business unit that works with academic partners across the campus and worldwide to develop online institutes, programs and services. She is responsible for developing strategic frameworks and business models and leading all activities that impact revenue growth. Dr. Geith's research interests include costs, benchmarks and business models for online and blended learning. Dr. Geith has over fifteen years of experience in online learning including four years as director of MSU Global Ventures. Prior to joining MSU, Dr. Geith was executive director of e-learning at Rochester Institute of Technology. Dr. Geith holds an M.B.A. from Rochester Institute of Technology and a Ph.D. from the University of Nebraska-Lincoln in Higher Education Leadership.

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XI. APPENDIX

Table 1. p Values by Carnegie Class versus Reasons for Online Learning

	Doctoral	Masters	Baccalau-reate	Associates	Specialized
Contribute to traditional on-campus student retention	Statistically Significant difference p=.00 Follow up tests (Kruskal-Wallis (KW)) indicate only Associates are significantly different				
Associates	KW p=.00	KW p=.00	KW p=.00		KW p=.00
Increase the diversity of student body	Statistically significant difference p=.000 Follow up KW tests showed Mean Rank of Associates is higher and statistically different than Masters, Baccalaureate, and Specialized				
Associates		KW p=.001	KW p=.001		KW p=.001
Increase the speed to graduation for traditional on-campus students	Statistically Significant difference p=.00 Follow up KW tests found both Baccalaureate and Associates were different. Mean Ranks were higher for Associates compared to others while Mean Ranks were lower for Baccalaureate institutions				
Associates		p=.023	p=.000		p=.041
Baccalaureate	p=.027	p=.002		p=.000	p=.002
Reduce or contain costs	Statistically significant difference p=.039 Follow up tests indicate while Associates Mean Rank is higher than other Carnegie classes, KW p values are only statistically significant between Associates and Masters KW p=.049 And between Associates and Baccalaureates KW p=.014				
Provide pedagogic improvements	Statistically significant difference p=.041 Follow tests indicate while Associates Mean Rank is higher than other Carnegie classes that only KW p values are statistically significant Between Associates and Specialized KW p=.023				

Table 2. p Values by Institutional Control versus Reasons for Online Learning.

	Public	Private Not-for-Profit	Private for Profit
Return a surplus to the institution	Statistically significant difference p=.000 Public institutions rank returning a surplus lower than either Private not For-Profit and Private For-Profit		
Public		KW p=.000	KW p=..001
Contribute to extension efforts	Statistically significant difference p=.014 Public institutions rank returning a surplus lower than either Private not For-Profit and Private For-Profit		
Public		KW p=.047	KW p=.001
Increase the diversity of student body	Statistically significant difference p=.006 Private not for-profit rank this as less important than either Publics or Private for-profit		
Private not for profit	KW p=.006		KW p=.016
Enhance value of university brand	Statistically significant difference p=.037 Private for-profit rank enhancing brand as higher than Public or Private not-for-profit		
Private for profit	KW p=.003	KW p=.015	
Increase speed to graduation for traditional on-campus students	Statistically significant difference p=.000 While both public and private for profit rank increasing speed to graduation higher there is only a statistically significant difference between private not-for-profit and public KW p=.000		
Reduce or contain costs	Statistically significant difference p=.009 While both public and private for profit rank reducing or containing costs higher there is only a statistically significant difference between private not-for-profit and private for profit KW p=.002		

Table 3. p Values by Enrollment Size versus Reasons for Online Learning.

	Less than 1.5K	Between 1.5K and 3K	Between 3K and 7.5K	Between 7.5K and 15K	Over 15K
Increasing speed to graduation for traditional on-campus students	Statistically significant difference p=.002				
Less than 1.5K			KW p=.035	KW p.006	KW p=.022
Between 3.5 to 7K		KW p=.011			

NOTE: For a complete data set, readers are encouraged to contact Karen Vignare at vignare@msu.edu.

BRIDGES AND BARRIERS TO TEACHING ONLINE COLLEGE COURSES: A STUDY OF EXPERIENCED ONLINE FACULTY IN THIRTY-SIX COLLEGES

Peter Shea
University at Albany, State University of New York

ABSTRACT

This paper reports on initial findings from a research study of factors that enable and constrain faculty participation in online teaching and learning environments. It is noted that demand for higher education continues to grow in the United States. It is argued that the nature of the higher education student population will likely continue to transform towards a non-traditional profile. These two trends drive an increased demand for alternative routes to a college degree and have fueled dramatic growth in online learning recently. The study identifies faculty acceptance of online teaching as a critical component for future growth to meet this demand and ensure quality. Through analysis of data from 386 faculty teaching online in 36 colleges in a large state university system, the most significant factors that support and undermine motivation to teach online are identified. The top motivator is a more flexible work schedule. The top demotivator is inadequate compensation for perceived greater work than for traditionally delivered courses, especially for online course development, revision, and teaching. However, respondents in this study chose to teach online for a wide variety of reasons many of which were associated with demographic and contextual differences. These distinctions are reviewed in light of their implications for future quality of online education. Additionally, through factor analysis, underlying constructs for online faculty motivations are identified. Finally, recommendations are made for policy, practice, faculty development and future research.

KEYWORDS

Faculty Participation, Motivators, Demotivators, Flexibility, Compensation, Faculty Satisfaction, Policy, Practice, Development

I. INTRODUCTION

Demand for higher education continues to grow in the United States. Statistics from the United States Department of Education indicate a 101% increase in the number of students enrolled in college between 1970 (7.3 million) and 2004 (14.7 million), and enrollment is predicted to continue to rise [1]. According to the National Center for Education statistics, the number of new undergraduates is expected to reach a new high each year from 2007 through 2015 [1]. This may not be surprising in that higher education has long been identified as means of increased social mobility. The monetary value of higher education is fairly clear, for example according to the Census Bureau, over the course of an adult's working life, high school graduates earn an average of $1.2 million; associate's degree graduates earn approximately $1.6 million; and bachelor's degree holders earn about $2.1 million [2]. Other researchers report that the differential in salaries based on educational attainment has increased over time such that male bachelor degree holders between the ages of 18–35 now earn 94% more than their higher school graduate counterparts [3]. However, other recent statistics reported by the Department of Education suggest that a

college degree may primarily allow wage earners to avoid losing ground, noting that workers whose terminal degree was a high school diploma saw a sizable decline in constant dollar wages from 1980–2004, while college graduates saw modest gains [1].

Beyond salaries college education is also correlated with higher levels of saving, increased personal and professional mobility, improved quality of life among children, better consumer decision making, and more leisure activities [4]. Of course the value of higher education is more than just financial—in a report funded by the Carnegie Foundation, other benefits of higher education included the tendency for college students to become more open-minded, rational, consistent, and less authoritarian. The report found that these characteristics were also communicated to succeeding generations [5]. Other non-monetary returns associated with higher education include reduced crime rates, more and better informed civic participation and improved performance across a broad range of socioeconomic metrics [3]. Finally, higher education can be viewed as unique mechanism for individual intellectual and ethical growth and advancement [6].

While continuing to provide many individual and societal benefits and in the face of expanding enrollments, US higher education has undergone significant changes in recent years. In fact, the composition of US higher education today can be characterized as "non-traditional," where traditional is defined as college attendance immediately following high school with at least some financial support of parents. Roughly 75% of all college students in 1999–2000 had at least one non-traditional characteristic (age, job status, etc.) [7]. The growth in demand for opportunities that satisfy the needs of non-traditional students track this ongoing and dramatic change in the nature of higher education in the United States. In the last decade distance education has been increasingly employed as a means through which non-traditional students can meet the often competing demands of school, family, and work. Colleges have begun to recognize that non-traditional students require additional modes of access. For example, a majority (56%) of all two and four-year higher education institutions offered distance learning opportunities in 2001 [8]. Among public institutions that number is far higher, with roughly 90% of all two and four-year public colleges offering at least some distance learning courses in 2001 [8]. The vast majority of these courses are now offered over the internet—90% of colleges offering distance education reported that they offered asynchronous internet-based courses [8]. It is currently estimated that 3.1 million students are enrolled in such courses in the US. Further, it is estimated that growth in enrollments in online higher education will continue to represent the majority of distance education offerings, and with growth rates about ten times that of traditional, classroom-based higher education [9].

Given the longstanding importance of higher education as a means of social mobility and individual improvement, the changing nature of US higher education enrollments from traditional to non-traditional, and the projected growth in distance and online learning as a mechanism to accommodate the needs of the increasing majority of non-traditional college students, it is critical that we examine the factors that support and inhibit the quality of education in this arena. High among such factors are faculty issues, many of which appear to be unaddressed. For example, despite rapidly increasing enrollments in online learning in higher education, a minority (less than one-third) of US Chief Academic Officers believe that their faculty fully accept the value and legitimacy of online education [9]. Clearly the cooperation and acceptance of higher education professors is of central importance to the quality of distance and online education. Given their role as curriculum developers and teachers, college faculty are directly and indirectly responsible for the nature and quality of teaching and learning in higher education. Consequently, understanding issues that enable and constrain successful faculty participation in such new modes of education is crucial. This study therefore examines factors that both support and inhibit faculty motivation for teaching in online environments.

II. RELEVANT THEORETICAL FRAMEWORKS

With approximately 100,000 faculty already involved in online teaching and learning at some level in the US [10], we have reached a stage in which the early adopters are, to a large extent, already involved. We need to know more about the factors that lead less enthusiastic faculty to become engaged in online teaching and learning. A promising conceptual frame is the literature reflecting theoretical models of social change and adoption of innovation in academic settings. Though never coherently applied to the context of online teaching, a number of relevant change and innovation-adoption models exist (e.g. [11, 12, 13, 14, 15, 16, 17, 18, 19] among others). A component of this research is to identify which of these models is best suited to understanding faculty adoption of online teaching.

A useful direction in this regard is to examine the adoption of online teaching as a process, rather than an event, reflecting early and influential theories such as Stages of Concern Model [13], as well as more recent conceptions such as Concerns Based Adoption Model (CBAM) [16]. The Diffusion of Innovation Model [18] suggests we simultaneously examine characteristics of the individual adopter, the institutional setting, and the technology itself—steps that have not been taken in research on faculty adoption of online teaching in higher education. In this paper we begin this process by identifying the most commonly expressed concerns stated by faculty with regard to their motivation to teach in online environments. Reflecting the theoretical and research literature in this arena we examine these concerns vis a vis a multitude of potential barriers and affordances including institutional settings, technologies used, faculty demographics, policies, and incentive systems.

III. REVIEW OF RESEARCH LITERATURE

The benefits of online education cited by faculty have been well documented (e.g. [20]) and include greater and higher quality interaction with students [21, 22, 23, 24, 25]; increased convenience and flexibility for their teaching and students' learning [22, 26, 27]; better access to student populations and increased access for students to higher education [22]; enhanced knowledge of educational technology [28, 29, 30]; increased opportunities for professional recognition and research [21, 24, 31]; high levels of student learning [21, 30, 32, 33]; greater necessity and opportunity for more systematic design of online instruction and a corollary positive impact on student learning and on classroom teaching [34].

Frequently cited barriers to online teaching include the greater amount of time that is required [22, 27, 30, 31, 35, 36]; compensation issues [22, 24, 28, 29, 37]; intellectual property ownership issues [22, 39, 40]; more work to develop and teach online (which is possibly counterproductive to professional advancement) [36, 37]; technical difficulties [22, 36, 41, 42]; inadequate training, support, and the addition of new roles (e.g., faculty become the helpdesk) [27, 28, 30, 36].

The majority of previous studies have looked at only a fraction of possible motivators and demotivators for online teaching, generally from the perspective of a relatively small sample of professors at a single institution, usually employing a single methodology. While there have been some notable exceptions (e.g. [43, 44, 45]), these broader studies did not focus specifically on the concerns of higher education faculty. The current study does emphasize online college faculty concerns. Our research into faculty motivators and demotivators also employed multiple methodologies, quantitative and qualitative, with a broader sample of faculty from a larger range of institutions and institution types then previous investigations focused on higher education settings. Some of the prior studies and instrumentation served as the basis for development of an online questionnaire and focus group protocols which solicited ratings by faculty of the importance to them of various sources of potential satisfaction or dissatisfaction with teaching online at their university, as explained further below.

Previously [46], the authors reported on aspects of preliminary qualitative research which included guided discussions with faculty focus groups. The current paper presents quantitative results of a survey of faculty who have taught online from 36 colleges in a nationally recognized program in a single state university system in the Northeastern United States. These results, while also preliminary, are suggestive and may point in promising directions for future research.

IV. METHODS

To begin to understand the variety of motivators and demotivators for teaching in online environments we surveyed the literature in this area and constructed a pilot survey of these factors. Feedback on the items that were included in the pilot survey was solicited through ninety-minute focus group implemented with six faculty and four doctoral students from three colleges representing a diversity of backgrounds. The group included faculty from a university center, a four-year private liberal arts college, and a private technology college. All of the participants had an expressed interest in the use of technology in education and were members of a forum that met on a regular basis to discuss research in instruction, design, and technology. Details on this field-testing of the survey follow.

Statements about the various advantages and disadvantages of teaching online were listed. For the items describing potential advantages, the pilot group participants were asked to read the statement and, using a seven point likert-type scale, rate the degree to which the advantage affected their motivation to teach online. If the stated advantage increased their desire to teach online they were instructed to choose a higher number (5, 6, 7). If the advantage did not increase their desire to teach online they were instructed to choose a lower number (1, 2, 3). Participants in the pilot group were also asked to write notes on aspects of the items that were unclear or confusing, and to suggest motivators and demotivators that were not covered. Feedback from the pilot group was recorded by one of the researchers, and subsequently suggestions regarding item clarity and additional motivators and demotivators were integrated into an expanded and re-formatted version of the original instrument. This version of the instrument was then programmed for online implementation using commercial survey software.

In the fall 2005 semester the survey was administered to faculty teaching in a multi-institutional online program in a single state university system in the Northeastern United States. The researchers worked with the program administrators to solicit respondents. An initial email soliciting participation was sent to all faculty teaching in the program in the fall semester. Follow-up email reminders were sent in two-week intervals three times over a six week period. Five hundred and five questionnaires were electronically collected from faculty teaching in 36 of the 40 institutions in the program that semester, including 119 blank questionnaires. These questionnaires were generated when a respondent followed a link to the survey but did not answer any of the questions, choosing instead to close the survey at that time. These blank surveys were excluded in the analysis. In this initial stage of the research 386 usable responses were therefore gathered, representing a response rate of 61%.

Demographics of the survey respondents are included in Table 1. Demographic information includes the type of college in which the respondent taught, gender, age, academic rank, online teaching experience, number of students in most recent online course, and computer skill level of the respondent. Demographic results suggest a fairly broad representation of faculty from a variety of age groups, college types, and academic ranks. The sample is skewed towards a representation of more experienced online instructors and is in alignment with the population from which the sample is drawn, one characterized by a large proportion of experienced online instructors. However, although this is a fairly large and broad sample, results must be viewed with caution. The response rate suggests that the sample may not be representative of the entire population of online faculty in the program. More importantly, a broad sample of faculty

who were not teaching online were excluded, and these faculty members undoubtedly have a somewhat different (and more negative) view of motivations and demotivations.

While controversy exists regarding the choice of parametric or non-parametric statistics to analyze ordinal data (e.g. [47]), the more conservative approach is to treat such data as non-parametric in nature. Examination of differences in motivational influences conducted in this paper therefore relies on the use of Pearson chi-squares and standardized adjusted residuals resulting from cross tabular analysis. Standardized adjusted residuals are the observed minus expected value for a table cell divided by an estimate of its standard error. The resulting value is expressed in standard deviation units above or below the group mean. Generally results that indicated differences of more than one standard deviation above or below the mean for an item were considered to be important.

This is exploratory research. We therefore set the significance threshold somewhat high. Three chi-square results are reported here: Pearson chi-square, likelihood ratio and linear-by-linear association. In most cases all three tests were below the .05 level of significance indicative of significant differences, i.e. those unlikely to have occurred randomly or by chance. However, in certain cases we chose to include suggestive results where only one or two tests met that threshold. So, results included here have at least one chi-square test that was at or less than the .05 level of significance. Finally, motivational differences were not considered significant for table cells with expected values less than 5 except in instances where the expected value was for a "neutral" response, i.e. where there was an indication that a difference did exist because very few respondents responded with a neutral choice. These three criteria guided efforts to identify significant motivational differences for online teaching by demographic and contextual factors.

V. RESEARCH QUESTIONS

1) What are the advantages of online teaching that recent online instructors report to increase their motivation to teach in online environments? 1a) Do the ranking of these motivators vary based on contextual and/or demographics such as gender, age, faculty rank, online experience or other factors?

2) What are the disadvantages that recent online instructors report as decreasing their motivation to teach in online environments? 2a) Do these demotivators vary based on contextual and/or demographics such as gender, age, faculty rank, online experience or other factors?

3) Do items in the survey used in this study cohere into statistical factors suggesting that they reflect latent constructs interpretable as motivators and demotivators for teaching online that may be useful in future research?

VI. RESULTS

Research Question 1) What are the factors that recent online instructors report to increase their motivation to teach in online environments?

The results of the survey presented in Table 2 provide an initial answer to this question. As can be seen from these results the motivator rated most highly by respondents included a more flexible work schedule. Following closely were a number of factors that reflect interests in taking on a new challenge, addressing student needs, learning about technology and pedagogy, and providing access to new student populations. Statements that suggested that online education might have monetary or other professional benefits were

not identified as highly as other possible motivators for teaching online.

2) Do the ranking of these motivators vary based on demographics such as gender, age, faculty rank, online experience or other factors?

Results obtained here suggest that certain demographic and contextual factors are associated with respondents' ranking of the motivators. Differences with regard to factors that motivate faculty were observed by gender, age, academic rank, whether the instructor volunteered or was required to teach online, by computer skill level, and by institutional setting (e.g. whether the instructor taught in a community college, or four-year college).

A. Results: Motivators

Gender — Two differences were identified with regards to gender. First, female respondents were more likely to report that they were motivated to teach online because online teaching accommodated other life needs (such as child care, transportation, and other family needs). Additionally females identified reduced commuting time or hassle as a motivator more frequently than their male counterparts (Tables 3 and 4).

Age — With regards to age, more "mature" faculty (those 45 or over) were more motivated by opportunities to experiment with new pedagogy then were younger faculty (Table 5). Younger faculty were more motivated (perhaps unrealistically) by opportunities to demonstrate competencies important for tenure or promotion that they believed online teaching provided (Table 6). Younger faculty also reported being motivated by other material incentives that might be available for online teaching (Table 7) and were more likely to report that online teaching might be a condition of employment as a motivating factor (Table 8).

Full-Time/Traditional versus Part-Time/Non Traditional — Motivational differences were also identified by the employment status of the faculty. Part-time/Non-Traditional faculty (lecturers, instructors, and adjuncts) were over represented as a group that identified the capacity of online teaching to accommodate other life needs as a motivator for online teaching, while Full-time/Traditional faculty (assistant, associate, and full professors) were under represented in this category (Table 9). Part-time faculty were also somewhat more motivated by the possibility that online teaching could provide more free time for other professional activities and reduce commuting time or hassle (Tables 10 and 11). Part-time instructors were also more motivated by the opportunity to teach a new subject area and by the possibility that online teaching could promote job security and might be a condition of employment (Tables 12–14).

Voluntariness — Faculty who reported that they volunteered to teach online (as opposed to those reporting that they were asked or required to do so) were more motivated by opportunities to reflect on their classroom teaching, experiment with new kinds of pedagogy, to gain new kinds of knowledge from the experience, and to renew their interest in teaching (Tables 15–18). Respondents who reported that they were asked or required to teach online were more motivated by the fact that online teaching was a condition of employment (Table 19) and by the possibility that additional material incentive might be offered for teaching online (Table 20).

Computer Skill Level — Computer skills played a role in the desire to teach new subject areas through the use of online instruction – those faculty with higher skill levels (perhaps a measure of readiness)

reported this opportunity to be a greater motivator than less computer savvy faculty (Table 21). Faculty with better computer skills also reported that they were not as motivated by the new challenge that online teaching might represent (Table 22) but were instead more motivated by opportunities to mentor others, especially when compared to faculty who had only average computer skills (Table 23).

Institution Type — Different kinds of institutions were represented in the survey sample, including community colleges, four-year comprehensive colleges, technology colleges, specialized institutions, and university centers. A number of motivational differences were associated with these different institutional settings. For example faculty from community colleges were more likely to report that they had volunteered to teach online rather than being asked or required to do so (Table 24). Given that "voluntariness" is associated with a number of positive outcomes, this may be an important result.

Other institutional differences suggest that faculty at four-year institutions were more likely to feel motivated by the potential of online teaching to accommodate other life needs (such as child care, or other family needs) (Table 25) and to teach a new subject area (Table 26) while faculty at two colleges were more motivated by the belief that online teaching could offer an opportunity to reflect on and improve classroom teaching (Table 27), promote job security (Table 28). Compared to four-year college faculty, community college faculty were particularly unmotivated by the possibility that online teaching might be a condition of their employment (Tables 29).

Demographic and institutional contextual differences were also associated with factors that faculty found particularly demotivating with respect to their choice to teach online. These will be discussed in further detail in the next section.

B. Results: Demotivators

2) What are the factors that recent online instructors report decrease their motivation to teach in online environments?

Results here again reflect the experience and commitment of the group of online faculty surveyed (Table 30). Very few of the statements describing possible disadvantages of online teaching had the effect of decreasing the desire to teach online very much. Even allowing for this demotivation there were some items that were more important than others. Topping the list of demotivators were issues surrounding compensation for course development, revision, and teaching, and concerns about students' access to the online environment. The compensation issues may be related to the next group of concerns regarding additional time required to develop and teach online courses, which fell just below the concern that campus administration may not recognize the additional effort required to teach online. Given the advanced experience of this population of faculty it may not be surprising that they were not demotivated from online instruction by lack of familiarity with online technology or pedagogy as seen in these results.

2a) Do these demotivators vary based on demographic variables such as age, faculty rank, online experience or other factors?

Differences in factors that undermine motivation to teach online were apparent among the respondents in the following categories: age, academic status, online teaching experience, whether the respondent volunteered or was asked to teach online, computer skill level, and institution type (community colleges v. comprehensive colleges).

Age — Age of the instructor was associated with concerns about lack of recognition for online teaching in regard to tenure decisions, salary increases, the possibility that online teaching may not be valued by campus administrators, and concerns that others might feel online courses were of inferior quality compared to traditional courses. Perhaps understandably, younger faculty (defined here as those under 45) were more demotivated from online teaching (Tables 31-34) by these concerns than older faculty (over age 45).

Academic Status, Tenure — Faculty tenure status appears to be related to factors that undermine motivation to teach online. Faculty who were either non-tenure track or untenured were over represented in the group that reported that their desire to teach online was decreased by inadequate compensation for course development, online teaching, and online course revision. Tenured faculty (associate and full professors) were under represented in these categories (Tables 35–37). Traditional faculty (assistant, associate and full professors) were more demotivated by the perception that online teaching was more time consuming than were faculty who were part-time or non traditional, defined as adjuncts, instructors and teaching assistants (Table 38).

Online Teaching Experience — The number of times an instructor had taught online was associated with the relative importance of the demotivators. Less experienced online teachers (those who had taught one or two times) were over represented in the group that reported that absence of face-to-face interaction decreased their desire to teach online (Table 39). Faculty who had taught three or more times were under represented in this category. Similarly, less experienced instructors were also more put off by their unfamiliarity with effective online pedagogy, lack of opportunity to observe online teaching before engaging in it, lack of opportunity to experiment with the technologies of online teaching, and inadequate time to learn about online teaching (Tables 40–43). Less experienced instructors were also over represented among those reporting that compensation issues (for course development and teaching) undermined their desire to teach online. More experienced instructors were under represented in these categories (Tables 44 and 45). Finally, less experienced instructors appeared more concerned that offering online education might reduce the reputation of their institution, while more experienced instructors were under represented among respondents who identified this as a factor that reduced their desire to teach online (Table 46).

"Voluntariness" also played a role with regard to the factors that demotivated faculty from teaching online. Faculty who felt they had been required to teach online were more demotivated by perceptions that the technology was confusing, the absence of face-to-face interaction, perceptions that students might lack access, lack of opportunity to experiment with technology, inadequate time to learn about online teaching and inadequate time to develop online courses (Tables 47–52). Non-volunteers also felt more put off from online teaching by concerns that it might not be recognized by campus administration and by the perception that online courses might be of inferior quality to classroom-based courses (Tables 53 and 54).

Institutional Differences were again evident when analyzing demotivating factors for online teaching. Faculty at comprehensive colleges (four-year institutions) were more concerned about lack of recognition of online teaching with regards to tenure decisions than were faculty at two year colleges (Table 55). Faculty at four-year institutions were also more put off by the perception that online teaching can be confusing and that there is inadequate time to revise online courses (Tables 56 and 57).

Computer Skill Level was associated with demotivational aspects of online teaching. Faculty who reported that they had higher computer skill levels were over-represented in the categories of respondents who reported that inadequate compensation and lack of recognition from the campus administration

decreased their desire to teach online while those with lower computer skill levels were underrepresented in these categories (Table 58 and 59).

VII. FACTOR STRUCTURES FOR MOTIVATORS AND DEMOTIVATORS

3) Do items in the survey used in this study cohere into statistical factors suggesting that they reflect latent constructs interpretable as reliable motivators and demotivators for teaching online that may be useful in future research?

To understand whether the items in the survey measure latent constructs that can be interpreted as motivators and demotivators for online teaching, we conducted a factor analysis. First, a maximum likelihood estimate with direct oblique rotation was used to test the factor construct of the items that reflected advantages or presumed motivators for teaching online. The inter-correlation coefficients for the items were greater than .30 and the KMO sampling adequacy (.90) and Bartlett's test of sphericity (chi-square is 3310.91, $p < .001$) supported the applicability of conducting factor analysis. For the motivators, five factors were extracted with eigenvalues greater than 1. Using this model, 64.6% of the total variance could be explained by these factors. The overall reliability (Chronbach's alpha) was .94 with individual reliability measures between .78 and .91. This analysis led to an interpretable factor structure and we labeled the factors "learning", "profession", "flexibility", "access" and "novelty", reflecting the nature of the items and concerns that each contained (Table 62).

For the demotivators the same procedure was followed. The inter-correlation coefficients for the items were greater than .30 and the KMO sampling adequacy (.91) and Bartlett's test of sphericity (chi-square is 4498.81, $p < .001$) again supported the applicability of conducting factor analysis. Five factors were extracted with eigenvalue greater than 1. In all, 71.5% of the total variance could be explained. The overall reliability (Chronbach's alpha) was .96 with individual reliability measures between .83 and .93. These factors were labeled "compensation", "reputation", "complexity", "promotion" and "technology", reflecting the nature of the items and concerns that each contained (Table 63).

VIII. DISCUSSION

The results presented here advance our understanding of the issues that support and undermine faculty willingness to teach in online environments and thus our ability to make higher education more accessible through this modality. Given the increased demand and historic benefits of higher education, coupled with the changing nature of the college student population, providing alternative options for access to college will continue to be a critical strategy to satisfy societal needs. Gaining insight into the factors that enable and constrain faculty acceptance and ongoing participation in the e-learning enterprise is a crucial piece of the puzzle. In this section we will first discuss motivators and then demotivators, reflecting results presented in the previous section.

A. Motivators

From these results we see that faculty in the state university systems studied here value online teaching for a number or reasons. "Flexibility" is among the most appealing advantages reported by this group of faculty who are experienced with online teaching. In light of this finding, it seems sensible to highlight and to preserve this aspect of the online teaching experience as fully as possible. Helping other faculty to understand that online teaching can provide greater control over their work life (as reported by these

experienced online instructors) will be beneficial in promoting online teaching as a method of increasing access to higher education. Taking care that flexibility and convenience do not take such a high priority that they begin to undermine the quality of the experience for students is a prime concern. Faculty development activities need to articulate both of these possibilities, and encourage a balanced approach. While online teaching can promote flexibility and convenience (for both students and faculty) it should not take precedence to the extent that quality suffers. Helping faculty to establish and maintain regular schedules for teaching and managing online courses is crucial to avoiding both the potential for overwhelming levels of interaction and for avoiding the potential problems associated with too little interaction. Providing direction for policies with regard to expected and reasonable levels of interaction with and between faculty and students is also useful in this regard.

Faculty respondents were also motivated by the opportunity to gain new pedagogical knowledge through online teaching, including opportunities to experiment with new pedagogy, reflect on classroom teaching, and gain new understanding of assessment issues. Respondents also reported being motivated by opportunities to learn about new technology and take on a new challenge more generally. In order to continue to attract new faculty to online teaching these opportunities for learning should also be highlighted in faculty development and other promotional efforts.

Faculty in this study were also concerned about their students' welfare and with increasing access to higher education (and their institutions specifically) through online teaching. Opportunities to reach new students with different cultural backgrounds, more mature students, and students in different geographical locations all appealed quite highly to respondents. Helping other faculty to understand that experienced colleagues report that online teaching can help achieve this highly rated objective will also be valuable in achieving more committed participation to online teaching.

Statements describing possible advantages that reflect either enhanced compensation or professional advancement opportunities as a result of online teaching were rated lower by respondents than other potential advantages. It appears that either faculty are not motivated by such possibilities or, given the results with regard to the demotivators, online teaching does not offer these possibilities. The latter seems the more likely of the two possibilities. Not only do respondents rate these potential advantages as less motivating, but fewer respondents chose to offer a rating of any kind for these potential motivators, choosing instead the N/A option. From these results it appears that compensation issues can undermine desire to teach online, especially given the disadvantages that were identified.

Contextual Differences — Some of the most interesting results of the study are the demographic and contextual factors that seem to play a role in the choice to teach online. If we seek to understand why higher education faculty may accept or reject online instruction, it is critical that we recognize the complexity of the issue. The theme of quality in online teaching and learning has a long history and lineage dating to the earliest efforts in distance education (e.g. [48]). Results presented here suggest that the choice to participate in online teaching is influenced by many factors. Engaging faculty as stewards of quality in this enterprise requires that we understand why they are likely to accept or reject this role.

Gender — Results hinted that female faculty may be more attracted to online teaching for the flexibility and convenience it affords. These results support and extend previous research into the experience of women as learners in online education (e.g. [49]) documenting its appeal as a mechanism to cope with the myriad roles women play and personal and professional challenges they confront. Our results suggest that these advantages may appeal to female online instructors as well as online learners.

Age — A number of differences in ranking of motivators were associated with age. These mirror other differences that were associated with academic status and experience with online teaching. Results suggest that younger faculty, perhaps naturally, appear more concerned with opportunities to advance in their careers and seem to be pinning some of their hopes to advantageous experiences gained through online course development and teaching to accomplish this goal. Much of the culture of higher education is incompatible with these hopes; however, new faculty in certain institutional contexts are warned that such activities may actually be detrimental, taking away from more important responsibilities such as research and publication. It seems clear that if younger faculty are to play a role in the furtherance of quality in online education, reward structures need to be aligned with that objective.

Employment Status — Other motivational differences were associated with employment structures. Full and part-time faculty ranked motivators differently. It is no secret that part-time instructors play a significant role in the academic offerings of many institutions of higher education, and are thus, by default, stewards of the quality of online education. Results suggest that part-time instructors are more appreciative of the benefits of flexibility associated with online teaching, ranking highly its capacity to accommodate other life needs, provide free time for other activities and reduce commuting time or hassle. Flexibility and convenience are well known advantages of online education, but again we need to take care that these attributes do not take precedence over pedagogical quality, learner engagement, and innovation. Flexibility and convenience can become ends rather than means and given the large and increasing number of part-time faculty involved in higher education, both online and in the classroom, we need to be aware of the potential pitfalls. That part-time faculty were over represented as a group that identified flexibility and convenience as a primary motivator may be a cause for concern in this regard.

Voluntariness and Institutional Context — Faculty who taught in two year colleges were more likely to volunteer to teach online than were faculty employed by four year colleges. It appears likely that cultural distinctions in these institution types favor online teaching for community college faculty. Given that voluntariness is associated with a range of other positive variables, this result may account for the relative over representation of community colleges among the ranks of online providers. Volunteers (and thus community college faculty) were also over-represented among faculty who ranked pedagogical value of online course development as a motivator, highlighting opportunities to reflect on classroom instruction, experiment with new forms of pedagogy, gain new knowledge, and renew interest in teaching. Non-volunteers associated the potential for material incentives with their desire to teach online. Four year college faculty were over represented among those who gave high marks to flexibility and convenience indicators such as benefits associated with child care or other family needs. Again it must be stressed that such convenience benefits need to be balanced against pedagogical quality issues. Given that voluntariness appears associated with such a broad range of factors likely to increase quality, these results suggest we need to work to ensure that faculty feel ownership over the decision to teach online.

Computer Skill Level — Faculty with higher reported computing skills appeared less motivated by the notion that online teaching might be a new challenge and more motivated to act as a mentor to others. Providing such opportunities through professional development programs has some obvious potential benefits in terms of engaging additional faculty in the quest for quality. Better computing skills may also be a prerequisite to the desire to teach in a new subject area online; respondents with lower computer skills did not identify this possibility as motivating as those with higher abilities. It seems likely that the struggle associated with mastering the technical aspects of online teaching may be a sufficient challenge without adding new subject matter into the mix. A potential lesson for faculty development professionals—keep it simple, especially with computer novices.

We turn now to a discussion of the demotivators.

B. Demotivators

The results on demotivators for teaching online are instructive in a number of ways. First, for this group of experienced online teachers, there were very few strongly demotivating factors – respondents simply did not weigh the effects of the disadvantages very heavily against their motivations to teach online. The disadvantages were seen as only somewhat demotivating; the highest mean score was 4.15 on a scale of 1-7 with 7 indicating the highest level of demotivation. Given the relatively consistent finding that faculty report online teaching takes more time and effort than classroom teaching, it may not be surprising that our respondents felt that inadequate compensation was their top demotivator. In fact, respondents identified inadequate compensation for course development, revision, and teaching as the most demotivating disadvantages associated with online teaching.

We felt it useful to again look at subgroups to determine where demotivational differences might be seen. We found distinctions based on age, academic status, online teaching experience, voluntariness, institution type, and computer skill level. Again the theme of faculty stewardship of online educational quality is a useful lens for framing the discussion of these differences. The results suggesting that younger faculty were more demotivated by concerns around professional advancement is cause for concern. If the goals of increasing access and ensuring quality of online higher education are to be realized it is crucial that younger faculty not be dissuaded by poor alignment between these goals and institutional reward structures. Overrepresentation of younger faculty among the group that rated a lack of recognition of online teaching by campus administration in general, and with regard to tenure decisions and salary increases specifically suggests such a misalignment exists for these instructors.

Also potential causes for concern are the differences in ranking of demotivators by academic status. Non-tenure (part-time) and untenured (assistant professors) were over represented among the group that identified compensation issues as undermining their desire to teach online. Results reflecting the undermining impact of inadequate remuneration for online course development, teaching, and revision, especially among a more dedicated cohort of online educators such as found in our sample, does not bode well for increased adoption of online teaching among less enthusiastic faculty. Again, given the increasing dependence on part-time faculty in higher education (both online and in the classroom) and the need to involve younger, pre-tenured faculty as stewards of online educational quality, these results raise the need for a discussion of policies that address these concerns. Results suggesting that traditional faculty (assistant, associate, and full professors) were more demotivated by concerns relating to the time consuming nature of online education may also be of concern. Time is a proxy for priority. These results reflect the perennial concern [48] that online learning may be marginalized from the core cultural practitioners, i.e. traditional faculty, and reside at the periphery of college life with the stigmatizing impact that such marginalization implies. If the goals of increased access and quality are to be achieved we need policies that enable full-time faculty to make online education a higher priority. Results suggesting that faculty at four-year colleges were more concerned about lack of recognition for online teaching in tenure decisions is further evidence of potential exclusion of online education from the mainstream of academia. Again, an examination of institutional reward structures relative to their impact on faculty priority setting would be a reasonable starting point for the discussion.

A number of demotivational distinctions related to online teaching experience suggest the need for ongoing professional development. That less experienced online teachers may be more dissuaded by their unfamiliarity with effective online pedagogy, absence of face-to-face interaction, lack of opportunity to observe online teaching before trying it, lack of opportunity to experiment with online technology before adopting it, and inadequate time to learn about online teaching suggests that future growth and quality is contingent on the availability of training. As noted above such professional development needs to be coupled with policies that make online education a recognized institutional priority. Results suggesting

that faculty with better computing skills were more motivated by opportunities to mentor others than by more general new challenges may be useful in this regard. Leveraging the assistance of such more able peers represents one promising strategy for helping less experienced online instructors to confront the challenges they identified as demotivating.

Factor Analysis

The factor analysis presented here suggests that the data has an interpretable factor structure. Relatively clear factors emerged, reflecting faculty concerns compatible with previous empirical and conceptual research in this area. These results suggest that motivational items reflect latent constructs important to understanding bridges and barriers to online teaching. Bridges include faculty learning, professional advancement opportunities, flexibility and convenience, provision of access, and benefits associated with novelty and innovation. Barriers reflect issues associated with inadequate compensation relative to time investment, lack of recognition for and negative reputation of online teaching, complexities of technology and online pedagogy, and reward structure misalignments with online teaching. We encourage other researchers to use this instrument in future investigations to provide additional checks of validity and reliability regarding bridges and barriers to online teaching.

IX. LIMITATIONS AND FUTURE RESEARCH

As an exploratory study the research approach utilized here sought to generate questions as well as answers. While it is useful to attempt to generate new hypotheses, examination of so many individual variables can result in Type I errors and thus spurious findings. Therefore these results need to be replicated through additional research. This is a preliminary study of a relatively small range of faculty (fewer than 400) who are experienced in teaching online, at 36 campuses that are part of the same state university system. We need to have data on faculty from different settings and in different states in order to determine the extent to which motivators and demotivators are shaped by the other contexts, or to which they are similarly perceived in terms of their importance at all types of institutions. We also need a larger and more nationally representative set of responses in order to validate the generalizability of the factor structures observed for these data. The participants in this study appeared to be highly committed to online teaching. Therefore, most importantly, we need to study faculty who have rejected or not had an opportunity thus far to teach online in order to compare their ratings of motivating and demotivating aspects of teaching online with those of more experienced online instructors.

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XI. ABOUT THE AUTHOR

Peter Shea, former director of the SUNY Learning Network, has a joint appointment with the Department of Educational Theory and Practice and the College of Computing and Information at the University at Albany, State University of New York. He is currently principal investigator on a Sloan Foundation funded study of faculty motivation for teaching online. He was also recently awarded a grant

by Sloan to implement a series of blended academic programs in the School of Education and other units at the University at Albany, State University of New York. He is author of many articles on student and faculty experiences in online education, and co-author of "The Successful Distance Learning Student."

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XIII. APPENDIX: TABLES AND TESTS

Table 1: Demographic Data and Teaching Experience (N=386)

	Frequency	Percent	Valid Percent
Institution			
Community College	204	52.8	55.7
University Center	19	4.9	5.2
University College	104	26.9	28.4
College of Technology	12	3.1	3.3
Specialized College	17	4.4	4.6
Other	10	2.6	2.7
Chose not to answer	11	2.8	
Blank (no answer)	9	2.3	
Gender			
Male	174	45.1	47.0
Female	196	50.8	53.0
Chose not to answer	12	3.1	

Blank (no answer)	4	1.0	
Age			
20 – 24	2	.5	.6
25 – 29	12	3.1	3.4
30 – 34	24	6.2	6.8
35 – 39	37	9.6	10.5
40 – 44	33	8.5	9.4
45 – 49	41	10.6	11.6
50 – 54	66	17.1	18.8
55 – 59	64	16.6	18.2
60 – 64	42	10.9	11.9
65 or older	31	8.0	8.8
Chose not to answer	30	7.8	
Blank (no answer)	4	1.0	
Academic Category			
Teaching Assistant	6	1.6	1.6
Instructor	57	14.8	15.5
Lecturer	10	2.6	2.7
Adjunct Professor	128	33.2	34.8
Assistant Professor	55	14.2	14.9
Associate Professor	46	11.9	12.5
Full Professor	66	17.1	17.9
Chose not to answer	14	3.6	
Blank (no answer)	4	1.0	
Times teaching			
First time	66	17.1	18.1
Second time	30	7.8	8.2
Third time	52	13.5	14.2
Fourth time	42	10.9	11.5
Fifth time	34	8.8	9.3
More than five times.	141	36.5	38.6
Chose not to answer	8	2.1	
Blank (no answer)	13	3.4	
Number of Students in Course			
1–10	37	9.6	9.9
11–20	186	48.2	49.9
21–30	103	26.7	27.6
31–40	23	6.0	6.2
41–50	15	3.9	4.0
More than 50	2	.5	.5
More than 100	7	1.8	1.9
Blank (no answer)	13	3.4	

Computer Skill			
Low	29	7.5	7.9
Medium	168	43.5	45.9
High	169	43.8	46.2
Chose not to answer	7	1.8	
Blank (no answer)	13	3.4	

Table 2: Descriptive Statistics for Motivators to Teach Online

Teaching online can provide…	N	Mean	SD
14. …a more flexible work schedule	346	6.08	1.439
23. …an opportunity to "stretch," - take on a new challenge	351	5.87	1.359
37. Students may want online courses	347	5.76	1.540
24. … an opportunity to learn new technology	349	5.74	1.513
20. …an opportunity to gain new knowledge, skills, and insights about my teaching	350	5.72	1.414
19. …an opportunity to experiment with new pedagogical approaches	348	5.70	1.333
27. …an opportunity to reach students in different geographical locations	347	5.69	1.685
29. … an opportunity to reach students at different stages of their learning lives (e.g. more mature/experienced, older, younger, etc.)	343	5.68	1.748
28. … an opportunity to reach students with different cultural backgrounds	337	5.55	1.787
18. …an opportunity to reflect upon and rethink classroom teaching	341	5.51	1.564
21. …an opportunity to experiment with alternative means of assessment	344	5.42	1.587
15. … accommodate other life needs (child care, transportation, other family needs)	330	5.41	1.930
17. …reduce commuting time, or hassle	326	5.30	2.100
25. … to renew interest in teaching (overcome staleness, apathy)	331	5.01	1.897
22. … a higher level of interaction with my students	344	4.82	1.961
31. Online courses/programs can allow an institution to maintain or increase enrollment/revenue and therefore promotes "job security."	320	4.80	2.017
16. … provide more free time for other professional activities (e.g. attend conferences, consulting, etc)	334	4.72	2.175
33. ...become a mentor or to assist others to learn about online teaching.	332	4.63	1.912
36. Colleagues may refer to online teaching in a positive way.	336	4.63	1.764
32. ...participate in a collaborative professional development activity (e.g. training) which enhances relationship with peers.	335	4.44	1.933
26. … to teach a new subject area	301	4.41	2.242
30. Teaching online can provide an additional opportunity to demonstrate competencies important for tenure and promotion	297	4.25	2.148
35. Other material incentives may be available for online course development	266	4.08	2.243
34. Teaching online may be a condition of your employment (hired to teach online)	240	3.68	2.327

Note: Range = 1 (not a motivator) to 7 (strongest motivator)

Table 3: Motivator Differences by Gender: "Online teaching can accommodate other life needs such as child care, transportation, etc."

			Life Needs			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
Gender	Male	Count	25	22	104	151
		Expected Count	25.1	15.3	110.6	151.0
		Adjusted Residual	.0	2.5	-1.7	
	Female	Count	29	11	134	174
		Expected Count	28.9	17.7	127.4	174.0
		Adjusted Residual	.0	-2.5	1.7	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.148(a)	2	.046
N of Valid Cases	325		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.33.

Table 4: Motivator Differences by Gender: "Online teaching can reduce commuting time or hassle."

			Reduce Commuting Time or Hassle			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
Gender	Male	Count	36	17	102	155
		Expected Count	31.9	11.6	111.5	155.0
		Adjusted Residual	1.1	2.3	-2.4	
	Female	Count	30	7	129	166
		Expected Count	34.1	12.4	119.5	166.0
		Adjusted Residual	-1.1	-2.3	2.4	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.500(a)	2	.024
N of Valid Cases	321		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.59.

Table 5: Motivator Differences by Age: Online teaching can provide opportunities to experiment with new forms of pedagogy.

			Experiment with New Pedagogy			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Age 2	Under 45	Count	3	15	81	99
		Expected Count	5.2	9.4	84.4	99.0
		Adjusted Residual	-1.2	2.3	-1.1	
	45 or older	Count	14	16	196	226
		Expected Count	11.8	21.6	192.6	226.0
		Adjusted Residual	1.2	-2.3	1.1	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.215(a)	2	.045
N of Valid Cases	325		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.18.

Table 6: Motivator Differences by Age: Online teaching can provide opportunities to demonstrate competencies important for promotion or tenure.

			Demonstrate Competencies			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Age 2	Under 45	Count	15	16	57	88
		Expected Count	27.0	15.1	45.9	88.0
		Adjusted Residual	-3.4	.3	2.9	
	45 or older	Count	71	32	89	192
		Expected Count	59.0	32.9	100.1	192.0
		Adjusted Residual	3.4	-.3	-2.9	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.813(a)	2	.003
Likelihood Ratio	12.554	2	.002
Linear-by-Linear Association	11.300	1	.001
N of Valid Cases	280		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.09.

Table 7: Motivator Differences by Age: Additional material incentives may be available for online teaching.

			Other Material Incentives			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
Age 2	Under 45	Count	20	8	48	76
		Expected Count	28.6	12.5	35.0	76.0
		Adjusted Residual	-2.4	-1.7	3.6	
	45 or older	Count	74	33	67	174
		Expected Count	65.4	28.5	80.0	174.0
		Adjusted Residual	2.4	1.7	-3.6	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.983(a)	2	.002
Likelihood Ratio	13.057	2	.001
Linear-by-Linear Association	10.614	1	.001
N of Valid Cases	250		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.46.

Table 8: Motivator Differences by Age: Online teaching may be a condition of your employment.

			Employment			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
Age 2	Under 45	Count	26	6	36	68
		Expected Count	33.3	6.8	27.9	68.0
		Adjusted Residual	-2.1	-.4	2.4	
	45 or older	Count	86	17	58	161
		Expected Count	78.7	16.2	66.1	161.0
		Adjusted Residual	2.1	.4	-2.4	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.729(a)	2	.057
Likelihood Ratio	5.687	2	.058
Linear-by-Linear Association	5.489	1	.019
N of Valid Cases	229		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.83.

Table 9: Motivator Differences by Employment Status - Full Time v. Part Time: Online teaching can accommodate other life needs.

			Life Needs			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Full Time - Part time	Part Time - Non-traditional	Count	22	17	141	180
		Expected Count	29.2	19.3	131.6	180.0
		Adjusted Residual	-2.2	-.8	2.4	
	Full Time - Traditional	Count	31	18	98	147
		Expected Count	23.8	15.7	107.4	147.0
		Adjusted Residual	2.2	.8	-2.4	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.024(a)	2	.049
Likelihood Ratio	6.007	2	.050
Linear-by-Linear Association	5.973	1	.015
N of Valid Cases	327		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.73.

Table 10: Motivator Differences by Employment Status – Full Time v. Part Time: Online Teaching can provide more free time for other professional activities.

			Free Time			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Full Time - Part time	Part Time - Non-traditional	Count	38	33	109	180
		Expected Count	49.5	25.6	105.0	180.0
		Adjusted Residual	-2.8	2.4	.9	
	Full Time - Traditional	Count	53	14	84	151
		Expected Count	41.5	21.4	88.0	151.0
		Adjusted Residual	2.8	-2.4	-.9	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.935(a)	2	.004
Likelihood Ratio	11.092	2	.004
Linear-by-Linear Association	3.838	1	.050
N of Valid Cases	331		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.44.

Table 11: Motivator Differences by Employment Status – Full Time v. Part Time: Online teaching can reduce commuting time or hassle.

			Reduce Commuting Time or Hassle			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Full Time - Part time	Part Time - Non-traditional	Count	23	14	141	178
		Expected Count	35.8	13.8	128.4	178.0
		Adjusted Residual	-3.6	.1	3.1	
	Full Time - Traditional	Count	42	11	92	145
		Expected Count	29.2	11.2	104.6	145.0
		Adjusted Residual	3.6	-.1	-3.1	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.983(a)	2	.002
Likelihood Ratio	13.001	2	.002
Linear-by-Linear Association	12.361	1	.000
N of Valid Cases	323		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.22.

Table 12: Motivator Differences by Employment Status – Full Time v. Part Time: Online teaching can provide an opportunity to teach a new subject area.

			New Subject Area			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
Full Time - Part time	Part Time - Non-traditional	Count	44	18	99	161
		Expected Count	52.9	21.6	86.4	161.0
		Adjusted Residual	-2.2	-1.2	2.9	
	Full Time - Traditional	Count	54	22	61	137
		Expected Count	45.1	18.4	73.6	137.0
		Adjusted Residual	2.2	1.2	-2.9	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.568(a)	2	.014
Likelihood Ratio	8.600	2	.014
Linear-by-Linear Association	7.570	1	.006
N of Valid Cases	298		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.39.

Table 13: Motivator Differences by Employment Status – Full Time v. Part Time: Online Teaching can promote job security.

			Promote "Job Security."			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Full Time - Part time	Part Time - Non-traditional	Count	27	32	108	167
		Expected Count	35.8	29.0	102.2	167.0
		Adjusted Residual	-2.4	.9	1.3	
	Full Time - Traditional	Count	41	23	86	150
		Expected Count	32.2	26.0	91.8	150.0
		Adjusted Residual	2.4	-.9	-1.3	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.955(a)	2	.051
Likelihood Ratio	5.971	2	.051
Linear-by-Linear Association	4.034	1	.045
N of Valid Cases	317		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.03.

Table 14: Motivator Differences by Employment Status – Full Time v. Part Time: Online teaching may be a condition of your employment.

			Employment			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Full Time - Part time	Part Time - Non-traditional	Count	46	13	73	132
		Expected Count	63.5	13.9	54.6	132.0
		Adjusted Residual	-4.6	-.4	4.9	
	Full Time - Traditional	Count	68	12	25	105
		Expected Count	50.5	11.1	43.4	105.0
		Adjusted Residual	4.6	.4	-4.9	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.045(a)	2	.000
Likelihood Ratio	25.784	2	.000
Linear-by-Linear Association	24.674	1	.000
N of Valid Cases	237		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.08.

Table 15: Motivator Differences by Voluntariness: Online teaching can present opportunities to reflect on your classroom teaching.

			Reflect on Classroom Teaching			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Volunteer Status	I was asked/required	Count	12	11	41	64
		Expected Count	7.1	5.8	51.0	64.0
		Adjusted Residual	2.1	2.5	-3.5	
	I volunteered	Count	26	20	231	277
		Expected Count	30.9	25.2	221.0	277.0
		Adjusted Residual	-2.1	-2.5	3.5	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.207(a)	2	.002
Likelihood Ratio	10.933	2	.004
Linear-by-Linear Association	9.740	1	.002
N of Valid Cases	341		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.82.

Table 16: Motivator Differences by Voluntariness: Online teaching can provide opportunities to experiment with new kinds of pedagogy.

			Experiment with New Pedagogy			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Volunteer Status	I was asked/required	Count	8	13	48	69
		Expected Count	4.0	7.1	57.9	69.0
		Adjusted Residual	2.3	2.6	-3.6	
	I volunteered	Count	12	23	244	279
		Expected Count	16.0	28.9	234.1	279.0
		Adjusted Residual	-2.3	-2.6	3.6	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.235(a)	2	.001
Likelihood Ratio	11.627	2	.003
Linear-by-Linear Association	12.247	1	.000
N of Valid Cases	348		

(a) 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.97.

Table 17: Motivator Differences by Voluntariness: Online teaching can present opportunities to gain new knowledge.

			Gain New Knowledge			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Voluntariness 1	I was asked/required	Count	10	6	52	68
		Expected Count	4.9	4.7	58.5	68.0
		Adjusted Residual	2.7	.7	-2.5	
	I volunteered	Count	15	18	249	282
		Std. Residual	-1.1	-.3	.4	
		Adjusted Residual	-2.7	-.7	2.5	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.126(a)	2	.017
Likelihood Ratio	6.962	2	.031
Linear-by-Linear Association	7.942	1	.005
N of Valid Cases	350		

(a) 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.66.

Table 18: Motivator Differences by Voluntariness: Online teaching can help renew interest in teaching.

			Renew Interest in Teaching			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Voluntariness 1	I was asked/required	Count	12	17	34	63
		Expected Count	12.0	9.9	41.1	63.0
		Adjusted Residual	.0	2.7	-2.1	
	I volunteered	Count	51	35	182	268
		Expected Count	51.0	42.1	174.9	268.0
		Adjusted Residual	.0	-2.7	2.1	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.815(a)	2	.020
Likelihood Ratio	7.052	2	.029
Linear-by-Linear Association	1.575	1	.209
N of Valid Cases	331		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.90.

Table 19: Motivator Differences by Voluntariness: Online teaching may be a condition of your employment.

			Employment			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Voluntariness 1	I was asked/required	Count	15	2	37	54
		Expected Count	26.1	5.6	22.3	54.0
		Adjusted Residual	-3.4	-1.8	4.6	
	I volunteered	Count	101	23	62	186
		Expected Count	89.9	19.4	76.7	186.0
		Adjusted Residual	3.4	1.8	-4.6	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.666(a)	2	.000
Likelihood Ratio	21.782	2	.000
Linear-by-Linear Association	17.815	1	.000
N of Valid Cases	240		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.63.

Table 20: Motivator Differences by Voluntariness: Additional material incentives may be available for online teaching.

			Other Material Incentives			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Voluntariness 1	I was asked/required	Count	17	5	33	55
		Expected Count	20.5	9.1	25.4	55.0
		Adjusted Residual	-1.1	-1.7	2.3	
	I volunteered	Count	82	39	90	211
		Expected Count	78.5	34.9	97.6	211.0
		Adjusted Residual	1.1	1.7	-2.3	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.907(a)	2	.052

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.10.

Table 21: Motivator Differences by Computer Skill Level: Teach in a new subject area.

			New Subject Area			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Computer Skill	Low	Count	11	2	10	23
		Expected Count	7.7	3.1	12.2	23.0
		Adjusted Residual	1.5	-.7	-1.0	
	Medium	Count	46	27	67	140
		Expected Count	47.1	18.7	74.2	140.0
		Adjusted Residual	-.3	2.8	-1.7	
	High	Count	44	11	82	137
		Expected Count	46.1	18.3	72.6	137.0
		Adjusted Residual	-.5	-2.5	2.2	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.783(a)	4	.029
Likelihood Ratio	10.707	4	.030
Linear-by-Linear Association	2.963	1	.085
N of Valid Cases	300		

(a) 1 cells (11.1%) have expected count less than 5. The minimum expected count is 3.07.

Table 22: Motivator Differences by Computer Skill Level: Online teaching can represent a new challenge.

			New Challenge			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Computer Skill	Low	Count	0	4	23	27
		Expected Count	1.6	2.0	23.4	27.0
		Adjusted Residual	-1.4	1.5	-.2	
	Medium	Count	4	18	142	164
		Expected Count	9.8	12.2	142.0	164.0
		Adjusted Residual	-2.6	2.4	.0	
	High	Count	17	4	138	159
		Expected Count	9.5	11.8	137.6	159.0
		Adjusted Residual	3.4	-3.2	.1	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.853(a)	4	.000
Likelihood Ratio	23.361	4	.000
Linear-by-Linear Association	1.848	1	.174
N of Valid Cases	350		

(a) 2 cells (22.2%) have expected count less than 5. The minimum expected count is 1.62.

Table 23: Motivator Differences by Computer Skill Level: Online teaching can be an opportunity to act as a mentor.

			Mentor			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
Computer Skill	Low	Count	9	4	13	26
		Expected Count	6.8	4.2	15.0	26.0
	Medium	Count	41	33	79	153
		Expected Count	39.8	25.0	88.3	153.0
		Adjusted Residual	.3	2.4	-2.1	
	High	Count	36	17	99	152
		Expected Count	39.5	24.8	87.7	152.0
		Adjusted Residual	-.9	-2.3	2.5	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.846(a)	4	.065
Likelihood Ratio	8.842	4	.065
Linear-by-Linear Association	3.771	1	.052
N of Valid Cases	331		

(a) 1 cells (11.1%) have expected count less than 5. The minimum expected count is 4.24.

Table 24: Institutional Differences: Voluntariness by institution type.

			Voluntary Online Teaching			Total
			I was asked/required	Neutral	I volunteered	
2-year or 4-year	Two-year colleges	Count	14	5	185	204
		Expected Count	33.2	5.1	165.8	204.0
		Adjusted Residual	-5.5	.0	5.2	
	Four-year + colleges	Count	45	4	110	159
		Expected Count	25.8	3.9	129.2	159.0
		Adjusted Residual	5.5	.0	-5.2	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.355(a)	2	.000
Likelihood Ratio	30.932	2	.000
Linear-by-Linear Association	29.741	1	.000
N of Valid Cases	363		

(a) 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.94.

Table 25: Institutional Differences: Two-year v. Four-year Colleges: Online teaching can accommodate other life needs.

			Life Needs			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
2-year or 4-year	Two-year colleges	Count	33	27	125	185
		Expected Count	31.5	19.7	133.8	185.0
		Adjusted Residual	.4	2.6	-2.2	
	Four-year + colleges	Count	23	8	113	144
		Expected Count	24.5	15.3	104.2	144.0
		Adjusted Residual	-.4	-2.6	2.2	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.715(a)	2	.021
Likelihood Ratio	8.170	2	.017
Linear-by-Linear Association	2.240	1	.134
N of Valid Cases	329		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.32.

Table 26: Institutional Differences: Two-year v. Four-year Colleges: Online teaching can provide an opportunity to teach in a new subject area.

			New Subject Area			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
2-year or 4-year	Two-year colleges	Count	64	26	75	165
		Expected Count	55.6	22.0	87.5	165.0
		Adjusted Residual	2.1	1.4	-2.9	
	Four-year + colleges	Count	37	14	84	135
		Expected Count	45.5	18.0	71.6	135.0
		Adjusted Residual	-2.1	-1.4	2.9	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.411(a)	2	.015
Likelihood Ratio	8.467	2	.015
Linear-by-Linear Association	7.070	1	.008
N of Valid Cases	300		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.00.

Table 27: Institutional Differences: Two Year v. Four-year Colleges: Online Teaching can provide an opportunity to reflect on classroom teaching.

			Reflect and Think Classroom Teaching			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
2-year or 4-year	Two-year colleges	Count	15	16	161	192
		Expected Count	21.5	17.5	153.0	192.0
		Adjusted Residual	-2.2	-.6	2.2	
	Four-year + colleges	Count	23	15	110	148
		Expected Count	16.5	13.5	118.0	148.0
		Adjusted Residual	2.2	.6	-2.2	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.716(a)	2	.057
Likelihood Ratio	5.674	2	.059
Linear-by-Linear Association	5.651	1	.017
N of Valid Cases	340		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.49.

Table 28: Institutional Differences: Two-year v. Four-year Colleges: Online teaching can promote job security.

			Promote "Job Security."			
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	Total
2-year or 4-year	Two-year colleges	Count	31	31	121	183
		Expected Count	40.2	31.6	111.3	183.0
		Adjusted Residual	-2.5	-.2	2.3	
	Four-year + colleges	Count	39	24	73	136
		Expected Count	29.8	23.4	82.7	136.0
		Adjusted Residual	2.5	.2	-2.3	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.907(a)	2	.032
Likelihood Ratio	6.860	2	.032
Linear-by-Linear Association	6.722	1	.010
N of Valid Cases	319		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.45.

Table 29: Institutional Differences: Two-year v. Four-year Colleges: Online teaching may be a condition of your employment.

			Employment			Total
			Does not increase my desire to teach online	Neutral	Increases my desire to teach online	
2-year or 4-year	Two-year colleges	Count	73	13	41	127
		Expected Count	61.6	13.3	52.1	127.0
		Adjusted Residual	2.9	-.1	-2.9	
	Four-year + colleges	Count	43	12	57	112
		Expected Count	54.4	11.7	45.9	112.0
		Adjusted Residual	-2.9	.1	2.9	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.507(a)	2	.009
Likelihood Ratio	9.569	2	.008
Linear-by-Linear Association	9.466	1	.002
N of Valid Cases	239		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.72

Disadvantages/Demotivators

Table 30: Descriptive Statistics for Demotivators for Teaching Online

	N	Mean	SD
There may be inadequate compensation…			
54. ...for online course development.	296	4.15	2.29
56. ... for online course revision.	307	4.14	2.26
55. ... for online teaching.	300	4.07	2.31
46. Students may lack adequate access to participate effectively in online courses.	314	3.84	2.00
60. The campus administration may not recognize the effort required to teach online.	289	3.82	2.30
52. Online teaching may take more time than classroom teaching.	319	3.71	2.24
50. Inadequate time to develop a new online.	288	3.64	2.13
39. A lack of recognition of online teaching in regards to considerations for promotion and/or salary increase.	260	3.61	2.13
51. Inadequate time to revise online courses.	297	3.59	2.10
42. The absence of face-to-face interaction with students can be a disadvantage.	319	3.53	2.09
45. Inadequate technical support for online course teaching.	284	3.42	2.21
44. Inadequate technical support for online course development.	276	3.37	2.24
38. A lack of recognition of online teaching in regards to tenure considerations.	239	3.35	2.09
48. There may be little or no opportunity to experiment with the technology for teaching online prior to committing to teach online.	307	3.33	2.01
40. Developing an online course can be complicated.	319	3.27	2.01
49. Inadequate time to learn about online teaching.	291	3.24	1.99
53. Concerns about intellectual property and teaching online.	310	3.20	2.08
47. There may be little or no opportunity to observe other faculty using technology for online teaching prior to committing to teach online.	303	3.17	1.91
59. The campus administration may not value online teaching.	281	3.06	2.06
57. Concerns that online course offerings may reduce the quality of our institution's reputation.	302	2.87	1.94
43. Effective pedagogy for online teaching may be unfamiliar.	314	2.86	1.71
41. The technology involved in online teaching can be confusing.	321	2.85	1.83
58. Colleagues may talk negatively about online teaching.	300	2.58	1.87

Note: Range = 1 (not a demotivator) to 7 (strongest demotivator)

Table 31: Age Differences – A Lack of Recognition of Online Teaching in Regards to Tenure Considerations

			Lack of Recognition (Tenure)			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Age 2	Under 45	Count	29	19	27	75
		Expected Count	37.0	18.2	19.8	75.0
		Adjusted Residual	-2.3	.3	2.3	
	45 or older	Count	83	36	33	152
		Expected Count	75.0	36.8	40.2	152.0
		Adjusted Residual	2.3	-.3	-2.3	
Total		Count	112	55	60	227
		Expected Count	112.0	55.0	60.0	227.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.522(a)	2	.038
Likelihood Ratio	6.450	2	.040
Linear-by-Linear Association	6.478	1	.011
N of Valid Cases	227		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.17.

Table 32: Age Differences: A Lack of Recognition of Online Teaching in Regards to Considerations for Promotion and/or Salary Increase

			Lack of Recognition (Promotion and Salary)			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Age 2	Under 45	Count	27	19	32	78
		Expected Count	34.6	18.7	24.7	78.0
		Adjusted Residual	-2.1	.1	2.1	
	45 or older	Count	82	40	46	168
		Expected Count	74.4	40.3	53.3	168.0
		Adjusted Residual	2.1	-.1	-2.1	
Total		Count	109	59	78	246
		Expected Count	109.0	59.0	78.0	246.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.557(a)	2	.062
Likelihood Ratio	5.533	2	.063
Linear-by-Linear Association	5.524	1	.019
N of Valid Cases	246		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.71.

Table 33: Age Differences: Online Teaching May Not Be Valued By Campus Administration.

			Not Valued by Campus Administration			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Age 2	Under 45	Count	40	16	27	83
		Expected Count	50.2	11.9	20.9	83.0
		Adjusted Residual	-2.8	1.6	1.9	
	45 or older	Count	121	22	40	183
		Expected Count	110.8	26.1	46.1	183.0
		Adjusted Residual	2.8	-1.6	-1.9	
Total		Count	161	38	67	266
		Expected Count	161.0	38.0	67.0	266.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.718(a)	2	.021
Likelihood Ratio	7.629	2	.022
Linear-by-Linear Association	6.354	1	.012
N of Valid Cases	266		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.86.

Table 34: Age Differences: Some people say that online courses are of an inferior quality compared to classroom-based courses.

			Inferior Quality			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Age 2	Under 45	Count	49	10	27	86
		Expected Count	55.2	11.0	19.9	86.0
		Adjusted Residual	-1.7	-.4	2.2	
	45 or older	Count	137	27	40	204
		Expected Count	130.8	26.0	47.1	204.0
		Adjusted Residual	1.7	.4	-2.2	
Total		Count	186	37	67	290
		Expected Count	186.0	37.0	67.0	290.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.738(a)	2	.094
Likelihood Ratio	4.561	2	.102
Linear-by-Linear Association	4.132	1	.042
N of Valid Cases	290		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.97.

Table 35: Tenured v. Untenured Faculty: There may be inadequate compensation for online course development.

			Inadequate Compensation (Course Development)			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Tenure	Untenured	Count	75	23	102	200
		Expected Count	82.6	23.9	93.5	200.0
		Adjusted Residual	-1.9	-.3	2.1	
	Tenured	Count	46	12	35	93
		Expected Count	38.4	11.1	43.5	93.0
		Adjusted Residual	1.9	.3	-2.1	
Total		Count	121	35	137	293
		Expected Count	121.0	35.0	137.0	293.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.730(a)	2	.094
Likelihood Ratio	4.758	2	.093
Linear-by-Linear Association	4.625	1	.032
N of Valid Cases	293		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.11.

Table 36: Tenured v. Untenured Faculty: There may be inadequate compensation for online teaching.

			Inadequate Compensation (Teaching)			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Tenure	Untenured	Count	77	25	105	207
		Expected Count	86.4	27.2	93.4	207.0
		Adjusted Residual	-2.4	-.8	2.9	
	Tenured	Count	47	14	29	90
		Expected Count	37.6	11.8	40.6	90.0
		Adjusted Residual	2.4	.8	-2.9	
Total		Count	124	39	134	297
		Expected Count	124.0	39.0	134.0	297.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.729(a)	2	.013
Likelihood Ratio	8.889	2	.012
Linear-by-Linear Association	8.100	1	.004
N of Valid Cases	297		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.82.

Table 37: Tenured v. Untenured Faculty: There may be inadequate compensation for online course revision.

			Inadequate Compensation (Revision)			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Tenure	Untenured	Count	76	26	106	208
		Expected Count	82.1	30.8	95.1	208.0
		Adjusted Residual	-1.5	-1.7	2.7	
	Tenured	Count	44	19	33	96
		Expected Count	37.9	14.2	43.9	96.0
		Adjusted Residual	1.5	1.7	-2.7	
Total		Count	120	45	139	304
		Expected Count	120.0	45.0	139.0	304.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.749(a)	2	.021
Likelihood Ratio	7.809	2	.020
Linear-by-Linear Association	5.171	1	.023
N of Valid Cases	304		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.21.

Table 38: Full Time/Traditional v. Part Time/Non-Traditional: Online teaching may take more time than classroom teaching.

			More Time			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Full Time - Part Time	Part Time - Non-traditional	Count	95	21	52	168
		Expected Count	82.7	21.2	64.1	168.0
		Adjusted Residual	2.8	-.1	-2.8	
	Full Time - Traditional	Count	61	19	69	149
		Expected Count	73.3	18.8	56.9	149.0
		Adjusted Residual	-2.8	.1	2.8	
Total		Count	156	40	121	317
		Expected Count	156.0	40.0	121.0	317.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.791(a)	2	.012
Likelihood Ratio	8.827	2	.012
Linear-by-Linear Association	8.759	1	.003
N of Valid Cases	317		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.80.

Table 39: Online Teaching Experience: Absence of Face-Face Interaction

			Absence of Face-to-Face Interaction			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	34	17	33	84
		Expected Count	44.4	12.4	27.2	84.0
		Adjusted Residual	-2.6	1.6	1.6	
	Three or more times	Count	134	30	70	234
		Expected Count	123.6	34.6	75.8	234.0
		Adjusted Residual	2.6	-1.6	-1.6	
Total		Count	168	47	103	318
		Expected Count	168.0	47.0	103.0	318.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.275(a)	2	.026
Likelihood Ratio	7.251	2	.027
Linear-by-Linear Association	5.203	1	.023
N of Valid Cases	318		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.42.

Table 40: Online Teaching Experience: Effective pedagogy for online teaching may be unfamiliar.

			Unfamiliar Effective Pedagogy			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	48	16	21	85
		Expected Count	55.1	14.9	14.9	85.0
		Adjusted Residual	-1.9	.4	2.0	
	Three or more times	Count	155	39	34	228
		Expected Count	147.9	40.1	40.1	228.0
		Adjusted Residual	1.9	-.4	-2.0	
Total		Count	203	55	55	313
		Expected Count	203.0	55.0	55.0	313.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.749(a)	2	.093
Likelihood Ratio	4.556	2	.102
Linear-by-Linear Association	4.664	1	.031
N of Valid Cases	313		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.94.

Table 41: Online Teaching Experience: There may be little or no opportunity to observe other faculty using technology for online teaching prior to committing to teach online.

			Little or No Opportunity to Observe			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	42	12	30	84
		Expected Count	48.4	14.5	21.1	84.0
		Adjusted Residual	-1.7	-.8	2.6	
	Three or more times	Count	132	40	46	218
		Expected Count	125.6	37.5	54.9	218.0
		Adjusted Residual	1.7	.8	-2.6	
Total		Count	174	52	76	302
		Expected Count	174.0	52.0	76.0	302.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.898(a)	2	.032
Likelihood Ratio	6.608	2	.037
Linear-by-Linear Association	5.297	1	.021
N of Valid Cases	302		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.46.

Table 42: Online Teaching Experience: There may be little or no opportunity to experiment with the technology for teaching online prior to committing to teach online.

			No Opportunity to Experiment with Technology			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	42	9	31	82
		Expected Count	45.8	13.4	22.8	82.0
		Adjusted Residual	-1.0	-1.5	2.4	
	Three or more times	Count	129	41	54	224
		Expected Count	125.2	36.6	62.2	224.0
		Adjusted Residual	1.0	1.5	-2.4	
Total		Count	171	50	85	306
		Expected Count	171.0	50.0	85.0	306.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.463(a)	2	.039
Likelihood Ratio	6.389	2	.041
Linear-by-Linear Association	3.180	1	.075
N of Valid Cases	306		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.40.

Table 43: Online Teaching Experience: There may be inadequate time to learn about online teaching

			Inadequate Time to Learn			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	46	5	29	80
		Expected Count	45.5	11.0	23.4	80.0
		Adjusted Residual	.1	-2.3	1.6	
	Three or more times	Count	119	35	56	210
		Expected Count	119.5	29.0	61.6	210.0
		Adjusted Residual	-.1	2.3	-1.6	
Total		Count	165	40	85	290
		Expected Count	165.0	40.0	85.0	290.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.380(a)	2	.041
Likelihood Ratio	7.076	2	.029
Linear-by-Linear Association	.562	1	.453
N of Valid Cases	290		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.03.

Table 44: Online Teaching Experience: There may be inadequate compensation for online course development.

			Inadequate Compensation (Course Development)			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	24	6	45	75
		Expected Count	30.9	8.9	35.2	75.0
		Adjusted Residual	-1.9	-1.2	2.6	
	Three or more times	Count	98	29	94	221
		Expected Count	91.1	26.1	103.8	221.0
		Adjusted Residual	1.9	1.2	-2.6	
Total		Count	122	35	139	296
		Expected Count	122.0	35.0	139.0	296.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.950(a)	2	.031
Likelihood Ratio	6.986	2	.030
Linear-by-Linear Association	5.645	1	.018
N of Valid Cases	296		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.87.

Table 45: Online Teaching Experience: There may be inadequate compensation for online teaching.

			Inadequate Compensation (Teaching)			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	26	8	45	79
		Expected Count	32.9	10.3	35.8	79.0
		Adjusted Residual	-1.8	-.9	2.4	
	Three or more times	Count	99	31	91	221
		Expected Count	92.1	28.7	100.2	221.0
		Adjusted Residual	1.8	.9	-2.4	
Total		Count	125	39	136	300
		Expected Count	125.0	39.0	136.0	300.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.853(a)	2	.054
Likelihood Ratio	5.840	2	.054
Linear-by-Linear Association	5.113	1	.024
N of Valid Cases	300		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.27.

Table 46: Online Teaching Experience: Concerns that offering online education can reduce an institutions reputation.

			Reduce Institution's Reputation			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Experience	One or two times	Count	49	6	22	77
		Expected Count	49.4	11.5	16.1	77.0
		Adjusted Residual	-.1	-2.0	1.9	
	Three or more times	Count	144	39	41	224
		Expected Count	143.6	33.5	46.9	224.0
		Adjusted Residual	.1	2.0	-1.9	
Total		Count	193	45	63	301
		Expected Count	193.0	45.0	63.0	301.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.436(a)	2	.040
Likelihood Ratio	6.766	2	.034
Linear-by-Linear Association	1.025	1	.311
N of Valid Cases	301		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.51.

Table 47: Voluntariness: The technology involved in online teaching can be confusing.

			Confusing Technology			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Voluntariness	I was required	Count	32	9	19	60
		Expected Count	39.1	9.2	11.8	60.0
		Adjusted Residual	-2.1	-.1	2.6	
	I volunteered	Count	177	40	44	261
		Expected Count	169.9	39.8	51.2	261.0
		Adjusted Residual	2.1	.1	-2.6	
Total		Count	209	49	63	321
		Expected Count	209.0	49.0	63.0	321.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.026(a)	2	.030
Likelihood Ratio	6.457	2	.040
Linear-by-Linear Association	6.515	1	.011
N of Valid Cases	321		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.16.

Table 48: Voluntariness: The absence of face-to-face interaction with students can be a disadvantage.

			Absence of Face-to-Face Interaction			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Voluntariness 1	I was required	Count	26	4	27	57
		Expected Count	30.0	8.4	18.6	57.0
		Adjusted Residual	-1.2	-1.8	2.6	
	I volunteered	Count	142	43	77	262
		Expected Count	138.0	38.6	85.4	262.0
		Adjusted Residual	1.2	1.8	-2.6	
Total		Count	168	47	104	319
		Expected Count	168.0	47.0	104.0	319.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.101(a)	2	.017
Likelihood Ratio	8.223	2	.016
Linear-by-Linear Association	4.053	1	.044
N of Valid Cases	319		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.40.

Table 49: Voluntariness: Students may lack adequate access to participate effectively in online courses.

			Students Lack Adequate Access			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Voluntariness 1	I was required	Count	20	5	31	56
		Expected Count	24.8	9.3	21.9	56.0
		Adjusted Residual	-1.4	-1.7	2.7	
	I volunteered	Count	119	47	92	258
		Expected Count	114.2	42.7	101.1	258.0
		Adjusted Residual	1.4	1.7	-2.7	
Total		Count	139	52	123	314
		Expected Count	139.0	52.0	123.0	314.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.081(a)	2	.018
Likelihood Ratio	8.127	2	.017
Linear-by-Linear Association	4.998	1	.025
N of Valid Cases	314		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.27.

Table 50: Voluntariness: There may be little or no opportunity to experiment with the technology for teaching online prior to committing to teach online.

			No Opportunity to Experiment with Technology			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Voluntariness 1	I was asked/required	Count	24	7	24	55
		Expected Count	30.6	9.1	15.2	55.0
		Adjusted Residual	-2.0	-.9	2.9	
	I volunteered	Count	147	44	61	252
		Expected Count	140.4	41.9	69.8	252.0
		Adjusted Residual	2.0	.9	-2.9	
Total		Count	171	51	85	307
		Expected Count	171.0	51.0	85.0	307.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.515(a)	2	.014
Likelihood Ratio	7.958	2	.019
Linear-by-Linear Association	6.938	1	.008
N of Valid Cases	307		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.14.

Table 51: Voluntariness: Inadequate time to learn about online teaching

			Inadequate Time to Learn			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Voluntariness 1	I was asked/required	Count	19	10	23	52
		Expected Count	29.5	7.3	15.2	52.0
		Adjusted Residual	-3.2	1.2	2.6	
	I volunteered	Count	146	31	62	239
		Expected Count	135.5	33.7	69.8	239.0
		Adjusted Residual	3.2	-1.2	-2.6	
Total		Count	165	41	85	291
		Expected Count	165.0	41.0	85.0	291.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.618(a)	2	.005
Likelihood Ratio	10.528	2	.005
Linear-by-Linear Association	9.969	1	.002
N of Valid Cases	291		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.33.

Table 52: Voluntariness: Inadequate time to develop a new online course

			Inadequate Time to Develop A New Online Course			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Voluntariness 1	I was asked/required	Count	16	7	28	51
		Expected Count	25.1	6.4	19.5	51.0
		Adjusted Residual	-2.8	.3	2.7	
	I volunteered	Count	126	29	82	237
		Expected Count	116.9	29.6	90.5	237.0
		Adjusted Residual	2.8	-.3	-2.7	
Total		Count	142	36	110	288
		Expected Count	142.0	36.0	110.0	288.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.646(a)	2	.013
Likelihood Ratio	8.702	2	.013
Linear-by-Linear Association	8.591	1	.003
N of Valid Cases	288		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.38.

Table 53: Voluntariness: The campus administration may not recognize the effort required to teach online.

			Not Recognized by Campus Administration			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
Voluntariness 1	I was required	Count	16	11	27	54
		Expected Count	24.5	6.5	23.0	54.0
		Adjusted Residual	-2.6	2.1	1.2	
	I volunteered	Count	115	24	96	235
		Expected Count	106.5	28.5	100.0	235.0
		Adjusted Residual	2.6	-2.1	-1.2	
Total		Count	131	35	123	289
		Expected Count	131.0	35.0	123.0	289.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.215(a)	2	.016
Likelihood Ratio	8.093	2	.017
Linear-by-Linear Association	4.035	1	.045
N of Valid Cases	289		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.54.

Table 54: Voluntariness: Some people say that online courses are of an inferior quality compared to classroom-based courses.

			Inferior Quality			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Voluntariness 1	I was required	Count	27	12	18	57
		Expected Count	35.8	7.6	13.7	57.0
		Adjusted Residual	-2.7	1.9	1.5	
	I volunteered	Count	167	29	56	252
		Expected Count	158.2	33.4	60.3	252.0
		Adjusted Residual	2.7	-1.9	-1.5	
Total		Count	194	41	74	309
		Expected Count	194.0	41.0	74.0	309.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.536(a)	2	.023
Likelihood Ratio	7.240	2	.027
Linear-by-Linear Association	5.164	1	.023
N of Valid Cases	309		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.56.

Table 55: Two-year and Four-year Faculty: A lack of recognition of online teaching in regards to tenure considerations.

			Lack of Recognition (Tenure)			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
2-year or 4-year	Two-year colleges	Count	75	28	28	131
		Expected Count	63.6	30.7	36.7	131.0
		Adjusted Residual	3.0	-.8	-2.5	
	Four-year colleges	Count	41	28	39	108
		Expected Count	52.4	25.3	30.3	108.0
		Adjusted Residual	-3.0	.8	2.5	
Total		Count	116	56	67	239
		Expected Count	116.0	56.0	67.0	239.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.647(a)	2	.008
Likelihood Ratio	9.711	2	.008
Linear-by-Linear Association	9.431	1	.002
N of Valid Cases	239		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.31.

Table 56: Two-year and Four-year Faculty: The technology involved in online teaching can be confusing.

			Confusing Technology			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
2-year or 4-year	Two-year colleges	Count	125	34	22	181
		Expected Count	117.8	27.6	35.5	181.0
		Adjusted Residual	1.7	2.0	-3.8	
	Four-year colleges	Count	84	15	41	140
		Expected Count	91.2	21.4	27.5	140.0
		Adjusted Residual	-1.7	-2.0	3.8	
Total		Count	209	49	63	321
		Expected Count	209.0	49.0	63.0	321.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.168(a)	2	.000
Likelihood Ratio	16.229	2	.000
Linear-by-Linear Association	8.429	1	.004
N of Valid Cases	321		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.37.

Table 57: Two-year and Four-year Faculty: Inadequate time to revise online courses

			Inadequate Time to Revise			
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	Total
2-year or 4-year	Two-year colleges	Count	85	29	53	167
		Expected Count	81.5	21.9	63.5	167.0
		Adjusted Residual	.8	2.4	-2.5	
	Four-year colleges	Count	60	10	60	130
		Expected Count	63.5	17.1	49.5	130.0
		Adjusted Residual	-.8	-2.4	2.5	
Total		Count	145	39	113	297
		Expected Count	145.0	39.0	113.0	297.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.539(a)	2	.008
Likelihood Ratio	9.807	2	.007
Linear-by-Linear Association	3.121	1	.077
N of Valid Cases	297		

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.07.

Table 58: Computer Skill Level: There may be inadequate compensation for online course development.

			Inadequate Compensation (Course Development)			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Computer Skill	Low	Count	8	9	7	24
		Expected Count	9.9	2.8	11.3	24.0
		Adjusted Residual	-.8	4.1	-1.8	
	Medium	Count	59	13	63	135
		Expected Count	55.6	16.0	63.4	135.0
		Adjusted Residual	.8	-1.1	-.1	
	High	Count	55	13	69	137
		Expected Count	56.5	16.2	64.3	137.0
		Adjusted Residual	-.3	-1.2	1.1	
Total		Count	122	35	139	296
		Expected Count	122.0	35.0	139.0	296.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.124(a)	4	.002
Likelihood Ratio	12.547	4	.014
Linear-by-Linear Association	.697	1	.404
N of Valid Cases	296		

(a) 1 cells (11.1%) have expected count less than 5. The minimum expected count is 2.84.

Table 59: Computer Skill Level: The campus administration may not recognize the effort required to teach online.

			Not Recognized by Campus Administration			Total
			Does not decrease my desire to teach online	Neutral	Decreases my desire to teach online	
Computer Skill	Low	Count	18	1	5	24
		Expected Count	10.9	2.9	10.2	24.0
		Adjusted Residual	3.0	-1.2	-2.2	
	Medium	Count	60	16	55	131
		Expected Count	59.4	15.9	55.8	131.0
		Adjusted Residual	.1	.0	-.2	
	High	Count	53	18	63	134
		Expected Count	60.7	16.2	57.0	134.0
		Adjusted Residual	-1.8	.6	1.4	
Total		Count	131	35	123	289
		Expected Count	131.0	35.0	123.0	289.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.396(a)	4	.034
Likelihood Ratio	10.690	4	.030
Linear-by-Linear Association	6.629	1	.010
N of Valid Cases	289		

(a) 1 cells (11.1%) have expected count less than 5. The minimum expected count is 2.91.

Table 60: Factor Pattern Matrix: Motivators

	Learning	Profession	Flexibility	Access	Novelty
Experiment with New Pedagogy	*.763*	-.116	-.216	-.101	-.123
Reflect and Think Classroom Teaching	*.708*	-.011	-.156	-.112	-.025
Gain New Knowledge	*.684*	-.026	-.144	-.150	-.163
Experiment with New Assessment.	*.573*	.150	-.154	-.049	-.163
High Level of Interaction	*.503*	.102	.164	-.300	-.053
Demonstrate Competencies	.041	*.654*	-.105	.007	.108
Employment	-.215	*.635*	-.106	-.070	-.043
Promote "Job Security."	.132	*.599*	-.103	-.116	.075
Positive Teaching	.122	*.570*	-.009	-.166	-.051
Collaborative Professional Development	.301	*.564*	.156	.017	-.268
Other Material Incentives	-.215	*.508*	-.122	-.133	-.181
Act as a Mentor	.398	*.494*	.104	.018	-.174
Teach a New Subject Area	-.060	*.465*	-.084	-.112	-.241
Students May Want Online Courses	.228	*.315*	-.094	-.141	-.094
Accommodates Other Life Needs	-.004	.051	*-.760*	-.057	-.099
Reduce commuting time or hassle	.025	.146	*-.679*	-.095	.053
Provides Flexible Teaching Environment	.167	-.107	*-.671*	-.102	-.152
Free Time	.120	.293	*-.527*	.040	-.011
Reach Students with Different Culture	-.021	-.037	-.041	*-.985*	.030
Reach Students with Different Location	.021	-.017	-.094	*-.895*	.044
Reach Students at Different Learning Stage	.052	.092	.070	*-.754*	-.074
Learn New Technology	-.090	-.058	-.090	-.030	*-.983*
New Challenge	.205	-.009	-.121	.004	*-.712*
Renew Interest in Teaching	.215	.160	.111	-.103	*-.476*
Reliability (overall .94)	.87	.88	.85	.91	.78

Table 61: Factor Pattern Matrix: Demotivators

	Compensation	Reputation	Complexity	Promotion	Technology
Inadequate Compensation (Course Development)	*.904*	.046	.028	.024	.043
Inadequate Compensation (Teaching)	*.890*	.013	-.023	.067	-.036
Inadequate Compensation (Revision)	*.887*	.020	.084	.045	.049
Inadequate Time to Develop A New Online Course	*.637*	-.021	.041	.001	-.353
Inadequate Time to Revise	*.572*	.015	.065	-.016	-.417
Inadequate Time to Learn	.436	.047	.087	.048	-.453
More Time	*.427*	.200	.254	-.002	-.071
Intellectual Property and Teaching Online	*.335*	.177	.099	.028	-.236
Negative Comment from Colleague	-.033	*.852*	.120	-.033	.004
Negative comments about Inferior Quality	.061	*.834*	.088	.070	.129
Reduce Institution's Reputation.	.039	*.783*	.074	-.058	-.036
Not valued by Campus Administration	.120	*.716*	-.080	.164	-.025
Students Don't Want Online Course	-.080	*.604*	-.044	.030	-.177
Not Recognized by Campus Administration	.435	*.558*	-.053	.123	.148
Complicated Course Development	.042	-.059	*.841*	.151	.106
Confusing Technology	-.005	-.022	*.733*	.134	-.083
Unfamiliar Effective Pedagogy	-.011	.119	*.707*	.032	.027
Absence of Face-to-Face Interaction	.054	.028	*.622*	-.129	-.078
Qpolicies_A_2 Lack of Recognition (Salary Increment)	.028	-.007	.002	*.924*	-.019
Qpolicies_A_1 Lack of Recognition (Tenure)	-.041	.042	.089	*.882*	-.054
Qtechsuppissues_A_2 Inadequate Technical Support on Teaching	.092	.049	-.009	.110	-*.789*
Qtechsuppissues_A_1 Inadequate Technical Support on Course Development	.138	.008	-.012	.127	-*.777*
Qtechsuppissues_A_3 Students Lack Adequate Access	-.010	.159	.287	-.005	-*.498*
Qtechsuppissues_A_5 No Opportunity to Experiment with Technology	.125	.186	.273	.004	-*.465*
Qtechsuppissues_A_4 Little or No Opportunity to Observe	-.025	.325	.245	.032	-*.462*
Reliability (overall .96)	.93	.91	.83	.95	.92

UNDERSTANDING AND FOSTERING INTERACTION IN THREADED DISCUSSION

Robert S. Williams
English Language Institute
The American University in Cairo

Rachel Humphrey
The University of Essex

ABSTRACT

This study (N=2,826 postings from 92 participants) examines the phenomenon of interactivity in asynchronous computer-mediated communication (ACMC), also known as threaded discussion, in the context of master's level Teaching English as a Second Language (MATESL) and Teaching English as a Foreign Language (MATEFL) courses. The study, which is grounded in a group of interrelated pragmatic, learning community, and pedagogical theories, attempts to determine when and under what conditions interactivity, here defined as a response to a previous posting, occurs. We focus on conditions that are present in interactive threaded discussions, those with low rates of serial monologuism and high rates of participant uptake. Taking interactivity as the dependent variable, we test a number of properties of individual ACMC postings to determine their relationships to interactivity. These variables include biographical properties of the writers (gender and first language (L1), role in the course) and a group of individual ACM posting properties, such the content of the posting (course related, phatic, both), whether or not the posting is interactive, the length of the posting, its intended audience, and whether or not the posting contains indicators of social presence (use of social speech, humor, naming, and more), face-threatening speech acts, and direct questions.

Data used in the study were collected from ACMC, part of a web-based graduate introduction to second language acquisition and research methods courses. Participants in the courses were from various L1 backgrounds, including American English, Polish, Korean, and Arabic. Among our findings is that while social presence markers do not predict interactivity, there does seem to be some relationship between indicators of social presence and the quality of interaction.

KEYWORDS

Distance Learning, Online Learning, Asynchronous Learning, Threaded Discussion, Interaction, Social Presence, Cognitive Presence, Length, Face-Threatening Speech Acts, Community Of Practice, Community Of Learning, Virtual Learning Network, TESL, TEFL, Naming, Questions

I. INTRODUCTION

In this study, we are interested in the nature of interaction in structured online courses, where a number of students and their instructors come together for the purpose of learning, and where ACMC is the primary means of interaction. We assume that these kinds of courses take place in learning communities, primarily, but not solely, because their members share a practice. We further assume, following Vygotsky [1], Lave and Wenger [2], Garrison and Archer [3], Anderson [4], and others, that interaction among

members of learning communities is a highly beneficial, if not necessary, condition of learning. We thus investigate a corpus of ACMC postings from online courses to discover how certain properties of threaded discussion postings relate to the degree of interactivity in the courses. We measure interactivity by uptake, or how many times discussants respond to a particular posting, as opposed to posting a message which does not respond directly to another discussant's posting.

From learning community, socio-cultural, pragmatic, and online learning theoretical perspectives, we are particularly interested to know whether interactivity is related to a number of variables in ACMC postings, including the presence of speech indicating social presence, face-threatening speech acts, and direct questions; the message content of postings (course content, social talk, both); and the intended audience of postings. From a more practical perspective, we are interested in whether or not the length of postings relates to interactivity.

We also acknowledge the importance of quality in ACMC interaction, especially as this relates to the ultimate goal of a learning community, a "purposeful and worthwhile learning experience" [5]. The achievement of this goal requires not just interactivity, but interactivity in the form of content-rich and critical discourse. A thorough investigation of the quality of discourse as it relates to interactivity is not within the scope of the present study. However, in order for there to be quality interchanges among discussants, there must first be interaction, and thus it is the nature of interactive ACMC that is the focus of the present study.

II. REVIEW OF RELEVANT LITERATURE

Student interaction is important for learning in general; however, different views are emerging concerning what this means in the online environment. If we consider that online learning takes place in a networked virtual learning environment [6] then we must recognize the various substructures of the networked environment when analyzing the role of interaction in online learning. Following Barab et al. [7], the Virtual Learning Environment (VLE) is a network made up of the technical structures that support interaction, as well as the various kinds of interaction that occur in the VLE. Among these are *people to technology*, *people to content*, and *people to people* interactions. Concerning the latter, there are now well-developed theories of the role of community in online learning. The ideas of community of practice (COP) [2, 8, 9, 10] and the more pedagogically oriented but similar community of inquiry [3], when applied to online learning, view learning communities as networks of mutual support, providers of information, and carriers of the culture and corporate experience of the discipline. The concept of community is particularly important from the perspective of the sociocultural [1] and constructivist [11, 12] approaches to education that consider learning as a process of co-constructing knowledge within a social context. Learning communities, by definition, are interactive and place more of the burden of learning on the students [13]. Accordingly, a learning community provides the conditions necessary for learning, that is, a space for constructivist discourse in a cooperative and nonthreatening environment.

However, the community of practice model has been criticized for several reasons. Goodfellow and Hewling [6] question the validity of a community of practice that in reality only seems to exist because the students have to post contributions to get a grade. Jones [13] adds that even valid communities of practice tend to exist on the margins of professional fields rather than being representative of standard professional practice. In addition, he suggests that a large proportion of learners who choose to take online courses do so because they value autonomy and flexibility with the availability of a virtual learning environment and a network of weak personal ties, not because they want to be linked to a demanding community. Finally, the importance of strong social ties in learning communities is not an uncontroversial position. Jones also raises the question of whether or not the kind of social cohesion found in learning

communities is a necessary precondition for networked learning. We will comment on this point in the discussion section.

A. Interaction in Online Learning

Anderson [4] identifies three types of student interactivity in the context of the online course: *teacher-student, student-student* and *student-content*. He suggests that at least one of these modalities needs to function at very high levels for "deep and meaningful learning" to occur. Goodfellow and Hewling [6] consider the inherent contradiction between the commonly stated advantages of flexibility and autonomy in accessing online content on the one hand, and the emphasis on the formation of online community from many practitioners on the other. Two distinct schools of thought seem to be emerging in course design—those focusing on flexible learning, and those based in the concept of a strong online community. As stated previously, the latter applies to the data in this study.

B. The Nature of Asynchronous Computer Mediated Communication

In the online context, where it is often not possible to perceive visual and audio cues, high quality interaction is crucial for instructors to be able to accurately assess students' needs [4]. Online interaction can also encourage reflection on the course materials as well as on the learning process itself [14], which increases students' ability to apply concepts in new situations.

ACMC has proved popular as an educational tool in many institutions [14, 15] due to its ability to include people from any time zone or geographical location, while providing opportunities for deep, reflective discussion that some users report as being richer than face-to-face interaction [16, 17]. This may be because of the time delay, which gives opportunities for students to reflect; refer back to source readings and frame their responses precisely [18].

With this recognition of the importance of high levels of interactivity, attention has begun to focus on the factors that make a posting interactive—in other words, how people reply to it and continue the discussion.

A recent trend in ACMC research has been the use of content analysis to describe the nature of postings [19] and also to describe specific concepts such as social presence, which researchers feel to be significant in promoting interactivity. Rourke et al. [15] defined social presence as "the ability of learners to project themselves socially and affectively into the community of inquiry." Rourke et al. developed a template for assessing social presence in ACMC, including factors such as humor, quoting others' messages and use of *we*, *our* or *us*. They also observed that certain elements, specifically *naming* and *phatic comments*, tended to occur in a negative correlation with the other elements of social presence.

Tu and McIsaac [20] saw social presence as "a measure of the feeling of community that the learner experiences in an online environment." They also worked with a complex set of variables including *social context, online communication issues, message length* and *task type*, assessing students' perceptions of these variables. Their findings suggest that although situations showing high social presence tend to be interactive, not all interactive situations have high social presence. A causal relationship has yet to be observed between social presence and interactivity.

Jeong [21] analyzed the online debates of 19 graduate students from a variety of linguistic backgrounds to establish if there was a connection between *response time, content* and *interactivity*. He found that,

generally speaking, the longer the wait, the less likely it was that a message would be answered. Exceptions were found, however, in the case of critiques which, although they had a longer than average wait for an answer, were among the most interactive postings. He suggests that critiques take longer to compose than other responses due to the complex thought processes involved, but because they deal directly with participants' opinions and work, they generate a great deal of interest and response.

Fahy and Ally [19] studied the effect of learning style on participation levels in ACMC. They administered the Kolb Learning Style Inventory, which identifies four types of learners—*convergers*, *divergers*, *accommodators*, and *assimilators*—to two classes of graduate students. They then analyzed subjects' participation in a threaded discussion both for frequency and type of participation. Their results indicate that learning style may be a predictor of the level and type of involvement in ACMC; for example, *convergers* made significantly more and longer contributions than *divergers*. *Accommodators* posted more contributions with the aim of scaffolding or engaging others while *assimilators* were more inclined to "lurk" in the discussion and observe without participating.

In summary, it appears that student learning style, message response time and content may be predictors of interactivity. Learning styles and message response time are beyond the scope of this study, but we do examine message content, particularly with respect to whether it is related to course content or is social communication. Many other factors, including social presence, could contribute to interactivity but a relationship has yet to be established. The object of this study is to identify further variables that may characterize an interactive posting.

III. THE PRESENT STUDY

The present study is primarily quantitative in nature, using a logistical regression procedure, discussed below. However, discussion of the results is also qualitative in nature. In the future, we hope to follow this study with another that will present a more qualitative examination of the results.

We have situated this study in a mixed theoretical framework, which includes the sociocultural and constructivists theories of learning; the online learning theories; and theories of communities of practice and learning discussed in the introduction. In addition, we draw upon various pragmatic theories, including speech act theories of Searle [22, 23], politeness theories of Grice [24, 25] Leech [26], and Brown and Levinson [27]. We focus these theories, in one way or another, on interactivity. The learning theories cited above all specify some kind of interaction as a precondition for learning. Thus, interactivity in ACMC is the dependent variable in the study.

The aforementioned pragmatic theories are relevant here because of the possible relationship of interactivity and certain speech events, known as face-threatening speech acts (FTA). These can be seen as acts hostile to a discussant in a way that threatens that person's sense of him or herself as a competent autonomous actor. Examples of such FTAs are the expression in ACMC of disagreement or dissatisfaction with a previous posting, where the competence of the other discussant(s) is called into question. Politeness theory would predict the presence of linguistic softeners, such as partial agreement or praise, where FTAs are present, in order to maintain decorum in communication. We are interested then, in examining the relationship between the presence of FTAs, with and without politeness redress, and interactivity.

Theories of the role of community in learning assume the importance of social cohesion. This can be measured in a number of ways. We follow Rourke et al. [15] and Tu and McIsaac [20] in measuring

social presence by the use of naming, humor, and emoticons. We also discuss other possible indicators of social presence, such as the use of politeness softeners with FTAs, which are not themselves counted directly as such. Thus we examine whether or not social presence relates to interactivity.

Finally, and from a more practical standpoint, we want to know whether certain properties of postings may relate to interactivity. These include the length of a posting and whether or a posting contains a direct question.

IV. THE PARTICIPANTS AND COURSES

There were 92 participants in the study, 91 of whom were students in two MATESL/TEFL programs. Of these, 66 were female and 26 were male. Thirty four students were taking the courses from Egypt, and all of these were in the hybrid courses. In the all-online courses, 38 students took the courses from Poland, 19 from the US. The instructor, who was the same for all seven courses, taught the courses while in Poland and the US. Though the medium of instruction of all courses was English, among the 91 students were speakers of American English, British English, Polish, Korean, Chinese, Vietnamese, Japanese, Greek, French, Palestinian Arabic, and Egyptian Arabic.

Data were gathered from seven graduate-level courses. Four of these were offered as part of the MATESL curriculum at a small university in the eastern United States. One was a research methods course and three were second language acquisition courses. All four courses were taught completely online, but were a component of a low-residency or hybrid FTF-online program, and all used the eCollege course management system. The remaining three courses were given as part of an MATEFL program at an American university in the Middle East. All were second language acquisition courses, and all were primarily delivered in face-to-face mode with data taken from a one-week online module using the WebCT course management system.

All seven courses relied on weekly threaded discussion as their main interactive forum, where each weekly discussion lasted five days. Where class size was over 10, students were divided into two separate discussion groups. Students were required to access the course website at least twice a week, at two-day intervals, and to contribute at least two postings per access. As well as contributing new postings, students were encouraged to "converse" with other students by replying to previous postings. The phenomenon of excessive serial monologuism was discussed and discouraged by the instructor. Though discussion participation was required, it was not counted as a percentage of the final grade. However, students were told that their constant participation, as well as the quality of their postings, could influence their final grades. Students were given no instructions with respect to verbal etiquette, or length of postings.

There was significant teaching presence in all seven courses, in that the instructor set the direction of each weekly discussion by posting several starter questions at the beginning of the discussion. Usually, students would begin by discussing the starter questions and then would add other topics. During the discussion, the instructor assumed the role of a codiscussant.

Finally, there was evidence of high cognitive presence in the discussions, in that 96% of postings were primarily concerned with course content.

C. The Data

The 92 subjects contributed 2,826 ACMC postings to the data set, which comprise a corpus in excess of

500,000 words. The same instructor, teaching at two universities, taught all of the courses in this study.

D. The Variables

We coded the data for the following 11 variables, which reflect properties of the writer, the course, and the postings themselves, as seen in Table 1.

Table 1. Variables

Category	Label	Variables
Characteristics of the Writer	▪ *L1* ▪ *GENDER*	▪ *native language* ▪ *gender*
Characteristics of the Course	▪ *TYPE* ▪ *STATUS*	▪ *course type* (all online/hybrid) ▪ *course status* (required/elective)
Characteristics of the Posting	▪ *FTA* ▪ *QUESTION* ▪ *AUDIENCE* ▪ *LENGTH* ▪ *TOPIC* ▪ *SP* ▪ *NAME* ▪ *INTERACT*	▪ *presence of face-threatening speech act* ▪ *presence of direct question* ▪ *intended audience* (student/instructor/both) ▪ *length of posting* ▪ *nature of topic* (personal/course content/both) ▪ *indication of social presence* (presence of phatic speech, humor, and emoticons or paralinguistic features) ▪ *naming* ▪ *interactivity* (whether or not the posting received a direct reply)

These variables, all categorical, were chosen for two main reasons, having to do with methodology and theory. The dependent variable *interactivity* (INTERACT) is dichotomous and thus can be used with a logistical regression. The other variables can easily be quantified and thus also work well with the statistical procedure. Also, these variables fit our theoretical orientation, and thus have the potential to address some theoretical foundations of ACMC-based learning. Most of the variables are self explanatory, with the exception of the three discussed below.

1. Face-threatening Speech Acts

For the purpose of this study, we consider a face-threatening speech act (FTA) to be anything that reflects negatively on the competence of the reader. These include the presence of the speech acts *disagreement, showing dissatisfaction with a posting in some way*, and *asking for clarification*. In addition, this variable was coded for the presence of linguistic politeness devices, such as *naming, partial agreement, praise*, and *self deprecation*, which work to reduce threat to face, as well as face-threatening act intensifiers, such as *naming* and the expression of *bold face disagreement*. We recognize that this definition of a face-threatening act is Anglocentric, and that different cultures, or maybe even different generations will define FTAs in different ways. However, we are interested to discover whether, within an English medium online environment, awareness of what constitutes an FTA, or the lack thereof, affects the ongoing relationships within the discussion. For this reason, we decided to use the traditional model, despite its shortcomings.

So, a posting was either coded for *no FTA, FTA without politeness device, FTA with politeness device*, or *FTA with intensifier*.

2. Naming

The speech act of *naming* (NAME) can function either as a softener, as in (1) and (2), or an intensifier as in (3) and (4) when present with FTAs. The examples below are taken from the data, though pseudonyms are used.

1) Hi Rick - Thanks for being the first to post. I think you all might be mixing up contrastive analysis theory with the idea of universal acquisitional orders...
2) Hi! Jennifer. I am not sure whether UG (universal grammar) influences IL (interlanguage) to the full extent. May be UG can be only once fully activated then UG works only via L1 to L2.
3) Katherine, even if there seem to be more outstanding men than women, you have to remember that the society didn't allow women to be special.
4) John - If you don't accept UG for L1, does that mean that you don't think there are properties universal to all natural languages?

The first two postings contain FTAs in the form of statements indicating dissatisfaction with an assertion in a previous posting. In these cases, naming, along with greetings and, in the case of (1), praise, work to decrease the intensity of the FTAs. In replies (3) and (4), however, naming seems to highlight the writers' disagreements with the postings to which they replied. It is perhaps significant that in the later two examples, where we have judged naming to be an FTA intensifier, it occurs alone. When naming occurs with politeness devices, such as agreement, in an FTA, it enhances social presence and works to lessen the threat to face in the FTA. It is also possible that naming acts as a neutral pointing device with respect to FTAs. Thus, when naming co-occurs with politeness devices in FTAs, naming points to the politeness device, having the effect of lessening the threat to face. However, when naming occurs in FTAs without politeness devices, it points to the FTA itself, thus acting to intensify the threat to face. Nguyen and Kellogg [28] find that naming occurs more frequently in their data with the expression of agreement than with disagreement. They suggest that naming is thus a device used to "build positive harmonious relationships." However, the fact that naming is also used with disagreement indicates that while it is a device used for social inclusion, social inclusion does not always equate to group harmony.

Naming seems to work as a kind of linguistic pointing device, such that when politeness devices are present, naming points to those, thus heightening their softening function, which in turn acts to lessen threat to face. In the case of FTAs where no devices are present, naming points directly to the FTA, and thus works to heighten the threat to face. This phenomenon was also noticed by Savignon and Roithmeier [29], who find that addressing a fellow discussant personally can be confrontational.

3. Indication of Social Presence

This study includes most of the variables which were included under Rourke et al.'s [15] definition of social presence, although some of the categories were conflated. Some of these were a specific focus of the study, specifically *questions, naming* and *face-threatening acts*, and were treated as separate variables because we wanted to determine their effect as individual features. Others such as *phatic speech, humor,* and *emoticons or paralinguistic features* were included in a single category of *social presence* (SP). If a posting had none of these three features, it was coded as 0; if one, it was coded as 1, and so on, so that the more indicators present, the higher the social presence of a posting.

However, another indication of social presence not included in the variable SP was the presence of politeness devices with FTAs, discussed in the previous section. We believe this is also a powerful indicator of social presence, since it shows that the writer wants to minimize the possibility of a face threat to the reader, thus reducing conflict in the community of inquiry possibly enhancing interaction

among group members. The kind of interaction brought about by an FTA is very desirable, because it enhances the quality of the discourse by engaging the participants in a "process of inquiry" [5], which in turn enhances cognitive presence, or meaningful interaction. According to the Garrison et al. [30] model of learning discussed with respect to social presence in Rourke et al. [15], the interaction of cognitive presence and social presence is a necessary condition of learning, and thus the use of politeness devices with FTAs, as a marker of social presence, might contribute to this interaction.

E. Interactivity

Postings were considered to be interactive (INTERACT) if they received a direct reply, as indicated by the threaded discussion interface schema from the course website.

Figure 1. Threaded Discussion Schema

Subject
NL – *SLA Relationships (1)
↳Re: NL – SLA (2)
↳ Social-linguistic influence (3)
↳ Re: Social-linguistic influence (4)
↳ Re: Social-linguistic influence (5)
↳ Re: NL – SLA (6)
↳ Re: NL – SLA (7)
↳ Re: Question 1 (8)
↳ Re: Question 1 (9)
↳Re: Discussion Questions (10)
↳ Re: Discussion Questions (11)

*SLA refers to second language acquisition

In Figure 1, all of the postings were considered interactive except numbers (5), (7), (9), and (11). It was also often the case in our data that a direct reply to one particular posting also referenced one or more other postings. For example, (7), which directly replied to (6), may also have referenced something written in (2). Due to the size of the data set, we were not able to code for this kind of secondary interactivity.

F. The Quantitative Analysis

We analyzed the data using a logistical regression procedure, which calculates maximum likelihood where there is a dichotomous dependent variable and categorical independent variables. The logistical regression procedure was chosen because of its superior ability to handle natural language data. The only other possible procedure to use with a dichotomous dependent variable is discriminant function analysis, which is not ideal to use with natural language data because it tends to bias results where independent variables are not normally distributed.

Our dependent variable was INTERACT with the other eleven variables used as independent variables

(see Table 1). The significance level for interactivity was .05.

V. RESULTS

The overall model was found to be significant $\{\chi^2 (11, N = 2826) = 235.9, p < .001\}$. The results of the linear regression procedure were as follows. The independent variables QUESTION, AUDIENCE, and LENGTH were found to be significant, at $p < .001$, $p < .002$, and $p < .001$, respectively, with respect to their relationships to the dependent variable INTERACT.

To further understand the logistical regression results, we looked at two-way Chi-square cross tabulations for each significant variable, to determine which level(s) of the significant independent variables was most closely related to INTERACT. We used the two-way Chi-square for these three variables because this allowed us to say more about the relationship between the dependent and independent variables, as is explained in 3.1.

A. Direct Question

The relationship between INTERACT and QUESTION was significant at $\chi^2 (1, N = 2826) = 99.342$, $p < .001$ in the logistical regression procedure. The use of a two-way Chi-square procedure for these two variables tells us more about this relationship. The cell –INTERACT/+QUESTION is responsible for 45% of the Chi-square value, where there were fewer tokens than expected, and the cell +INTERACT/+QUESTION, where there were more tokens than expected, for 34% of the value. This indicates that the presence of a direct question in a posting is a predictor of positive interactivity.

Table 2. Chi-square Cross Tabulations for Interactive and Direct Question

		- Direct Question	**+ Direct Question**
- Interactivity	Count Expected Count Cell Contribution	1058 950.1 (12%)	154 261.9 (45%)
+ Interactivity	Count Expected Count Cell Contribution	1158 1265.9 (9%)	457 349.1 (34%)

B. Audience

The relationship between AUDIENCE and INTERACT was significant in the logistical regression $\{\chi^2 (2, N = 2826) = 32.540, p < .001\}$. The Chi-square for AUDIENCE and INTERACT shows that the interactivity was increased when a posting had a broad intended audience, which is when more than one person was included as the target, whether by directly naming more than one person, or by complete lack of naming.

Table 3. Chi-square Cross Tabulations for INTERACT and AUDIENCE

		Audience		
		Student	**Instructor**	**Both**
- Interactive	Count Expected Count Cell Contribution	768 696.2 (22.7%)	49 48.4 (0%)	395 467.3 (34.4%)
+ Interactive	Count Expected Count Cell Contribution	856 927.8 (17.1%)	64 64.6 (0%)	695 622.7 (25.8%)

C. Length

The relationship between the variables INTERACT and LENGTH was also significant in the logistical regression $\{\chi^2 (4, N = 2826) = 100.410, p < .001\}$. The Chi-square results for these two variables show that extremely short postings are predictors of negative interactivity. We can see this because there are far more non-interactive/short postings than expected and far fewer interactive/short postings than expected. Also, longer postings, those of 251–500 and 500+ words in length were more likely than expected to be interactive. There was no statistically significant relationship between QUESTION and LENGTH ($\chi^2 (4, N = 2826) = .664, p = .956$), so a possible explanation that shorter postings were less likely to contain direct questions does not hold true.

Table 4. Chi-square Cross Tabulations for Interactivity and Length of Posting

		Length of Posting				
		0–50	**51–150**	**151–250**	**251–500**	**500+**
- Interactive	Count Expected Count Cell Contribution	298 225.5 (23.2%)	654 625.1 (1.3%)	184 234.1 (10.7%)	73 116.2 (16%)	3 11.1 (5.9%)
+ Interactive	Count Expected Count Cell Contribution	228 300.5 (17.5%)	804 832.9 (1%)	362 311.9 (8%)	198 154.8 (12%)	23 14.9 (4.4%)

D. Role of the Instructor

Initial qualitative analysis of the data indicates that the participation of the instructor in the discussion has different characteristics than that of the students, due to the instructor's role in eliciting information and challenging incorrect statements, and to his status. We therefore re-ran the logistical regression a second time excluding the postings contributed by the instructor to establish if these contributed to the overall effect. We found that they did not. The overall model without the instructor was also significant $\{\chi^2 (11, N = 2353) = 194.265, p < .001\}$. The two variables QUESTION and LENGTH were still significant with respect to INTERACT, each at $p < .001$, but AUDIENCE ($p > .037$) was not. The overall χ^2s for QUESTION and LENGTH with respect to INTERACT without the instructor were similar to those where the instructor was included. Thus, these results indicate that the effect of the instructor's role is not significant with respect to overall interactivity levels in the threaded discussion. So, student discussants were no more likely to reply to the instructor's postings than to those of their fellow students.

We did note that the personal interactivity levels of individuals vary significantly. By personal interactivity, we refer to the degree to which an individual's postings are directly answered by another

participant in the threaded discussion. The interactivity level for the corpus as a whole is 57.1%, but the instructor's personal interactivity level is significantly lower at 46.2%. Certain individuals among the students, by contrast, have significantly high levels of personal interactivity, for example, student 38, whose postings received direct replies 70.3% of the time. Further examination is needed to establish reasons for these differing levels, although we hypothesize here that the low instructor level of interactivity may be due to his perceived status as someone with superior knowledge and experience. This is speculation, though, since this instructor had a relatively informal relationship with the students, indicated by the students' use of his first name when addressing postings to him, making it less likely that students would challenge or query his postings.

VI. DISCUSSION

Descriptive statistics show that 57% of all postings in the data are interactive, and that 70% contain one or more speech acts marking social presence. These statistics indicate that the courses had a high degree of interactivity and good social cohesion, though as shown previously, these two variables are not statistically significant. A much lower percentage of postings (15.6%) contain a face-threatening speech act. Of those, 81% also show some kind of politeness softener, indicating that students feel that it is necessary to maintain a high level of politeness in ACMC discourse.

The results of our data analysis are interesting both for what they do and do not show. Beginning with QUESTION, AUDIENCE, and LENGTH, the three variables that have a significant relationship to interactivity, it was found that the presence of direct questions predicts enhanced interactivity. This result is not surprising, since a response request is inherent in the speech act of a non-rhetorical question. Direct questions also functioned as FTAs when they showed dissatisfaction in some way with a previous posting. FTAs are important for meaningful class discussions, because it is partly through disagreement and its resolution that meaning is constructed. However, for this to happen there must be dialogue, meaning that postings with FTA must be interactive. Postings with FTAs with direct questions accounted for slightly over 30% of all FTAs. When question FTAs were paired with politeness devices, those posting were more likely than expected to be interactive. This suggests that indicators of social cohesion, in the form of politeness softeners, may increase interactivity, at least in the context of FTAs. This is important, because, at least for postings with FTAs, social cohesion and interactivity quality appear to be linked. Politeness softeners seem to lead to increased interactivity for FTAs to which they are attached, and this is an indicator of the quality of interactions. Our results in this area differ from those of Jeong (2005), who found that FTAs (which he calls *arguments*) with politeness devices (which he refers to as *qualifiers*) were less interactive than those with intensifiers or with no qualifying language.

Though the variable GENDER was not found to be significant in our study, we did find a significant relationship between increased interactivity and FTAs with politeness devices written by females (χ^2 (3, N = 1881) = 15.470, $\underline{p}$ = .001). This relationship was neither significant for males nor for the group as a whole. Thus, our findings are in direct contradiction to Jeong's [31]. That students responded to direct questions with a significant frequency is also perhaps an indication of the social cohesion of the learning community, even though the logistical regression did not indicate that written indicators of social presence were related to interactivity.

Data for the variable LENGTH yielded results that we found somewhat counterintuitive. While it might be expected that extremely long postings would inhibit interactivity, this was not the case in our data. Very short postings, however, did correlate with low interactivity. As previously mentioned, this was not due to a lack of direct questions in short postings, or to a lack of indicators of social presence. One possible explanation for this phenomenon is that many short questions in our data were merely

expressions of support directed at other postings. In fact, a qualitative analysis of short postings indicates that they were sometimes used by students as a means of fulfilling participation requirements without having to present new ideas, opinions, or reflections about previous postings. Short postings were also used frequently by very prolific participants, again to express support or make quick comments or jokes, as a means to build social cohesion and maintain dialogue in addition to those participants' main substantive contribution to the discussion. Extremely lengthy postings often contained complex analyses of course content, and though these are not more likely than shorter postings to contain direct questions, they nevertheless offered a richer basis for responsive comments. However, the relationship between very long postings and levels of interactivity is complex, and showed no statistical significance in the Chi-square analysis. Qualitative analysis suggests that when a writer's opinion is controversial, it provokes others to share relevant personal experiences, or raises a new set of questions; these complex postings can be highly interactive. But postings where a writer appears to have covered the subject comprehensively can be less interactive, possibly because other students have difficulty finding something new to say.

Even the postings that produce large numbers of responses are not necessarily the most helpful in generating further discussion. There was one individual among the subjects who was responsible for more than his share of lengthy postings, and his longer contributions mostly consisted of detailed analysis. Others in his class would often wait for him to respond first and many would then contribute very short postings agreeing with his point of view. On some occasions, though, these thought-provoking contributions sparked off some of the most challenging and complex debates in the data set. It seems that in the data overall, the positive and negative effects of these postings cancelled each other out.

The data for AUDIENCE indicate that postings intended for a broad audience, that is, more than one person, and for both instructor and other students, are more likely than not to be interactive. Although the variable NAME, certainly a marker of social presence, was not found to be a predictor of interactivity on its own, the vocative speech act was a frequent device used to indicate the intended audience of a posting, usually limiting the audience to one person. Indirectly then, naming does appear to be a possible negative predictor of interactivity.

We were somewhat surprised not to see a relationship between the independent variables FTA, SP, and NAME and the dependent variable INTERACT. In the case of FTAs, this is positive in one respect: they are not negative predictors of INTERACT. While it would be advantageous for a quality learning experience to have FTAs positively correlate with INTERACT, their statistical neutrality in this regard is still a positive attribute in light of Anderson's online learning model (2004). In fact, though, we do find in our qualitative analysis that some FTAs do have a positive relationship with increased interactivity, namely FTAs that are direct questions with politeness devices.

In addition, as suggested by Rourke et al. [15] and Tu and McIsaac [20], we found no relationship between expressions of social presence, i.e. naming, humor, emoticons, and the presence of phatic speech, and interactivity. While a high degree of expressed social presence is considered desirable for building a learning community [6, 15, 20], it seems possible to have a quality interactive asynchronous discussion without such markers.

Among indicators of social presence, we were particularly interested in NAME, even though it was not shown to have a relationship to INTERACT. However, we plan to do further qualitative analysis of naming in our data since the present study reveals it to be a speech act that interacts in a complex way with FTAs and with the indication of the intended audience. In particular, the use of naming as an FTA intensifier needs further study. We have very few instances of this in our data, so it remains to be seen

what relationship, if any, this use of the vocative has on interactivity.

VII. IMPLICATIONS FOR ONLINE LEARNING AND TEACHING

Interactivity in ACMC may be enhanced by the presence of direct questions in postings, broadening of intended audiences, and by consideration of the impact of length on the interactivity of postings. It would be possible to train students as to these particular written behaviors in such a way as to enhance interactivity in ACMC. It would also be possible for instructors to construct tasks that would encourage more interactive behavior. While discourse training in ACMC is not an uncontroversial subject, and it remains to be seen exactly what effect such training would have on the quality of discourse, there is some evidence for the positive role of structure and instructor presence in online learning [5].

VIII. LIMITATIONS OF THE STUDY

Among other variables, the study was unable to account for *off-line interaction among class members*, such as face-to-face or telephone communication; *outside-of-class online interaction,* such as emailing, or talking on SKYPE; or *developing or existing social hierarchy among group members*.

The results of the present study call for further qualitative analysis, especially with respect to question types, postings of extreme length, individual markers of social presence, and consideration of highly interactive postings.

Results of the study are not generalizable to a population of online learners outside of the courses in the study. However, the sample size is large enough to provide meaningful comparison between this group and other online learners.

IX. DIRECTIONS FOR FUTURE RESEARCH

The quantitative results lead us to a qualitative analysis of the nature of interactivity. We are now examining adjacency pairs and longer exchanges, looking particularly at the quality of interactivity with respect to *question types*, *speech acts*, and individual markers of social presence, such as *naming*, *humor*, and *phatic speech.* In addition, further research is needed with respect to the nature of social and power relationships in online learning communities. Of particular value would be the application of conversation analysis and ethnographic methodology.

X. ABOUT THE AUTHORS

Robert Williams teaches in the MA program in Teaching English as a Foreign Language at the American University in Cairo, Egypt. His research interest is in the linguistic aspects of online talk and he is currently assembling a corpus of asynchronous classroom talk to be published in early 2008.

Rachel Humphrey teaches fifth grade elementary school in London, UK and is studying for an MA in Psycholinguistics and Neurolinguistics at the University of Essex. She has a MA in Teaching English as a Foreign Language from the American University in Cairo where she taught for two years in the English Language Institute. She has presented papers at EgypTESOL and TESOL Arabia.

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