AC 2008-975: AN EXPLORATORY ASSESSMENT OF DISTANCE AND ON-GROUND DELIVERY OF BUSINESS, MATH AND ENGINEERING TECHNOLOGY COURSES

Meral Anitsal, Tennessee Tech University

Dr. M. Meral Anitsal is an Assistant Professor of Marketing at Tennessee Tech University. Dr. Anitsal holds a Ph.D. in Marketing from the University of Tennessee, Knoxville. Her current research interests focus on measurement of customer value for products and services, especially educational services in active learning environment.

Ismet Anitsal, Tennessee Tech University

Dr. Ismet Anitsal is an Assistant Professor of Marketing at Tennessee Tech University. Dr. Anitsal holds a Ph.D. in Marketing from the University of Tennessee, Knoxville. His current research interests focus on customer productivity and customer value in services marketing, specifically at technology-based self-service environments.

Ismail Fidan, Tennessee Tech University

Dr. Ismail Fidan is an Associate Professor in the Manufacturing and Industrial Technology Department, College of Engineering, Tennessee Tech University, Cookeville, TN. Dr. Fidan received his Ph.D. in Mechanical Engineering from Rensselaer Polytechnic Institute in 1996. His teaching and research interests are in computer-integrated design and manufacturing, electronics manufacturing, rapid prototyping, and distance learning.

Bonita Barger, Tennessee Tech University

Dr. Bonita Barger is an Associate Professor in Decision Science Management in the College of Business at Tennessee Tech University. She received her Doctorate in Human Resource Development from Vanderbilt University. Her teaching interests include International Management, Leadership and Strategic Management at the Undergraduate and Graduate levels.

Michael Allen, Tennessee Tech University

Dr. Michael Allen is an Associate Professor in the Department of Mathematics in the College of Arts and Sciences. He received his doctorate from the University of Georgia in 1997. His current research interests include bootstrapping, time series, spatial statistics and statistical learning methods.

An Exploratory Assessment of Distance and On-Ground Delivery of Business, Math and Engineering Technology Courses

Abstract

This exploratory and interdisciplinary study illustrates students' assessments on teamwork, creativity, communication, and critical thinking skills developed in multiple study areas across the campus of Tennessee Tech University located in Cookeville, Tennessee. Specifically, this illustration covers business (management and marketing), mathematics, and engineering technology courses that were delivered both traditionally on-ground and fully online distance over a period of six years. A total of 781 students were enrolled and 577 students responded the IDEA^{TM} survey. Total usable sample size was 549 with an overall response rate of 70.3 percent in 31 courses from 2000 to 2006. The paper initially introduces individual courses in each discipline with their course objectives and teaching methods, and later compares the aggregated mean scores for selected areas as well as distance and on-ground courses. Finally, authors highlight some important similarities and differences on distance and on-ground courses based on the findings of the study and their individual experiences. The study concludes with some insights for future research avenues.

Introduction

Technological advances have increasingly offered numerous educational tools and techniques that can be utilized in both traditional and virtual classrooms. Ten years ago, while distance learning programs were offered by 80 percent of the schools[1], now they are utilized by virtually all major universities in the United States. Indeed, the programs and courses offered fully online through Tennessee Tech University have increased almost 500 percent in the last five years[2]. Typical students of earlier generations of distance education were only adults seeking advanced education and training at home or on the job whose multiple responsibilities or physical circumstances prevented attendance at a traditional institution. Now anyone is potentially a distance learner.

Distance learning could be defined as an educational system in which the student is formally enrolled in a university but receives instruction at some remote site. It is not merely a geographic separation of learner and teacher. Rather, there are pedagogical concepts that lead to special patterns of learner and teacher behaviors. Traditionally, correspondence has been the primary delivery medium, but the delivery systems most common today are web-based utilizing webcams, Internet technologies, audio, and computer technologies.

There are various publications on the advantages and disadvantages of distance and face-to-face learning[3, 4, 5, 6]. Several key considerations emerge that contribute to the success of distance learning programs – student and faculty/administrative issues.

Student Issues

There are various reasons why students choose online learning over traditional learning. Flexible study times and geographic location are the most common reasons students take online courses[7, 8, 9]. Many students perceive online courses as easier than traditional on-ground courses[8], and for some individuals, the supervision and control of traditional education serves as a detractor[7]. However, some students shy away from online courses because of feelings of boredom and the belief that they must possess high-end computers to participate[8]. "According to Brennan, Horton, McNickle, Osborne and Scholten[10], many students perceive online courses at first glance as more time-consuming, isolated, requiring computer skills and the need for self-discipline and time management"[7]. Academic and family matters, instructors, finances, full time jobs, dissatisfaction, and lack of direction contribute to attrition rates of online courses[8, 11]. Online students have to be mature, highly motivated, and self-disciplined in order to be successful in online learning[8, 9, 12, 13]. MacBrayne[14] reported that distance education students appeared to be motivated adults between the ages of 18-40, mostly female, who, because of their family and work commitments, lacked time to participate in on campus studies.

Distance education in engineering and technology is no longer seen as a second-rate way of teaching; it is just different due to its hands-on and practical nature. Distance education addresses geographical, time, indirect cost, flexibility, and service needs for learners. Whereas naysayers challenge distance education on issues of student isolation, course time commitments, and program quality, strides in the field demonstrate that distance education programs do deliver high quality education[15].

Faculty who attempt teaching online courses for the first time may realize that online learning is not easily successful. The instructor must give extra effort in order for the student to learn effectively since the key of the success is "student learning." Students have access to the instructor 24 hours a day via email. The instructor must develop a state-of-the-art instructional course site and effectively participate in the course in order for students to learn and understand materials in an effective manner. Many have asked what type of an individual it takes to participate in online learning. Social learning theories tell how new innovations can inhibit learning or increase learning for a student[16].

Students in distance education settings perform as well or better on assignments, class activities, and exams when compared to on-ground students. Nevertheless, students must maintain persistence and a clear focus to succeed in a distance-learning situation. Self-direction, a passion for learning, and strong individual responsibility are important influences on achievement. There are also indications that distance education works even best for more mature, motivated, and well-organized learners.

Faculty/Administration Issues

Faculty resistance, perceptions of faculty and administrative staff, lack of administrative support, and training are considered as obstacles to the success of distance education[17, 18, 19, 20, 21]. In addition, studies have demonstrated the impact of time on faculty who must design and teach online courses. E-learning environments require instructors to exert more effort and be more

attentive[22, 23]. "Faculties have enormous task to learn new teaching strategies, redesign teaching methods, and provide the students with a meaningful learning experience"[24].

Faculties who participate in distance learning have different perceptions and motivating factors than non-participating faculty[25]. Faculty prefer traditional education because of the interpersonal contact[26, 27, 25]. According to Schifter's[25] survey of faculty at one state university, faculty who participate in distance education are much more likely to be motivated to participate by intrinsic motivations (i.e. job satisfaction), rather than extrinsic motives (i.e. administrative support) or personal needs (i.e. monetary support). Non-participating faculty in this study tended to be motivated by personal needs and extrinsic motives rather than intrinsic motives[25]. The study concluded that age, gender, faculty level, and tenure status demonstrated significant differences in personal needs[25], which partly explains the differing views of non-participating faculty on distance education. Many faculty resist online teaching because of feelings of isolation and redundancy, lack of confidence using technology, and fears of replacement[8]. Some instructors believe that the increased amount of preparation time required for distance learning takes away from activities they will be evaluated on such as grant writing and publishing[9, 28, 29].

Covington, Petherbridge, and Warren[17] followed a state university's English department during its implementation of an online program. Covington et al.[17] recognize administrative support (i.e., defined goals), professional development (i.e., training), and peer support (i.e., shared experiences) as pillars to implementing distance programs and curbing faculty resistance. Faculty members with prior distance teaching experience were found to be instrumental in providing support to colleagues who were beginning to move their traditional courses online[17]. Team training experiences and peer-to-peer support were also found to enhance the learning process and improve attitudes about distance teaching.

Although there are numerous publications discussing the success of distance learning, there has been no research on the comparative studies of both online and on-ground teaching practices for STEM (science, technology, engineering, and mathematics) and Distance MBA fields. These thorough studies will be pioneering efforts in these fields.

Statement of Purpose

This study provides analytical and comparative information on the efficiency and effectiveness of both on-ground and distance learning practices simultaneously. Furthermore, both on-ground and distance engineering technology, management, marketing, and mathematics courses were taught by the same faculty. This provides an unbiased comparison of students' evaluations in both dissemination channels. Another objective of the study is to compare student learning on critical thinking, communication, teamwork, and creativity areas in distance and on-ground teaching.

The Tools

Several tools were used to conduct this study. WebCT™ was the Learning Management System. The Individual Development and Educational Assessment (IDEA™) was the assessment tool which measured student reaction.

WebCT™, the Learning Management System (LMS), was used for both online and on-ground courses. The learning management system provided the platform which enabled the instructors to create and manage web-based learning activities and course materials. It tracked the learners' activities within the course and provided online reports. It provided the standard components to support a collaborative learning community (i.e. public and private discussion boards and chats, emails, and content modules). In summary, it managed the delivery of self-paced, e-learning courses across the disciplines.

The Individual Development and Educational Assessment (IDEA™) www.idea.ksu.edu developed at the Kansas State University in 1975 was the instrument used to measure student reactions on teamwork, creativity, communication and critical thinking skills. The underlying premise of the evaluation is that student evaluation can be influenced by the instructors' communication skills and teaching style, and that students do not necessarily assess the accuracy of information presented to them. Tennessee Tech University policy requires untenured faculty administer the evaluation for every course, while tenured faculty are required to assess two courses per year. The instructor selects the teaching goals, and allows for extraneous variables such as motivation, class size, team training, and distance education. National databases are used for comparisons. Students rate their progress on each course compared to other courses based on gaining factual knowledge, application of course materials to problem solving, and the ability to analyze and evaluate ideas, creativity, and team skills. Further information can be found at: http://iweb.tntech.edu/ideaevaluations/IDEA%20Overview2.ppt

The Courses

Engineering Technology – CAD for Technology Course

CAD for Technology course covers the 2D and 3D CAD techniques for industrial applications with laboratory experiences. AutoCAD 2006 software is used for the laboratory practices. This junior level course has various teaching, assessment and practice components, and has the following course management modules in the WebCT™ system.

- Course syllabus and information
- Calendar, tips and grade book
- Lecture materials and extra study materials
- Tests, labs, practice quizzes, and homework
- Discussions, chat, and e-mail
- Supplements

This course has been successfully delivered as a hybrid engineering course before its online offer. Based on the students' interest, CAD for Technology has been scheduled fully online since the summer semester of 2005.

Management – International Management Course

This course bridges theory and practice. It demonstrates how cultural factors influence behavior in the workplace and examines the skills needed to manage across national borders. Course objectives are to: 1. Practice and knowledge of managing global business practices; 2. Gain knowledge of business environment within which the company operates on the factor of national and organizational culture; 3. Gain knowledge of the influences of national culture on the internal arrangements of a company; 4. Gain knowledge of how internal arrangements influence the strategy of a company; 5. Practice and knowledge of International Human Resource Management issues in making the company strategy work; 6. Gain knowledge of cross cultural negotiations and communications; 7. Experience in interviewing and interacting with people from other countries/cultures.

Marketing – Strategic Marketing Graduate Course

This MBA level strategic marketing course initially refreshes the marketing infrastructure by briefly highlighting selected principles, concepts, tools, processes, theories, issues, debates, real-life practices and ethics of marketing based on the following definition of marketing:

"Marketing is an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit the organization and its stakeholders"[30].

The focus of this course eventually becomes a marketing strategy exercise filled with tactical details. Through a computer business simulation, students are placed into a very realistic international business setting where they will start up and run a company for two years in compressed time (eight rounds of decision making; one for each quarter).

Mathematics – Elementary Probability and Statistics Course

This mathematics course is an introductory course for freshmen and sophomores seeking to meet a general education or course of study requirement. Course material can be broken into three main topics: basic descriptive statistics, elementary probability theory, and inferential statistics for the mean and proportion. Course objectives are simple and straightforward but comprehensive. After completing this course, students will be able to use mathematics to solve problems and determine if the solutions are reasonable, to use mathematics to model real world behaviors and apply mathematical concepts to the solution of these real-life problems, and to make meaningful connections between mathematics and other disciplines. To accomplish these comprehensive goals, students will be taught how to use technology for mathematical reasoning and problem solving and to apply mathematical and/or basic statistical reasoning to analyze data and graphs. This mathematical/statistical reasoning is motivated and encouraged by introducing the students to some of the foundations of probability and statistics like probability distributions, mathematical expectation and hypothesis testing. The final goal of this course to equip the students with the knowledge and background to understand hypothesis testing as related to the mean and proportion for future use in any research on the part of the students.

The Teaching Methods

CAD for Technology

CAD for Technology is one of the first developed engineering courses and most commonly offered engineering course in the College of Engineering of this university. This course is a combination of instructional modules and industrial design practices. Each teaching module has very-well prepared, intuitive support materials. These materials help students learn the specific design issues by themselves. There are also numerous tutorials linked to instructional tutorials. As soon as students finish their learning, they start practicing the laboratory exercises given as a separate handout.

WebCT^{TM} materials prepared for the course also have its pre-requisite materials so that students refresh their past learning. Although the majority of the course is based on the individual practices, it is a requirement for the students to prepare and submit their final industrial design projects with a team. Teams are formed with two to four students. Course students practice various communication mechanisms during the semester. There are many discussions made on the final projects, although there is a very minimal discussion on the class assignments. E-mail and chat tools are also popularly practiced communication tools during the semester. In order to announce the course schedule, the course calendar is fully filled for the entire semester. Student tips are commonly used so that students learn the upcoming assignments and due dates quickly.

International Management

International Management is grounded in multiple learning theories. It is designed on the belief that learning is a process formed through curiosity, inquiry, and grounded in experience to create knowledge. The course is series of rooms or blocks where the student can work for 20-30 minute intervals moving between the hard copy textbook to the interactive content study center by chapter, and then to the interactive process center by assignment. The knowledge component is designed in two blocks: Content and Process. The interactive Content knowledge block focuses on the facts, functions, and policies of International Management. The content is in the textbook, in the interactive content study center by chapter online. Students read the textbook, review by chapter in the interactive content study center, re-exam with practice quizzes in the evaluation tools and, when ready, take graded tests. The Process knowledge block focuses on learning how to learn, working in a team, managing a project, and researching a case, culture, company, and country. Students *do* and *apply* their knowledge through transactions with teammates and analysis of a Culture/Company/Country research project.

Strategic Marketing

In order to learn and apply strategic marketing in a simulated international business environment, students are expected to accomplish the following tasks, using multiple teaching and learning methods:

- Use/overview/ practice the course syllabus, textbook, simulation, reference guides, resource documents, lecture summaries, topical power point slides, and exercises, all for team-based action oriented competitive and interactive marketing applications.
- Form an entrepreneurial firm that will compete in a "business war game." Run their companies, struggling with marketing strategy and marketing management fundamentals.
- Compare/ use the instructor's periodic email messages through WebCT™ for hints to frequently asked questions. Pay attention to what is posted in the general and team-specific discussion boards. Use chat rooms in the course site. Be an active participant/discussant in class.
- Read what is posted in the weekly updates for each quarter. For each quarter, prepare an executive briefing report. Read the comments on quarters before decisions wrap-up stage.
- Prepare a marketing/business plan. Prepare a report to their Board of Directors.

Students face great uncertainty from the outside marketing micro-environment and macro-environment and from their own individual and team decisions. Incrementally, they learn how to skillfully adjust their strategy as they discover the nature of their real-life decisions, which must consider the available options, linkages to other parts of the business, conflicts, tradeoffs and potential outcomes.

Mathematics

As seen in the course objectives, it is clear that the main, comprehensive goal of this course is to give students the tools needed to solve real world problems. Hence, the method used in this course is the coaching method, also known as the master-apprentice method, i.e., explanation, demonstration, practice, and review. For each module, students are given an explanation of the theory or type of problem under study then shown a demonstration of the theory by working through a couple of sample problems. Next, practice problems (homework) are assigned and a quizzing tool, either online or in class, is used to review and evaluate the students before the main test over the material. By breaking the material down into modules of knowledge, students find it easier to gain competence for the material.

Findings on Course Evaluations

The IDEA™ survey results are analyzed in terms of the development of teamwork, creativity, communications and critical thinking skills for distance and on-ground courses in engineering technology, management, marketing, and mathematics disciplines. Table 1 summarizes the definition of IDEA™ items in the current study.

The overall results indicated that distance and on-ground courses provide similar development opportunities in terms of teamwork, creativity, communications and critical thinking skills (Table 2, Figures 1, 2, 3, and 4). However, the highest student evaluations come from the development of team work skills, especially from the distance courses in management area. The second area that students gave high ratings is critical thinking. Communications and creativity are considered to be equally well developed. The largest difference between distance and on-ground courses in IDEA™ evaluations come from the development of creativity skills.

Table 1
IDEA™ Item List for the Current Study

Progress on Objectives
Teamwork: Acquiring skills working with others as a member of a team **Creativity:** Developing creative capabilities (writing, inventing, designing, performing in art, music, drama, etc.) **Communication:** Developing skill in expressing yourself orally or in writing **Critical Thinking:** Learning to analyze and critically evaluate ideas, arguments, and points of view

Table 2
Mean Values Summary

Means for	Type of Course	Teamwork	Creativity	Commu-nication	Critical Thinking	Average Number Enrolled	Average Number Responded	Response Rate (%)
Overall	Distance	4.29	3.39	3.39	3.71	20	14	68.6
Overall	On-ground	4.19	3.61	3.49	3.67	28	21	78.4
Mktg + Mgt	Distance	4.52	3.36	3.51	3.87	21	14	66.7
Mktg + Mgt	On-ground	4.63	3.95	4.19	4.00	32	22	71.0
Marketing	Distance	4.39	3.45	3.45	3.98	24	17	73.7
Marketing	On-ground	4.60	3.36	3.80	3.87	24	21	87.6
Management	Distance	4.74	3.19	3.62	3.67	16	8	55.0
Management	On-ground	4.64	4.24	4.38	4.06	36	22	62.7
Engr. Technology	Distance	3.35	3.55	2.90	3.10	15	12	76.4
Engr. Technology	On-ground	4.00	3.44	2.86	3.07	17	16	89.2
Mathematics	On-ground	3.53	3.18	3.05	4.00	37	28	76.3
Math+Engr. Technology	On-ground	3.83	3.34	2.93	3.41	24	20	84.5

Engineering Technology

Student responses received from the IDEA™ survey results indicate that there is no significant difference between the traditional on-ground and distance CAD for Technology course offerings. The only difference observed was on the lower student rating in teamwork. The difficulty on the establishing virtual design teams for the term projects was a big concern, and this issue has been clearly presented in the IDEA™ surveys.

Distance students usually find difficulties in choosing a design project and collaboratively working on it. After the project is completed the design work is also written and presented to

course students and instructor using Microsoft Office tools, Real Player, YouTube and digital media tools. Students having a full-load usually find it hard to fully complete the expectations of the term project requirements due to its collaborative design nature.

The survey results also prove that there is a slight improvement in student communication, creativity and critical thinking skills. Students appreciated the very-well prepared instructional and practice materials available in WebCT™. Students freely practice the various communication tools during their assessments and projects, specifically prepared design projects helped students improve their critical thinking and creativity skills. This was a result of TTU sponsored QEP grant program. The Engineering Technology instructor, with the help of his quality enhancement plan grant, he has prepared specific project, homework, test, and discussion topics in order to enhance students' critical thinking and creativity skills. All these projects, home works, tests, and topics were usually from daily real life and students' field of interest.

Management

This course requires extensive teamwork with 40 percent of the final grade dependent upon a collaborative product and week or management (online) or an hour presentation for on-ground teams. Teams have the ability to terminate dysfunctional teammates in both cases. The pressure to perform is high in both delivery modes. There is no significant difference noted for the development of teamwork (acquiring skills in working with others as a member of a team) between the two teaching approaches.

The content, tests, quizzes, and discussions are the same for both courses which measures critical thinking through "what if" application questions. Students perceive a moderate difference in critical thinking between the two delivery modes. Discussions online are asynchronous while in the on-ground classes, they are synchronous with affect, tone, and emotional components. Does this hot communication have an impact on critical thinking? This will be a future research question.

There are significant differences in students' reactions/perceptions to creativity (developing creative capabilities) and communication (developing skill in expressing yourself orally or in writing). They perceive less developed capabilities in both areas for online courses. Communication in online courses is a cold media with asynchronous delivery and a time lapse element which impact emotional connections during discussions.

The final presentation (60 minutes for on-ground teams) versus a week of management for online teams while similar in content requirements is different in delivery. In the former, students present to a physically present audience with high visibility which often generates the "fear of public speaking." In the online team week of management presentation, individuals can "hide" behind the technology, generating less stress. This may account for the perception/reaction that communication and creativity skills are less developed online. Further research is required here.

Marketing

IDEA™ survey results indicated that student evaluations of distance and on-ground marketing courses were more or less similar overall. In terms of teamwork and communications, on-ground courses were considered slightly better than distance courses. In terms of critical thinking, distance courses were evaluated as slightly better than on-ground courses. In terms of creativity, distance and on-ground courses could be considered almost equal.

Apparently, computer-based business simulation enhanced student skill development on team work as they have to prepare quarterly progress reports and yearly budget proposals. They utilize WebCT™ tools to the fullest extent to enhance teamwork skills; however, on-ground students had a better chance of working with each other face-to-face. As can be seen from critical thinking evaluations, course design and use of simulation provided real world problems helped student development in this area. In such an environment, communication skills were very important, and student evaluations showed the impact of course on their skill development. Finally, evaluations about the development of creativity skills were on the average, as the course design did not require students to come up with creative designs or ideas.

Mathematics

Available IDEA™ survey results for this on-ground course compare to the rest of the on-ground courses. Team work and communication scores were a little lower than the other on-ground courses, as it does not actively promote these two activities. But the result for critical thinking was significantly above the average. Creativity score was close to the overall average.

Student and Faculty Experiences

Engineering Technology

The Engineering Technology instructor found that it is extremely difficulty to manage the virtual design teams when especially they are tasked to work jointly in collaborative design projects. The results of the IDEA™ surveys have tangibly presented the difficulty of this implementation.

CAD for Technology students appreciated the availability of prerequisite course materials to refresh their existing knowledge. Daily/current industrial part design and production practices increased the students' access and participation in communication, critical thinking, and creativity. Gaining hands-on design skills for the complex parts was appreciated by the students. The difficulties faced by the students were promptly responded using chat and email tools. Students also found the discussion ports always versatile to troubleshoot their problems/difficulties.

Students who work fulltime or have full-course load appreciated the availability of offering the CAD for Technology course online. They always indicated that they saved a ton of time, and this availability freed their schedule.

Figure 1
Mean Values for All Math and Engineering Technology Courses

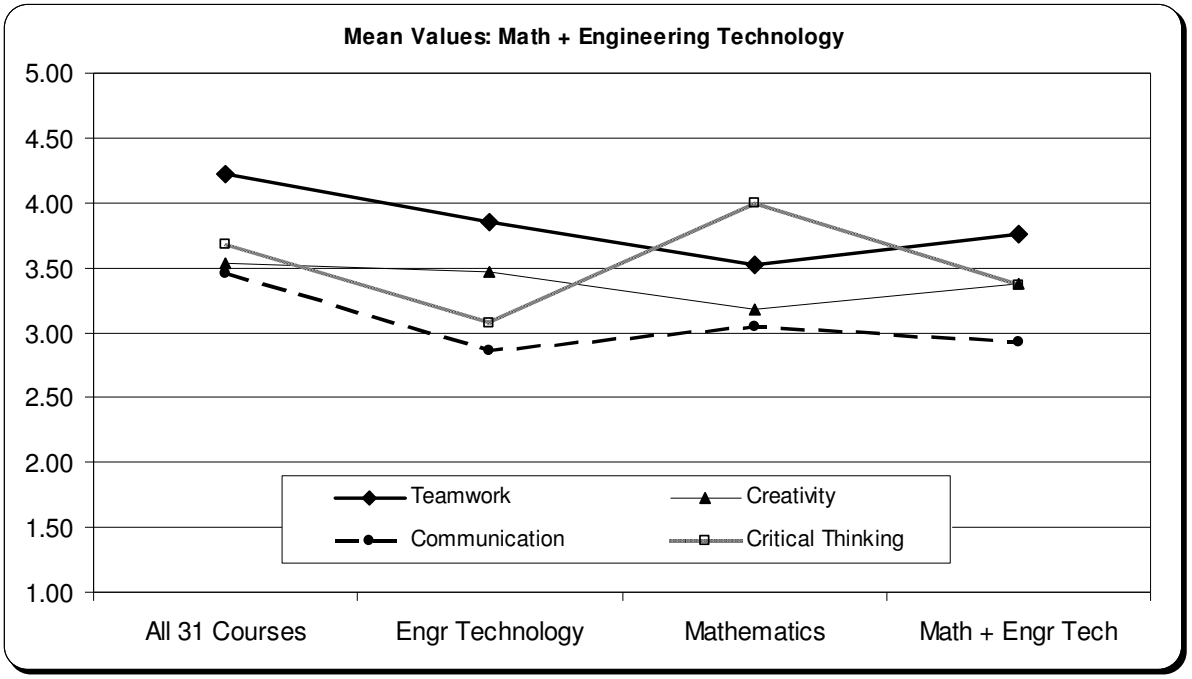


Figure 2
Mean Values for All Marketing and Management Courses

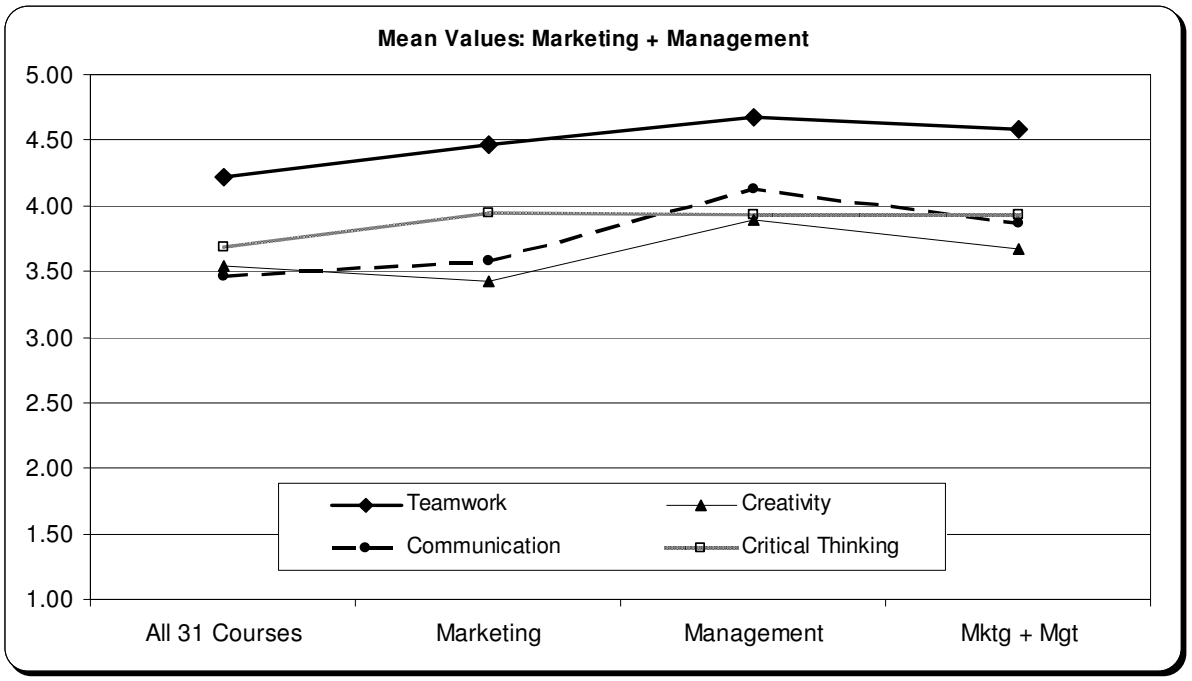


Figure 3
Mean Values for Distance & On-ground Math and Engineering Technology Courses

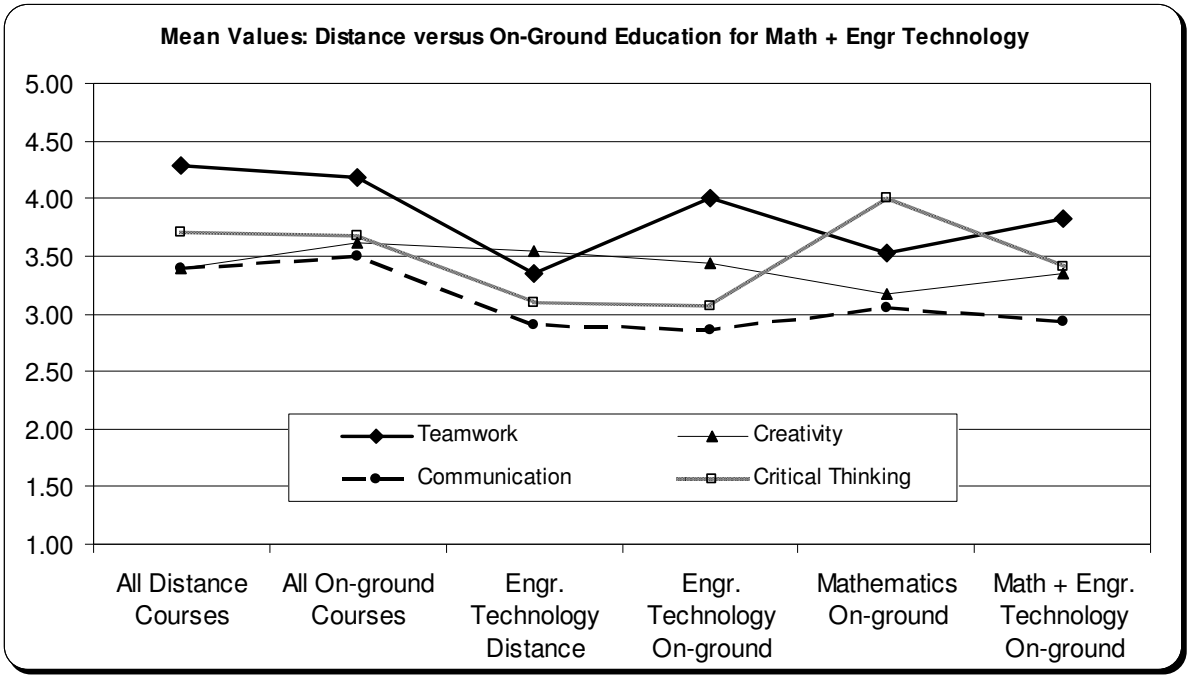
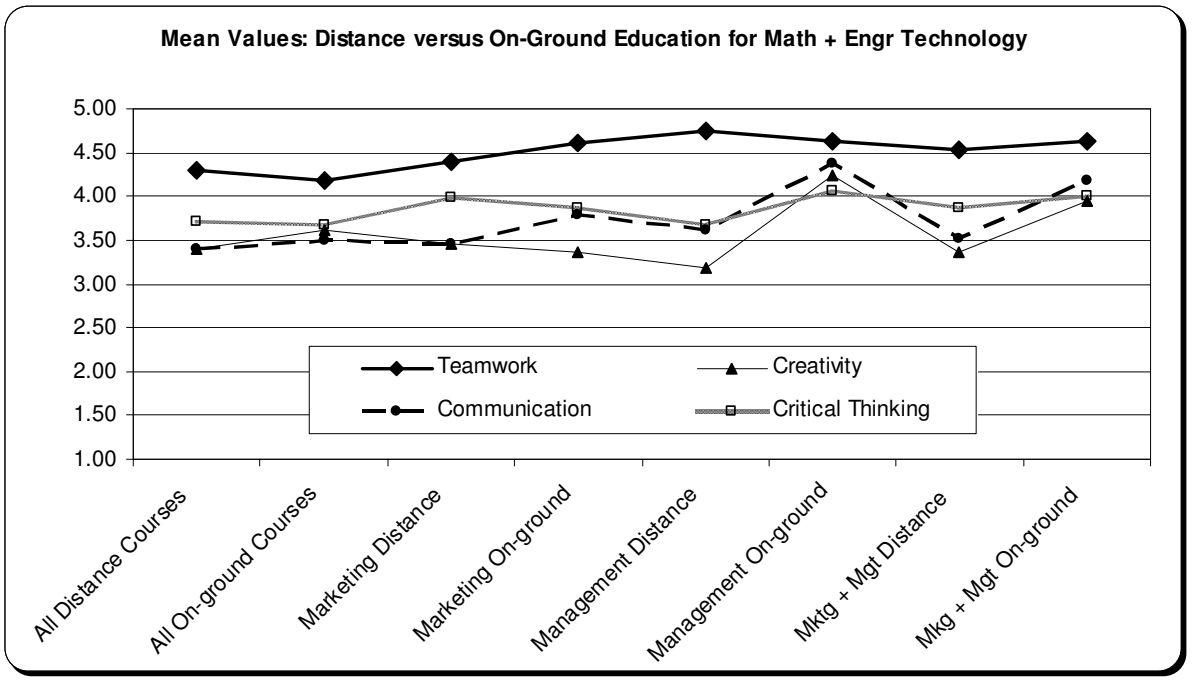


Figure 4
Mean Values for Distance & On-ground Marketing and Management Courses



However, the difficulty of managing final design projects was easily managed in on-ground CAD for Technology courses. Students have presented much better projects and results in their works. This was the result of their close interaction in classroom environment.

Management

From the Management instructors' reflection of both on-ground and online narrative comments accompanying the IDEA™ evaluations, student reactions were favorable in all cases. Students in the on-ground classes commented on their relationship with the instructor more than the content or delivery.

This instructor found that she "enjoyed" teaching the on ground classes more as they were "alive with human energy." She was able to see and intervene at the "teachable HOT moments" and make comments that added value in real time. In the online courses, messages in discussion board replies or feedback on written assignments were "teachable COLD minutes."

The following are direct quotes randomly chosen to reflect patterns of student reactions in both on-ground and online courses.

*Distance: "*I really enjoyed the class. The testing process was a bit intense, but study the study guide, and you will do fine. It really helped me I think that I was currently in Business Strategy and had already taken HRM and Marketing. I feel these classes gave me a great foundation for understanding and applying my skills and knowledge in International management."

"After managing how to navigate on the webpage, I started to enjoy the WEBCT™ site more. With this being my first course, it was a little challenging in the beginning. Overall I am happy I remained in the course and completed it. I liked the student homepage feature: It allows a person to get a better "feel" for who is part of their learning community."

"I don't like that the work of other people having an effect on my grade!"

*Student responses when asked to recommend "how to bring the on-ground courses alive" in the online components: "*Have students made PowerPoint presentations and post to the web." "Upload DVD presentations that students can upload and watch."

Marketing

Students evaluating the marketing course focused on the content and skill development aspects, rather than the means of delivery-distance or on-ground as can be seen from the direct quotations:

"The teamwork and simulation aspects of this course were great! Having the quizzes over the text helped me gain more factual knowledge, and the team assignments within the simulation helped reinforce the learnings by application." (DMBA 6100 Fall 2006)

"This was the most enjoyable MBA course I have participated in thus far. The best thing about the course was my ability to apply learnings to my work will the course was going on." (DMBA 6100 Spring 2007)

"… Overall, this is an excellent course from a very good professor. The professor took time to think out and plan the course. He structured the course in a very tactical manner where the knowledge gained from the class will remain with you for a long time. … If you are looking for a marketing class, this one will definitely take you beyond the books. …" (DMBA 6100 Spring 2007)

"This is a great class that makes the learning experience fun, but not easy. This is the most practical learning experience so far in the MBA program." (DMBA 6100 Spring 2007)

"I will not soon forget this course. It was an adventure from beginning to end. …"
(DMBA 6100 Spring 2007)

"Dr. Anitsal is a very good professor – always available to answer questions. His good background & professional experience prepare him great for his actual position." (MBA 6100 Spring 2005)

"Game simulation does an awesome job of preparing students to think critical in real world settings."
(MBA 6100 Spring 2005)

"I would like to personally say that I enjoyed the learning experience of your class. I think that the business simulation online is a creative way to get students to think critically and like most of my classmates have already said, adapt to an ever changing competitive environment. This method of learning brought a lot of clarity the true concept of marketing and how marketing effects all functional departments within an organization. Continue to use this online simulation. Thanks for the experience!"
(MBA 6100 Spring 2005, from a student's e-mail)

Mathematics

As for student anecdotal evaluations, instructor comments were the norm and no comments were found discussing the online course itself. Of course, the IDEA™ form does not specifically ask about online sections and so this is another area of future research. Two example evaluations are given below. One student's comment was

"He made the material easy to understand and was very helpful if anyone didn't understand."

Another student wrote:

"This instructor's class is not stressful and at the same time you still learn. He is fair and always willing to help."

Students did informally comment on the open accessibility of the online section of the course and how helpful it was to be able to access the course at anytime. Yet, this information is lacking and future data gathering is required.

From an instructor's point of view, a difference in the grade distributions for Elementary Statistics taught on-ground and online has been noticed, though not analytically compared. The spread of the grades in the online section appears larger than the on-ground section. This indicates a larger standard deviation in the grades and a study of this apparent difference in the grade distributions is proposed for future research.

Conclusions

It was interesting to see that student perception gap between on-ground and distance courses were closing in engineering, management, marketing, and mathematics disciplines. The course contents in distance courses got enriched in all disciplines. Multiple opportunities to develop team work, critical thinking, creativity, and communication skills were provided to students. All these changes might contribute to the shift in students' focus from the delivery means to content, as can be seen from student evaluation quotation and IDEA^{TM} survey results. A limitation of this research is that data to compare grade distributions between delivery modes had not been collected for these courses. Therefore, there was no opportunity to analyze how expected grades moderate perceptions of learning. This will be a topic of future investigation.

Technology and development of programs such as WebCT^{TM} enhanced student-instructor, student-student, and team-team interactions. Instructors have increasingly begun to incorporate elements of distance courses such as discussion boards, drop boxes or chat rooms into on-ground course designs. These elements help students to learn from each other as well as instructors.

Due to the nature of disciplines and instructor preferences, there were minor differences in the students' responses to four areas of skill development in on-ground and distance courses. The following paragraphs are addressing these differences.

The availability of CAD for Technology course fully online has been greatly appreciated by the junior engineering technology students. However, they found that forming and managing collaborative virtual design teams are extremely difficult. This is because the tasks and deliverables of the projects are a combination of designing the assembly parts, writing a final report, and preparing a team presentation in a virtual format. Future work and more research will be targeted to solve the problems related to collaborative team design projects.

From the management perspective, the delivery of an international management course either graduate or undergraduate simulates the conditions/requirements students will be faced in the world of work. They will be working in virtual teams across multiple cultural boundaries 24 hours a day, 7 days a week. Thus, these courses set the boundaries and create the requisite skills required for critical thinking in creative ways.

From the marketing perspective, different elements may be incorporated to the course designs to enhance creativity skill development. Research is needed to understand how students perceive their development in this area.

Finally, new data has been collected for distance mathematics courses to understand the differences in student reactions to this format of course delivery. This way, it will be possible to investigate student perceptions and the spread of grades simultaneously for distance and on-ground courses.

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