
AC 2011-1497: OVERCOMING THE CHALLENGES OF DISTANCE EDUCATION DELIVERY OF A MASTER OF SCIENCE DEGREE IN CONSTRUCTION MANAGEMENT

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Overcoming the Challenges of Distance Education Delivery of a Master of Science Degree in Construction Management

Abstract

The Master of Science in Construction Management (CM) is beneficial to actively employed construction professionals who desire to broaden their educational background for career advancement or support for their current job demands. Unfortunately many who desire additional education in the CM field have personal or professional demands that do not allow them to attend resident graduate programs. At many universities distance delivery has become a means to provide graduate professional educational opportunities. Since 2006, Purdue University has been offering a Master of Science in Construction Management through a synchronous distance delivery format. From its inception the program has included a fixed course schedule and the requirement for a directed project (an applied thesis format) to be completed under the supervision of a traditional three person graduate committee emulating the longstanding thesis approach to graduate study that has historically been practiced at the university.

As an outcome of working with several cohorts of students in the program, the challenges in using the traditional faculty mentored thesis research and writing format through a distance delivery method have become apparent. This paper describes the significant challenges students have experienced in completing the program from a distance under the direction of the traditional committee structure; specifically their failure to complete required academic research and writing. A comparison to CM graduate programs with distance delivery at peer institutions is included to examine research and writing requirements common in CM programs with distance delivery. Detail of corrective actions that have been implemented with limited effect are provided. Finally, the program change for the most recent cohort of students enrolled in the program to a guided capstone academic writing activity under the direction of a single faculty member is described.

Introduction

Graduate education in Construction Management (CM) has been slow to develop. In the years since the American Council for Construction Education (ACCE) was organized in 1974 by the American Institute of Constructors (AIC) and the Associated Schools of Construction (ASC), it has accredited undergraduate programs that provide CM education for entry level construction management professionals that have been in high demand¹. Unfortunately, construction industry hiring practices haven't placed as high a priority on graduate level education. Some CM educators have advocated the need for graduate education programs that are fully aligned with the construction industry. Graduate level CM programs would advance the body of knowledge of the industry, provide professional construction educators with industry specific knowledge,² and

develop graduates with advanced skills appropriate for executive level careers in construction. The need for professional construction educators was addressed in a 2005 task force report to the Board of Directors of the ASC which examined the need for and the appropriate format of a PhD degree in Construction Management³.

Beginning in 1990 the Purdue Department of Building Construction Management delivered its first graduate courses offered through the Department of Industrial Technology. Initial enrollments were between eight and ten students, but soon dropped. In 2000, the College of Technology, of which the Department of Building Construction Management (BCM) is a part, received approval for a Master of Science degree program with Building Construction Management as an area of specialization. The program graduated a few students between 2000 and 2005, but the program never had more than eight students enrolled. The faculty involved felt that construction management employers did not provide sufficient rewards for students to pursue graduate degrees. In addition, since the early 1990s nearly 100% job placement was experienced by construction management professionals who were not willing to give up their current job to pursue a graduate degree on campus, even if career advancement was possible⁴.

During the 2006-2007 academic year this 15 year period of poor graduate enrollment came to an end with the introduction of a MS degree in construction management delivered through a distance learning platform. This BCM distance MS program was the result of support from the Associated General Contractors (AGC) of America, a national trade association comprised of more than 33,000 firms. As stated in their request for proposal, intended to advance graduate CM programs, the AGC expressed an interest in partial funding and advertized support for up to four programs because “The need for senior executives to secure a masters is apparent from two perspectives. First, they will benefit from learning newly evolved construction techniques and management methods. Second, their experience is needed on campus as instructors”⁴. In the BCM distance MS program that developed from AGC initial support, there were 13 enrolled in the first cohort of students. The program quickly grew to an enrollment between 17 and 23 students. Total enrollment has been limited to 24 students in order to maintain the student-faculty contact level as well as to prevent the limitations of the distance delivery platform from degrading the audio and video clarity of online class delivery.

It was predicted as early as the late 1990s that advances in Internet based communication technology would provided flexibility in terms of course delivery as well as access to academic source material, allowing professional students unprecedented opportunity for study without interrupting their work environment⁵. As distance learning has evolved, some verification has come to light that affirms the effectiveness of online delivery when compared to more traditional face-to-face learning environments^{6,7}. When establishing the BCM distance MS program many options existed for delivery including self-paced independent study, asynchronous interactive learning, synchronous learning, and a combination of online and in-person delivery. Evidence supporting the advantages of interaction between learners⁸ and synchronous interaction between

students and faculty⁹ guided the faculty to select real-time class delivery. The synchronously delivered classes meet two evenings each week in 3 hour time blocks.

The synchronous delivery platform is Adobe Connect (previously known as Macromedia Breeze). Connect is an Internet based real-time videoconferencing system utilizing Flash technology to integrate audio, video, text based discussions, presentation software (such as PowerPoint) and a built-in whiteboard (or pen-based display). The content delivery tools are organized in “pods”. The pods, which can be arranged in a variety of configurations on the computer screen, can be manipulated to provide the look and feel of a classroom.

Research in the Traditional Graduate Program

In 1993 Patricia Gumpert traced the role of research in graduate education in the United States during the last century as part of a book titled *The Research Foundations of Graduate Education: Germany, Britain, France, United States, Japan*. Beginning in the late 1800s, research and graduate education became closely linked at major universities primarily through the growth in the disciplines of science and engineering. The common practice of graduate student education at that time consisted of a period of class based study followed by research. Graduate education during this time period evolved to become a mentor based learning environment where students worked alongside professors on research projects. The benefit of this mentor based process was that students would transition from consumers of research to producers of research. This process was accelerated in the post-World War II period where the economic expansion and cold war competition of the time period encouraged significant financial support for research. By the 1970s top tier universities had interwoven organized research and graduate education and lower tiered institutions strove to emulate this practice¹⁰.

As Federal research funds began to diminish in the 1970s and 1980s, reduced financial support for graduate students impacted the student-faculty mentor relationship by limiting the degree to which faculty could work directly with students in the research setting. The relationship began to evolve into one where the students worked more independently, often on research that the faculty mentor was not involved with. This reduced integration of graduate education and organized research activity occurred at the same time that professional graduate education began to emerge. Professional graduate education, which was intended to provide a more market-driven practitioner rather than a researcher, reduced the need for graduate research experiences¹¹.

As a form of professional graduate education, business schools have adopted the non-thesis or course-only model for graduate study. The quest for a Master of Business Administration (MBA) has been a popular graduate pursuit for students from a variety of undergraduate disciplines to transition to work in the business related aspects of their career. Another area of non-thesis professional graduate study has evolved with the advent of computers. Information Technology, Computer Science, and Computer Graphics all offer complex professional opportunities in the

course-only setting. Because the application of business principles and computer technologies in the professional setting require a great deal of knowledge beyond what is available in many undergraduate curriculums, these professional master degree programs have proliferated without the organized research component typically associated with university graduate study.

Although Purdue University offers thesis based Master of Science degree programs in the majority of the disciplines represented on campus, the Purdue Graduate School does allow non-thesis MS options in any graduate program. As a result, many of the traditionally research oriented disciplines in engineering and the applied sciences have an option for a non-thesis MS degree. Some educators have questioned the validity of course-only graduate education even in applied engineering technology graduate programs. Grubbs and Kozak cite the fact that without a thesis, students do not support growth of the body of knowledge in a discipline or even focus on applied solutions to problems in the workplace. They place into question what value is added in a non-thesis graduate degree beyond what is learned as an undergraduate¹².

An alternative to a course-only MS degree is offered by the College of Technology, of which the Department of Building Construction Management is a part. Here the non-thesis option is provided through the use of a directed project rather than a thesis. The directed project is less formal than a thesis with the objective to engage the student in an industry based study culminating in a report. The topic is generally more practical than a thesis and is expected to be completed in one semester¹³. A total of three credit hours are included in the student's plan of study for a directed project as opposed to the six credit hours for a thesis. This arrangement allows the student pursuing a directed project to take one additional course during their MS degree.

The Directed Project was intended to an applied research project that was more extensive than a graduate-level independent study but less rigorous than a Master's thesis. Some difficulty has been created by faculty who require the Directed project to be of equivalent academic validity as the thesis. They are ignoring the intent of the Directed Project as well as the fact that the Directed project is worth one half the credit hours required for a thesis.

Challenges Experienced

The directed project process for Department of Building Construction Management first year distance masters students starts during the first (fall) semester. The beginning students come to campus for two and a half days to receive instruction in a one credit academic writing course. During this time the students are guided to pick a topic that interests them, taught how to compile an annotated bibliography during the semester, and shown how to access the library through the internet. According to the librarian who supports the Department of Building Construction Management, internet access of the library is the most common type of access, even among the students who are on campus. This trend is confirmed by a study of five university medical

libraries that showed that remote users outnumbered in-house users of electronic information at five medical libraries. The percentage of remote users varied from 51% to 84%.¹⁴

Also, during the first (fall) semester on campus session the students are taught the rules of APA Style for formatting their references. During the remainder of the semester the students compile an annotated bibliography. This first semester the students also take two 3 credit courses. Each course meets one class session per week for 3 hours. There is also 5 – 8 hours of work per week outside of class for each course. The students average 20 hours per week for their seven credit hours of classes. This is a substantial load for the students who typically have families with small children as well as a busy professional career.

In the second (spring) semester the first year students take two 3 credit courses. While there is not a designated writing course during this semester, all of the distance masters courses require writing assignments conforming to the APA style.

During the third (summer) semester the first year students take the 3 credit course, Analysis of Research in Construction. The goal of this course is to teach the students to analyze and evaluate academic literature in construction management. The emphasis is on understanding the application of business research procedures including fundamental statistical methods in the solution of construction industry relevant problems. The students also begin work on their three credit directed project.

Below is an outline of the directed project process.

- During the third (summer) semester the first year students enroll for the first credit hour of their directed project to generate the directed project proposal. The proposals include the introduction, the literature review of prior work, and the procedures to be employed to complete the directed project.
- The students return to campus for two and a half days at the beginning of their fourth (fall) semester to defend their proposal in front of graduate committee, work on an individual basis with the university librarians, and to receive advanced instruction in a second one credit academic writing course. The fourth semester students enroll for the second credit hour of their directed project and work under the direction of their graduate committee.
- During the fifth (spring) semester the students enroll for the third credit hour of their directed project. They complete their first draft by March 1st and start on a series of revisions as directed by their graduate committee. Upon completion of the project and associated documentation the student defends his/her directed project in front of graduate committee. Many students defend their project using Adobe Connect web conferencing software. With web cameras, monitors, headsets, and microphones the student and the committee can see, be seen, hear, and be heard.

The total academic load for the students in the fourth semester (fall) is 8 credit hours. This consists of two 3 credit courses, the one credit advanced academic writing course, and one credit for the directed project. The academic load for the students in the fifth semester (spring) is not much easier. It consists of two 3 credit courses and one credit for finishing the directed project.

This plan of study has proved to be challenging for the students. Only 30% of the students have finished in five semesters. Just over half (53.3%) of the students have finished within six semesters. All of the students have finished the coursework within the five semesters. In every case it has been the uncompleted directed project that has kept the students from graduating on time. Another negative trend is that once the students complete their coursework and take a break from the directed project, they have a difficult time restarting the directed project. See Table 1 which shows the Completion of Directed Project statistics for the students who have finished their coursework.

Table 1 - Completion of the Directed Project

Program Start Date	Total	Students Who Have Completed the Directed Project					
		Within 5 Semesters		Within 6 Semesters		Total as of December 2010	
		Number	%	Number	%	Number	%
8/06	13	3	23.1%	5	38.5%	8	61.5%
8/07	7	3	42.9%	5	71.4%	4	57.1%
8/08	10	3	30.0%	6	60.0%	5	50.0%
Total	30	9	30.0%	16	53.3%	17	56.7%

While the students are struggling to finish the Directed Projects, there has not been a similar trend about completing individual courses. To-date one student dropped out of the program before completing the coursework. Less than five students have received any “Incompletes” in their coursework. It is likely that the synchronous coursework helps to pace the student’s work and leads to course completion. On the other hand, the Directed Project is a self-paced independent project without a pacing mechanism.

The Distance Masters students have many obligations with their families and careers. After four semesters of intense coursework the students see the Directed Project as an obligation without a firm deadline. Financially, the student only needs to sign up for one credit hour every third semester to remain in the program while they work on their Directed Project. The students can continue to delay completion of this work for up to five years from the end of their first semester in the program. The five students that started in the fall of 2006 and have not submitted their Directed Project have a December 2011 deadline. Distance education appeals to busy people. However, the burden can be overwhelming. “Distance-education students tend to leave us because they are very busy, their lives are crammed full of things, and suddenly they find

themselves in a situation of having to rethink their priorities,” says Jacquelyn B. Tulloch, the executive dean of distance education and college services at the LeCroy center. “Very often, for better or for worse, education is the easiest thing to let go of.”¹⁵

Comparison to Other Distance Learning Programs

Four online construction management master's degree programs were endorsed by the Associated General Contractors of America in 2006¹⁶. The Department of Building Construction Management is one of these programs. All four of the programs allow students to choose between a thesis and a non-thesis academic writing project. One of the four programs also has a coursework only option. Table 2 summarizes the writing requirements for the four programs.

Table 2 - Comparison of Capstone Project Requirements for Online AGC Endorsed Construction Management Masters Programs¹⁶

University	Program	Can distance masters students choose to do a thesis?	Non-thesis Capstone Project Requirement Description	Is the Non-thesis Capstone Project Required?
Arizona State University	Master of Science Degree with a major in Construction	Yes	3 credit research methods class	Yes
Clemson University	Master of Science in Construction Science & Management	Yes	3 credit Special Problem not considered a capstone project	Yes
Iowa State University	Masters Degree Program in Civil Engineering with an Emphasis in Construction Engineering and Management	Yes	2 credit research project	No - there is a coursework only option
Purdue University	Master of Science Degree in Technology with a specialty in Building Construction Management	Yes	3 credit directed project - see text for description	Yes

Following are brief descriptions of the non-thesis writing project requirement for three of the programs. The description of the non-thesis writing project requirement for the Department of Building Construction Management has been described previously in this paper.

The Del E. Webb School of Construction at Arizona State University project course is CON 501 Research Methods, 3 credit hours ¹⁷. The non-thesis writing project is included in this course.

The Clemson University project course is CSM 889 – Special Problem, 3 credit hours. The course requirements state that the student is to: “1. Develop a research-based proposal on an approved construction-related topic; 2. Demonstrate mastery of formal research methodology and terminology through conducting a project on an approved construction-related topic; 3. Prepare and present in writing (in APA format) and orally a formal research report; and 4. Prepare a paper for presentation to an approved research refereed journal. ¹⁸”

The Iowa State University optional project course is C E 599. Creative Component, a pre-enrollment contract required¹⁹. This course is further described as, “a two credit project that may be arranged to develop a process improvement in cooperation with your employer or to research a topic that is of mutual interest with your employer²⁰”.

Corrective Actions

To improve the completion rate on the Directed Project, the existing academic writing courses and the Analysis of Research in Construction course were reviewed and improved by the instructors of the writing courses. Improvements included more frequent though smaller assignments in the course. There was a written assignment due each week. Again, this was an attempt to provide pacing for the course. Another change was to provide guidance on picking a Directed Project topic during the summer before first year students started classes. This allows the student to examine their work environment for topics that will be applicable in their careers. These changes have not had a measurable effect on the Directed Project completion rate.

Finally the Department of Building Construction Management Graduate Committee as a whole studied the problem. The Graduate Committee examined the students’ work load each semester and determined that the requirement to work on the Directed Project in the fourth and fifth semester was an overwhelming burden on the students given the six hours of coursework each semester and the one credit academic writing course in the fourth semester.

The Graduate Committee decided to make the Distance Masters program a six semester program. The added sixth (summer) semester is to be dedicated to writing the capstone project. The thought is that this will give the students both the time and the structure to complete the capstone project.

The committee also discontinued the use of the Directed Project for the non-thesis option. The Directed Project will be replaced by the requirement for the student to submit an article for publication in a construction management journal. The Graduate Committee is preparing a list of pre-approved journals that have outstanding editorial requirements. The committee will accept requests from students to submit to other construction management journals that are not on the approved list.

Another change that the Graduate Committee is introducing is the elimination of the three person Directed Project advisory committee. With the new journal paper requirement, each student will work with one faculty advisor. This change will simplify the meeting coordination that is complicated by the geographic distance between the students and faculty.

These changes implemented by the Graduate Committee will make the capstone project look less like a Thesis. The Directed Project has been considered by the Purdue Graduate School to be a non-thesis option, so no change in program status was required. The capstone article as an applied academic writing project will enhance the students' career aspirations through an emphasis on construction industry problem solving. Since many faculty members expected Directed Projects to be nearly equivalent to a Thesis, the journal article requirement will also avoid faculty confusion about the intent of the writing assignment.

The student will complete the journal paper requirement when the faculty approves the paper and the paper has been submitted to the journal for review. The student will not need to wait on journal acceptance before receiving their degree because the review and acceptance process can take several months. The faculty advisor will have the responsibility to work with the new alumni to incorporate the journal reviewer's comments and to resubmit for publication. A desired impact of this new procedure is to enhance the publication skills of the Department of Building Construction Management.

Conclusion

The synchronous delivery of classes works very well for a Construction Management program with both traditional students in the physical classroom as well as professional students geographically dispersed. Purdue is located in a small town 70 miles away from a medium sized metropolitan area. There are not enough construction management professionals within commuting distance of the university to support a masters program in construction management. The synchronous delivery method not only extends the target market, but it also creates a sense of community similar to traditional teaching in the physical classroom.

Distance education students tend to be older than traditional college students and often have very busy lives full of family and career activities. A Distance Masters program should have realistic goals for the expenditure of the student's time. A lesson learned at the Department of Building Construction Management is to have achievable time requirements. In addition, it is necessary to provide structure so that busy students are less likely to find themselves in the situation of being overwhelmed by the academic requirements. Finally, the experience with distance education for active construction managers has shown a need for academic writing requirements that are not too open-ended and have relevance to construction industry practice.

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